FILE COPY

New England Economic Review

Federal Reserve Bank of Boston

Special Issue

May/June 1996

Bishop
Bound
Bradbury
Cappelli
Freeman
Glaeser
Gottschalk
Hanushek
Holzer
Ihlanfeldt
Kain
Katz
Kodrzycki
Levy
Mayer
Murnane
O'Regan
Quigley
Rosenbaum
Schnare
Singleton
Summers

Earnings Inequality

Proceedings of a Symposium on

Spatial and Labor Market Contributions to Earnings Inequality

President
Cathy E. Minehan

Senior Vice President and Director of Research
Lynn Elaine Browne

Research Department:
Banking and Monetary Policy
Eric S. Rosengren, Vice President
Joe Peek
Katerina Simons
Robert Tannenwald

International
Norman S. Fieleke, Vice President

Macro/Finance
Richard W. Kopcke, Vice President
Peter Fortune
Geoffrey M. B. Tootell, Assistant Vice President

Open Economy Macroeconomics
Jeffrey C. Fuhrer, Vice President
Jane Sneddon Little

Regional
Katharine L. Bradbury, Vice President
Yolanda K. Kodrzycki
Christopher J. Mayer
Joanna Stavins
Robert K. Triest

The **New England Economic Review** is a publication of the Research Department of the Federal Reserve Bank of Boston. Joan T. Poskanzer is the editor. Ann Eggleston coordinates the design and production. Views expressed are those of the individual authors, and do not necessarily reflect official positions of the Federal Reserve Bank of Boston or the Federal Reserve System. The authors will be glad to receive comments on their articles. The Review is available without charge. Requests to be placed on the mailing list or for additional copies should be sent to the Research Library–D, Federal Reserve Bank of Boston, P.O. Box 2076, Boston, MA 02106-2076. Articles may be reprinted if the source is credited. Please send copies of the reprinted materials to the editor.

Earnings Inequality

Proceedings of a Symposium on

Spatial and Labor Market Contributions to Earnings Inequality

Although the increase in earnings inequality in the 1980s and 1990s has been well documented, its causes are still being studied and debated. Some explanations revolve around changes in job skills, job requirements, and labor market institutions. Other explanations focus on the deteriorating quality of many urban neighborhoods and the increasing economic isolation of their residents. A symposium at the Federal Reserve Bank of Boston on November 17, 1995, brought together experts from labor and urban economics to address the extent to which changes in labor markets and location have contributed to rising inequality. Participants also discussed the effectiveness of policies that may help overcome the problem.

Contents

The Role of Organizational Change and Labor Market Institutions in Earnings Inequality

What are the characteristics of technology or work organization that are contributing to changes in skill requirements and relative earnings? To what extent has the decline of institutions such as collective bargaining and the minimum wage contributed to rising inequality? What scope is there for the United States to develop institutions and work environments to reduce inequality?

Panel Discussion on Policy Implications

What have we learned from the papers presented at this Symposium? What are the implications of rising earnings inequality for economic growth? What are the appropriate roles (if any) of employers and federal, state, and local governments in addressing the problems posed by earnings inequality? To what extent are small-scale socioeconomic experiments generalizable? How urgent is the problem and what are the prospects for action? 173

Anita A. Summers, Moderator; *Ann B. Schnare, Frank Levy,* and *Lawrence F. Katz*

Correction

Correction, May/June 1996 *New England Economic Review*

In the article "Technology and Skill Requirements: Implications for Establishment Wage Structures," by Peter Cappelli, incorrect summary statistics were given for Tables 2, 3, and 4. The correct figures are as follows:

Table 2, on page 149: $R^2 = .47$, $\overline{R^2} = .45$, $F = 20.849$

Table 3, on page 149: $R^2 = .40$, $\overline{R^2} = .38$, $F = 16.001$

Table 4, on page 150: $R^2 = .12$, $\overline{R^2} = .08$, $F = 3.12$

Please enter these corrections on your copy of the May/June 1996 issue.

Spatial and Labor Market Contributions to Earnings Inequality: An Overview

Katharine L. Bradbury, Yolanda K. Kodrzycki, and Christopher J. Mayer

Vice President and Economist, Senior Economist, and Economist, respectively, at the Federal Reserve Bank of Boston. *The authors are very grateful to Joan Poskanzer and Rebecca Hellerstein for their excellent editing of the symposium papers and panelists' remarks for publication.*

Earnings inequality has increased markedly in the United States in recent decades. In 1979, full-time workers at the 90th percentile of the wage distribution earned about three times as much as those at the 10th percentile. By 1992, high earners were being paid about four times as much as low earners. Inequality has risen along various dimensions—by education, by age group, and among similarly educated workers with similar length of experience. Moreover, the trend toward greater earnings inequality looks more pronounced when one takes account of persons who work less than full-time or less than year-round. And the degree to which inequality has risen has been greater in the United States than in other advanced economies.

Increasing inequality has occurred against a backdrop of increasing economic segregation. In the 1960s, middle-class and wealthy Americans began to move out of central city neighborhoods to the suburbs in greater numbers, leaving poor Americans increasingly isolated in poverty-stricken urban areas. Although segregation by race remains at very high levels, the exodus of middle- and upper-income blacks from central cities has accelerated. This growth in segregation by income has left many poor (and often minority) households living in neighborhoods that lack positive role models or established job networks, have high crime rates, and are isolated from fast-growing suburban employers.

Some economists have explained trends in earnings inequality by looking exclusively at changes in job skills, job requirements, and labor market institutions. Others focus on the deteriorating quality of many urban neighborhoods and the increasing economic isolation of their residents that inhibits the accumulation of skills by youth and reduces their access to jobs. In November 1995, the Federal Reserve Bank of Boston convened a symposium of experts representing these alternative perspectives, with the goal of fostering a more integrated understanding of the causes of inequality and generating fresh insights into possible policy responses.

The symposium began with two overviews of the largely separate literatures on labor market and spatial contributions to earnings inequality, written by Yolanda Kodrzycki and Christopher Mayer. A consensus appears to be growing within each of these bodies of research that the rise in inequality has been multifaceted. Discussions at the symposium expanded on this theme and, appropriately, considered a broad array of potential remedies.

The participants generally agreed that increases in earnings inequality during recent decades are a source of concern. They also indicated that the distribution of earnings is likely to become even less equal in the future. Although some experts (particularly those specializing in labor economics) expressed support for measures that would have the effect of reducing inequality in the upper half of the income distribution, most policy proposals appeared motivated by a specific concern for low earners. One prominent focus of such efforts would be to reduce concentrations of poverty, both by reducing barriers to residential mobility for the urban poor and by enhancing their educational opportunities.

I. Spatial Contributions to Earnings Inequality

For years, economists have recognized that residential location plays an important role in the labor market outcomes of individual workers, but have debated about which specific locational factors are most relevant.

How Residential Location Matters

Katherine O'Regan and John Quigley analyze employment and "idleness" (not employed and not in school) outcomes for a large sample of "at-home" urban youth. They find evidence in favor of two broad explanations for why location is so important. First, the "spatial mismatch hypothesis," developed in the 1970s by John Kain, posits that racial segregation of minorities in inner-city neighborhoods and increasing job suburbanization have reduced the incomes and employment opportunities of blacks. More recently, William Julius Wilson's work on the "urban underclass" suggests that the social isolation resulting from the concentration of minorities has a negative effect on individuals generally, and on their labor market performance specifically.

The authors' analysis is based upon an unusually rich sample of 28,000 youths in four New Jersey metropolitan areas, matched to detailed census tract demographic information and specially constructed measures of access to employment. Even after controlling for a variety of human capital characteristics, O'Regan and Quigley find that neighborhood factors matter consistently in explaining both "idleness" and employment, although they cannot distinguish whether the effect is due to informal job networks, role models, or peer influence. Measures of access to jobs, while not consistently significant across metropolitan areas, are positively related to employment in some areas, especially for minority youth. Access to jobs appears to play essentially no role in determining youth idleness.

O'Regan and Quigley find that neighborhood factors matter consistently in explaining both youth "idleness" and employment, although they cannot distinguish whether the effect is due to informal job networks, role models, or peer influence.

Simulations using these results demonstrate quite clearly that the constellation of factors that distinguish "good" from "bad" neighborhoods affects teenage employment in profound ways. For example, predicted employment rates for a neighborhood with characteristics encountered by the average white youth are up to one-third higher than for the average black youth's neighborhood.

In his discussion, Edward Glaeser comments that O'Regan and Quigley have made significant improvements in distinguishing the impact of proximity to employment from that of neighborhood characteristics on employment outcomes. Nonetheless, the paper still faces possible problems of interpretation because attributes of the neighborhood may be related to unobserved individual characteristics, and individuals might choose a neighborhood based on the productivity of that neighborhood for that specific person. Glaeser notes that the reliability of O'Regan and Quigley's results depends critically on two assumptions: first, that parents of at-home youth choose a neighborhood based on their own job concerns rather

than the employment prospects of their children; and second, that these two factors are independent of each other. On the policy front, Glaeser suggests that the role of neighborhood factors in influencing individual outcomes could provide an efficiency argument for government policy intervention since individuals cannot directly control the actions of others. He warns, however, that government may exacerbate rather than improve existing market failures.

Glaeser concludes that policies designed to promote and subsidize human capital accumulation and alter the patterns of family responsibility are most likely to be successful, while enterprise zones, subsidized transportation, or mobility strategies are unlikely to provide many long-lasting benefits. He draws this conclusion by noting that measures of job access are less significant in the O'Regan and Quigley paper than the measures of neighborhood composition. Glaeser agrees with the authors, however, that it is difficult if not impossible to separate out specific neighborhood influences (such as the crime rate, the percentage of poor residents, or the employment rate). Nonetheless, identifying such specifics is a necessary first step in designing government policies to address neighborhood externalities.

Employers and Location

Much of the empirical evidence and theoretical support for spatial mismatch comes from studying individuals, but Harry Holzer and Keith Ihlanfeldt argue that an investigation of firm behavior is also important. Previous studies have found strong evidence that access to jobs affects labor market outcomes for minorities, and many researchers have proposed policies to improve access from predominantly minority urban areas to suburban job locations or to encourage minority households to move to the suburbs. Yet, if the newly located minority households do not have the skills that firms demand, or if firms discriminate in the hiring process, such policies are doomed to failure.

Holzer and Ihlanfeldt use data from a new survey of over 3,000 employers in four major metropolitan areas to investigate the determinants of black employment and wages at the firm level. While considering a wide variety of other factors that might affect black employment, including employers' skill needs, the race of customers, and the race of the person responsible for hiring, the authors find that employers' proximity to black residences and to public transit increases the likelihood of hiring black workers. They also find that wages are lower at employers located close to the black population. Holzer and Ihlanfeldt argue that such results are consistent with the predicates of spatial mismatch in which labor demand shifts away from black areas, but the labor supply response is limited by housing segregation.

Holzer and Ihlanfeldt conclude that policies designed to encourage the mobility of minority households or to subsidize reverse commuting would likely raise employment levels and wages for black workers. The authors support programs to improve the skills of minority workers, but they view such programs as complements rather than substitutes for transportation programs, because one type of policy enhances the effectiveness of the other.

Holzer and Ihlanfeldt find that employers' proximity to black residences and to public transit increases the likelihood of hiring black workers. They also find that wages are lower at employers located close to the black population.

The discussant, James Rosenbaum, accepts Holzer and Ihlanfeldt's empirical findings, but takes issue with their policy recommendations. In assessing the empirical findings, Rosenbaum notes that sample selection is still a potential problem—that is, black workers hired in white suburbs might somehow be different from other black workers in ways that are not captured by the controls. Yet Rosenbaum goes on to present evidence supporting Holzer and Ihlanfeldt from the Gautreaux experiments in Chicago, in which low-income black applicants to public housing were randomly allocated to the city or the suburbs. In a subsequent study of 300 adults, movers to the suburbs had significantly higher employment rates than those who moved within the city, while employed members of the two groups had similar wages and hours of work.

In developing policy recommendations, Rosenbaum is less optimistic than Holzer and Ihlanfeldt about transportation policies unless they are combined with some programs to equip black workers with the attributes that many employers seek. He cites

evidence showing that employers are often concerned with personality issues in addition to directly measured skills, using such imperfect indicators as a firm handshake or a traditional hairstyle. In fact, employers often use residential location as another signal of whether job candidates will be "good" workers, a practice that casts doubt on the possible success of transportation programs. Programs must be developed to give employers more accurate signals of a potential worker's quality. One advantage of residential mobility programs like Gautreaux is that they allow potential workers to tap into informal job networks through local schools or churches, which provide signals that employers trust. Rosenbaum concludes by describing the significant long-term advantages of encouraging the residential mobility of blacks: The largest benefits of mobility occur in the second generation.

Inequality in Local Schools

John Kain and Kraig Singleton focus on differences in the access to educational inputs among children in five racial and ethnic groups. The authors pattern their paper after the Coleman Report, a path-breaking study prepared nearly 30 years ago, which found that the nation's schools were highly segregated by race but that schools of various racial composition had quite similar access to direct school inputs. Kain and Singleton focus on schools in Texas, where they have collected enrollment data and assessment test scores for 1.8 million students during the five-year period between 1990 and 1994.

The authors find that important changes have taken place since the Coleman report was published. The most obvious change has been a significant reduction in the severest types of racial and ethnic segregation. In fact, only 16 percent of Anglo students in Texas attend schools that are more than 90 percent Anglo, with similar results for other groups. While segregation may have diminished, Kain and Singleton show that test scores for black and Hispanic students are significantly lower than for Anglo and Asian-American students, even controlling for school fixed effects and the family's poverty status. Finally, the authors find significant differences in the within-district provision of several important school inputs. Teacher ability, as measured by proficiency test scores, is inversely related to a school's percentage of black and Hispanic students. In addition, teachers employed in schools with a high percentage of disadvantaged minority students have fewer years of education and less experience than average, although they also have slightly smaller classes.

Kain and Singleton view their paper as a first step in a longer-term project of quantifying the impact of educational inputs on student performance. However, even if policymakers acknowledge only a limited relationship between inputs and performance, the results in this paper suggest additional opportunities to equalize inputs across schools. Texas educators appear to have narrowed differences in class size at schools within a district, but they have yet to equalize teacher quality.

Eric Hanushek reviews the Kain and Singleton paper with few criticisms, but a different interpretation of the results. He considers the most important finding in the paper to be that estimated racial and ethnic differences in student performance appear to be independent of school inputs. Even if school inputs do vary by a school's race and ethnicity, such differences will neither harm nor help the performance of minority students. This conclusion supports Hanushek's views (formulated from previous research) that measured school inputs are, for the most part, unrelated to student performance.

Nonetheless, Hanushek concedes that many studies have found that teacher test scores are positively correlated with student performance, suggesting the possibility that differences in teacher quality could have some measurable effect. He also notes that the racially biased distribution of inputs that conventional wisdom links to student performance could imply systemic racial discrimination.

II. Labor Market Contributions to Earnings Inequality

The labor market studies presented at the symposium concentrated on three themes: demand and supply trends for college-educated workers, the effect of workplace innovations on wage structures, and institutional influences on earnings inequality.

Responses to the Rising College Wage Premium

The earnings of college graduates and non-graduates diverged sharply in the 1980s and early 1990s, after showing little relative change during the 1970s. John Bishop's paper explores whether the earnings premium associated with a college education will increase, given likely labor market trends and demographic and institutional constraints. He con-

cludes that opportunities for college-educated workers will continue to expand and will lead to a continuation of recent trends in their relative earnings.

Bishop criticizes U.S. Bureau of Labor Statistics (BLS) calculations that appear to predict rising underemployment among BAs. The BLS derives projections of the demand for college-educated workers from forecasts of industry output, using data on occupational staffing ratios by industry and on the prevalence of college graduates within occupations. This methodology historically has produced poor forecasts of the direction of the college job market. According to Bishop, the BLS attempt to divide jobs into some that require a bachelor's degree and others that do not is flawed conceptually. In many occupations that do not require a B.A., productivity nevertheless rises with academic skills. Furthermore, over time many sectors of the U.S. economy have been increasing their demand for professional, technical, and managerial workers, so historical relationships between industrial composition and occupational mix provide an unreliable basis for making forecasts.

Bishop concludes that opportunities for college-educated workers will continue to expand and will lead to a continuation of recent trends in their relative earnings.

Bishop proposes an alternative, regression-based model of the demand for different occupations. This model, which has been more accurate than the BLS methodology in the past, now projects that professional, technical, and managerial jobs will account for 60 percent of total job growth between 1990 and 2005. Although Bishop believes that college enrollments will respond to these work opportunities, he foresees a decline in the ratio of BAs awarded to total employment because relatively few individuals will be in the age group that typically attends college. Thus, government should intervene to improve access to colleges and universities. To this end, Bishop suggests raising high school standards, increasing student financial aid, making tuition tax-deductible, and halting tuition increases at public institutions.

Discussant Richard Murnane agrees with Bishop's prediction that college will continue to be a good investment in the years ahead. He explores possible reasons for the observed anxiety over the fate of college-educated workers, despite the considerable evidence that this group has done and will continue to do better relative to their less-educated counterparts. One observation relates to successive cohorts of BAs. Recent male college graduates are not earning any more, adjusted for inflation, than men of similar age and educational background 15 years ago. (The growing earnings premium of male college graduates results from a decline in the real earnings of high school graduates rather than any increase in their own earnings.) And because of real tuition increases, the recent BAs have a higher debt burden than their predecessors. Second, an increasing proportion of older male college graduates are now in low-paying jobs, compared to the situation in the late 1970s. This trend presumably relates to earnings patterns for workers who lose their jobs in corporate restructurings and other layoffs. Finally, Murnane indicates that highly educated workers often spend a couple of years in low-paying jobs immediately after graduation. The popular image of college graduates wasting their education working in coffee bars and the like is based largely on such temporary employment.

Murnane shares Bishop's concern about improving access to higher education, but differs somewhat in how to achieve this goal. He argues that states should allow tuition at public institutions to continue to rise, but they should allocate more funds to need-based financial aid.

Technology in the Workplace

A number of studies have argued that technological change has been raising the demand for highly educated and otherwise skilled workers, while lowering the demand for the less educated and the less skilled. Some of these studies do not measure technology directly but attribute unexplained trends in wage patterns to technological change. Others include only very general measures of technology, such as capital intensity or computer investments by industry. In contrast, Peter Cappelli's paper uses the responses to a national survey of about 3,000 employers to take a closer look at the influence of technology on skill requirements and relative wages for production workers and their supervisors. He uses the term "technology" to encompass changes in workplace organization, such as changes in how jobs are defined and who controls their content.

Cappelli reviews findings from a range of social sciences disciplines on how technology alters skill requirements. In line with the themes of these earlier studies, his regression analysis indicates that workplaces with more widespread computer usage, higher capital intensity, a research and development center, and a total quality management (TQM) program are more likely to require upgraded skills among production workers.

Cappelli then examines the links between technology and wage structures by comparing pay at establishments that make intensive use of the new technologies with others that do not. The introduction of computers and new work practices appears to increase inequality within occupations. At the same time, more advanced technologies tend to reduce inequality within establishments, as indicated by the relative pay of production workers and their supervisors.

Cappelli's analysis indicates that workplaces with more widespread computer usage, higher capital intensity, an R&D center, and a TQM program are more likely to require upgraded skills among production workers.

Cappelli warns that these findings do not provide clear guidance on future wage or employment patterns for the economy as a whole. If employers have difficulty hiring skilled workers (or if wage requirements for these positions become too high), they may take compensating actions, such as redesigning jobs to have lower skill requirements. Because they lack knowledge of what measures employers are likely to take, government policymakers cannot know what interventions are needed to achieve societal earnings distribution goals.

In his discussion, John Bound questions the ability of largely cross-sectional studies of work establishments such as Cappelli's to shed light on trends in inequality. Despite isolated examples to the contrary, technological change undoubtedly has increased the demand for skills over the past two decades. This conclusion is based on indirect, but irrefutable, evidence that the relative utilization of skilled labor has been rising despite increases in its relative cost. Furthermore, a focus on the skills and wages of production workers ignores the decline in the fraction of the work force in production jobs. This shift in the composition of jobs is an important component of the skill upgrading that has been taking place.

Bound acknowledges, however, that Cappelli's examination of production workers results in some new insights. The paper is the first to find that computer usage and workplace innovations such as TQM raise the pay of these employees. Bound calls for a more detailed examination of exactly how these capital investments and human resources management practices affect skill requirements.

Influences of Labor Market Institutions

The trends toward a higher share of professional, technical, and managerial employees in the work force, and toward the adoption of new technologies, are common across a number of countries. Yet the United States has experienced a greater increase in earnings inequality, and a greater decline in the earnings of low-end workers, than other industrialized countries. Richard Freeman's paper explores the degree to which international differences are due to differences in labor market institutions, notably collective bargaining and the mandated minimum wage. He finds that the effects of institutional factors are at least as strong and arguably stronger than the effects of more commonly cited market factors.

A higher degree of inequality in the United States than in other countries is sometimes attributed to our greater degree of ethnic and cultural diversity. Freeman disputes this allegation by comparing workers of different backgrounds in the United States and Sweden. Americans of Swedish descent and Swedes of non-Nordic descent have earnings distributions similar to those prevailing in their country of residence—not their country of ancestry. Freeman concludes that cross-country differences are due to institutional factors, which he describes.

Freeman cites several studies showing that declining unionization has accounted for about one-fifth of the increase in U.S. earnings inequality over the past two decades. He notes the remarkable unanimity in the findings despite considerable diversity in methodologies, but argues that the studies underestimate the true impact to the degree that union wage settlements have spillover effects to nonunionized sectors. Freeman's own regressions, which explain earn-

ings inequality in 12 OECD countries as a function of collective bargaining coverage and unionization, suggest that as much as one-half to two-thirds of U.S.-European differences in the degree of inequality can be traced to these institutions. Finally, Freeman finds that countries with the largest declines in collective bargaining coverage generally had the largest increases in inequality.

Freeman emphasizes that the cures for problems do not have to be linked directly to the causes. Thus, a more progressive fiscal policy or measures to increase the access of poor children to technology are solutions worth considering. But in light of the seriousness of the rise in inequality in the United States, Freeman believes that institutional interventions such as a rise in the minimum wage should not be ruled out. Expansions in collective bargaining coverage may have unique benefits, such as increasing the degree of worker influence in workplaces, which in turn has the potential to raise workplace efficiency.

In his comments, Peter Gottschalk agrees that institutions matter; one cannot hope to explain U.S.-European differences in inequality by market forces alone. But he calls for a more rigorous assessment of the relative role of institutions and markets in determining changes in inequality over time. Gottschalk finds that roughly one-half of the countries with centralized wage-setting institutions also experienced education- or age-related changes in labor supplies that are consistent with earnings patterns. By not including explicit tests of the role of markets in earnings inequality, Freeman's analyses offer only upper-bound estimates of the role of institutions.

Turning to policy, Gottschalk argues that regardless of whether labor market institutions were or were not an important cause of the increase in inequality, the United States could have done more to offset this trend. He urges consideration of an expanded earned income tax credit in addition to Freeman's proposals.

III. Policy Implications: A Panel Discussion

The panelists were asked to reflect on three broad issues:

- the nature of the "problem" posed by rising inequality and, in particular, its implications for economic growth;
- the urgency of the problem; and
- the appropriate policy actions to take.

Anita Summers observes that development of appropriate policies can occur only when consensus is reached that inequality has risen to unacceptable levels. In her view, inequality is currently too high because of its consequences for those at the bottom of the income distribution—the poor—and it is the poor on whom policy concern should focus. Comprehensive policy programs, not single-pronged strategies, are needed to address the problems of those at the bottom. Such programs must deal with the spatial concentration of the poor as well as with their low incomes per se.

Any consideration of policy must recognize the ongoing devolution of responsibility from the federal government to state and local governments, Summers points out. Increased emphasis on sub-federal governments' decision-making will complicate development or implementation of policies focused on labor markets and transportation, and especially any policies aimed at spatial dispersion of the poor, because they may cross the relevant jurisdictions' borders. For example, analysts are already concerned about interstate competition in pursuit of welfare reform. In the context of devolution, the biggest U.S. cities—in which the poor are highly concentrated—may lose out because they are outvoted in their states by suburban and rural interests.

Ann Schnare carries forward the theme of "people versus place," focusing on the housing market. After rising rapidly in preceding decades, home ownership rates have held steady in the last two decades as a result of income stagnation among the middle class. And income declines at the bottom have made well-maintained rental housing unaffordable for many, resulting in physical decay in those residential areas in which low-income renters are concentrated—central cities. This decay has, in turn, increased the impetus for those who have a choice to live elsewhere, further augmenting spatial segregation by income.

Discussing mortgage programs of Freddie Mac as well as housing policies of the Department of Housing and Urban Development (HUD), Schnare reports some discouraging developments. Special low-equity mortgage programs aimed at low-income potential home-buyers have a weak record because many poor individuals cannot maintain payments on their properties. For mainstream mortgage programs, by contrast, loans to low-income individuals appear to be no riskier than loans to middle-income borrowers, but neighborhood income exerts a strong independent effect: Loans on properties in distressed inner-city neighborhoods are noticeably riskier, regardless of the

income of the borrower. By the same token, Schnare argues, HUD programs have become less successful as they have attempted to allocate their increasingly limited budgets to both providing housing assistance to very poor individuals and addressing the community development needs of distressed neighborhoods. She suggests that policies centered around vouchers and mixed-income developments would suffer less from, and indeed might help to reduce, the negative neighborhood externalities that plague current subsidized housing programs.

Summers observes that comprehensive policy programs, not single-pronged strategies, are needed to address the problems of the poor.

Schnare suggests that policies centered around vouchers and mixed-income developments might help to reduce the negative neighborhood externalities that plague current subsidized housing programs.

Levy argues that in the short run we need "emergency" policies to ease the impact of economic adjustments such as restructuring on those hardest hit. In the long run, the supply of well-qualified workers must increase via education.

Katz notes that our experience with training and wage subsidy programs shows that early intervention pays off, and the returns to higher education are particularly large for those from disadvantaged backgrounds.

Frank Levy focuses on the potential responsiveness of labor supply—via education and human capital development—to the sizable shifts in labor demand that underlie much of the recent increase in U.S. earnings inequality. While he believes that in the long run rising inequality slows the nation's economic growth, in the shorter run the causation runs in the opposite direction. Restructuring in the manufacturing and services sectors has raised the education premium, and thereby increased inequality, by reducing the demand for semi-skilled labor much faster than these workers can acquire new skills. The policy challenges are twofold: In the short run, he argues, we need "emergency" policies to ease the impact of these economic adjustments on those hardest hit. In the long run, the supply of well-qualified workers must increase via education, particularly elementary and secondary schooling because it is difficult for mature workers to upgrade their educational attainment later.

Spatial issues enter the labor policy discussion because of the local character of public schooling in the United States. Schools should adjust their curricula and their teaching routines to provide a better fit between what they teach and what graduates will need when entering the labor market, Levy argues. The need for these adjustments is greatest in the communities that have historically prepared children for the jobs that are in decline. Moreover, parents in these communities have often been on the wrong side of the rising educational wage premium. Thus, because of increased geographic homogeneity by income, the communities needing the greatest school adjustments are generally those with the fewest resources to explore and finance them. Information about labor market opportunities and skill needs is critical: even as we keep upgrading educational standards, we also need to disseminate information to children and parents early enough to influence tracking and other educational decisions.

Larry Katz also focuses on the shrinking demand for disadvantaged workers, defined as those with limited education or skills, or from poor families or impoverished neighborhoods. Neither this labor demand shift, nor the reinforcing changes in other supply and demand factors that have accompanied it, show any signs of abating, he notes. While strong macroeconomic growth improves disadvantaged workers' prospects, the recent "twist" in the wage structure has been so massive that specific initiatives are needed to address the structural barriers preventing a speedy supply response. In addition, because the supply response takes time, the government may want to intervene in the short run on the demand side of the market (via wage subsidies, expansion of the earned income tax credit, or raising the minimum wage, for example) to ensure that work pays.

A number of lessons can be drawn from our experience with training and wage subsidy programs, Katz says. One is that early intervention pays off; once a student drops out, it is difficult to turn things around. And mature workers are much less likely than those still in school to continue their schooling. Thus,

provision of mentoring and more general information to improve the matching of skills and demands, as well as the possibility of financial support for higher education, must be in place early enough to provide young students with a realistic expectation of realizing the payoff to further education. The returns to higher education are particularly large for those from disadvantaged backgrounds, suggesting that borrowing constraints are binding in some cases. Financial constraints also keep many poor families in public housing, where access to jobs is poor and where they feel their children's futures are threatened by crime and poor schooling. To overcome the particular difficulties of the poor who are spatially concentrated, the government should try "place-based people policies," which would target training and human resource funds on the areas with the greatest needs.

IV. Overall Themes and Policy Conclusions

A key issue that both motivated the symposium and animated much of the discussion is the question of what current trends imply about future patterns of earnings inequality in the United States. Virtually all participants agreed that the increase in inequality in recent decades is a source of concern, even where consensus is lacking about "appropriate" or "acceptable" levels of inequality. Thus, a critical question is whether the forces that caused the recent rise in inequality are likely to reverse themselves, or be offset by other equalizing forces, without policy intervention.

Space Matters

One basic conclusion that emerged from the conference is that "space matters." This is not a very encouraging message when evaluated in the context of future inequality trends. Access to jobs is critical to any individual's labor market success. And access has a geographic aspect—the length of the commute to employment opportunities—as well as an individual job preparation (education/skills) aspect.

In a generally suburbanizing economy, residents of core parts of many of the nation's largest cities have become increasingly isolated from the functioning of the broader economy. Neighborhood externalities cause this isolation to foster further isolation, both cultural and geographic, as employers make location decisions considering the availability of the existing work force, for example, and children pattern their behavior and aspirations on what they observe in their own neighborhoods. Transportation policy could help to overcome some spatial barriers to equal job access, but effective policies do not appear to be operating today. And transportation policies cannot offset the broader isolating forces operating in the markets for housing and schooling.

The Labor Supply "Problem"

Individuals have begun responding to the incentives offered by the rising educational premium by obtaining more education. But these investments take time, and for some students they may be limited by financial constraints. Therefore, demand for educated workers may continue to grow faster than supply for a considerable period. Policy interventions may be needed in the near term to enhance the supply adjustments.

Critical to the demand for educated workers is how technology influences skill requirements. In this regard, the symposium highlighted changes in the structure of work relationships, in addition to the investments in computers and research and development that are more typically thought of as "technology." Despite evidence that selected changes have served to equalize pay within workplaces, most participants appeared skeptical that technological advances or employer actions would reverse the trend to greater inequality.

Changes in the Policy Context

A recurring theme in the policy discussions was the prospect of a change in the U.S. system of federalism. Partly as a result of initiatives designed to encourage competition and innovation among subnational jurisdictions, the federal government is devolving responsibility for policy development and implementation in a number of functional areas toward states and localities. As responsibility moves to smaller geographic entities, direct redistribution or indirect policies targeted at improving specific geographic areas become more difficult to implement. This difficulty happens virtually by definition, and also because increased residential sorting is likely to occur as revenue-raising and service provision are made more dependent on geographic location. Thus, existing federal policies that may have helped reduce inequality in the past cannot be expected to have greater redistributional effects in coming years. Future policy initiatives must be evaluated in light of this shift in the decision-making locus.

Future Directions for Policy and Research

Both because "space matters" and because labor supply and demand forces show no signs of turning the tide, the trend toward increased earnings inequality is very likely to continue. Most participants view government policy as having an important role to play in alleviating some of the perceived market failures that contribute to this trend. While the symposium did not develop a consensus regarding which policies should be adopted, it did raise some useful questions and—by spelling out where we are, how we got here, and where we seem to be headed—it provided a context in which to consider policy proposals.

One key question is the degree to which concern should focus on the bottom of the income distribution rather than on inequality across the entire income distribution.

One key question is the degree to which concern should focus on the bottom of the income distribution rather than on inequality across the entire income distribution. Broad policy interventions are not needed, for example, if market-responsive shifts in the supply of labor can be counted on to shrink the educational wage premium over the longer term. Some labor economists at the symposium indicated that a decrease in the relative pay of high earners would improve the international competitiveness of the U.S. economy. But a range of participants noted that market failures pose obstacles to those at the bottom. Thus, most of the policy interventions proposed at the symposium focused on raising incomes at the bottom of the income distribution.

Institutional arrangements and traditions have limited the extent to which U.S. governments intervene in labor markets. A few participants expressed support for a greater role for government or labor unions in setting pay, more supported at least stopgap measures that would help to ensure that "work pays" at the bottom, but most assigned highest priority to education, housing, or general fiscal measures.

Several participants recommended policies that would encourage residents of poor and minority inner city neighborhoods to move to the suburbs. As a decentralized, democratic society, the United States has not historically undertaken policies to disperse the residents of urban neighborhoods (and some government policies may even have helped to create these neighborhoods). Anti-discrimination statutes, however, have been enacted to provide more equal access to housing and credit markets. While mobility strategies patterned after the Gautreaux program in Chicago can provide some hope for a few residents of disadvantaged neighborhoods, such programs are likely to leave many remaining residents of poor neighborhoods facing even more severe neighborhood conditions (especially in the absence of alternative programs designed to encourage reverse migration by middle-class households). This discussion suggests an important role for policies designed to reduce the broader consequences of neighborhood isolation, such as government efforts to raise the quality of schools in poor districts or to directly improve neighborhood conditions or the skills of existing residents.

Education emerged as a critical arena for policy, especially since a significant governmental role already exists. Symposium participants generally appeared to view schools as the most appropriate place for providing students with information about workplace technologies and labor markets, in addition to teaching them traditional academic skills. Increases in residential sorting make the equalization of educational opportunity at the elementary and secondary level a difficult task. In addition, rising real student costs and declining real incomes have reduced access to higher education for students from lower and middle-income households. While addressing the causes and consequences of inequality is difficult enough for the generation currently in the labor market, the problems of inequality will become even more intractable if not addressed for future generations. Viewed in this context, redoubled efforts to assure all children access to good-quality schools makes sense as an early intervention strategy.

Labor Markets and Earnings Inequality: A Status Report

Yolanda K. Kodrzycki

Senior Economist, Federal Reserve Bank of Boston. *The author is grateful to Kathy Bradbury, Lynn Browne, and other symposium participants for helpful discussions, and to Margaret Enis for research assistance.*

Earnings inequality has increased dramatically in the United States over the last decade and a half. Take, for example, average weekly earnings for adults who work full-time (Figure 1). The U.S. Department of Labor (1994) has calculated that in 1979, a man at the 90th percentile of the wage distribution earned 3.2 times as much as a man at the 10th percentile. In 1992, a man at the 90th percentile earned 4.1 times as much. For women, the disparity increased from 3.1 to 3.7 over this same time period. Men at the bottom of the earnings distribution fell behind not only in relative but also in absolute terms, as average earnings for all full-time male earners fell by about 3 percent from 1979 to 1992. For women, average earnings increased by about 15 percent, so the rise in inequality was less likely to be associated with declining real earnings. While these particular calculations focus on only two points in the income distribution, the conclusion that inequality has risen markedly over the past decade and a half is supported by a large body of evidence.[1]

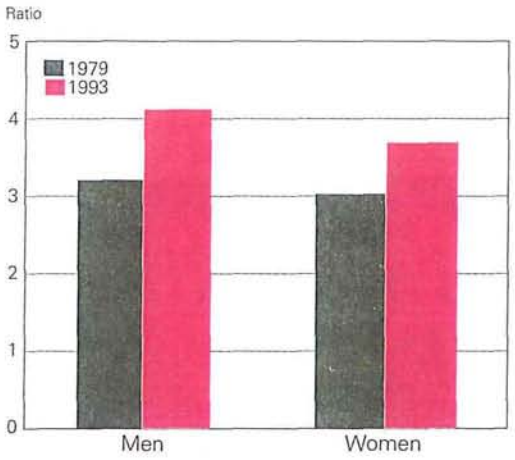
Earnings inequality has risen along various dimensions. Highly educated workers have gained relative to less educated workers. Experienced workers have earned increasingly more than inexperienced workers. And pay for similarly educated workers with similar length of experience has become more unequal. The only significant contrary trend is that the earnings of women have become more similar to those of men.[2] Recent evidence also shows that the increase in inequality during the 1980s was greater in the United States than abroad, and that the distribution of earnings here is much more dispersed than in other industrialized countries.

Much of the literature on earnings inequality was reviewed in a landmark survey by Frank Levy and Richard Murnane (1992). The current paper provides an overview of our present knowledge, concentrating for the most part on contributions since the publication of the Levy-Murnane study. It summarizes explanations for trends in inequality by educational attainment, by experience, within education-experience

Figure 1

Weekly Earnings for Full-Time Workers

Ratio of 90th Percentile to 10th Percentile



Source: U.S. Department of Labor (1994).

categories, and in general. A remarkably diverse array of economic factors (rather than a single dominant force) have caused the rise in earnings inequality in the United States. And although the rising education wage premium has received considerably more attention than the other aspects of inequality, new evidence suggests that growing inequality is traceable at least as much to other aspects of work skills.

This survey briefly examines the significance of two refinements to the measure of earnings—the role of unemployment and underemployment on the one hand, and the role of earnings variability on the other. Individuals with a low earnings capacity are increasingly likely to be out of work or working fewer hours, relative to those with a high earnings capacity. Therefore the trend toward greater earnings inequality looks more pronounced when one takes account of persons who work less than full-time or less than year-round.

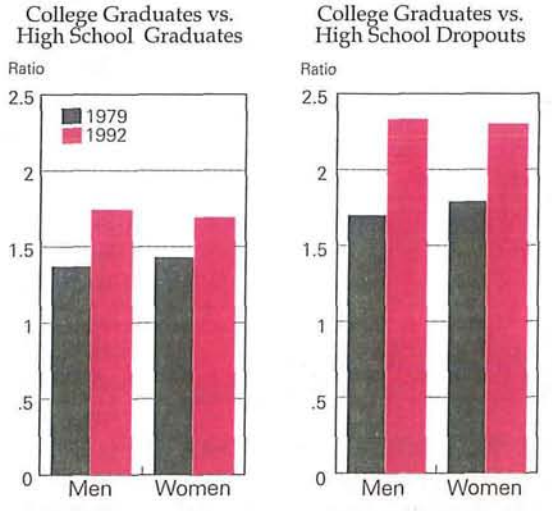
The paper assesses how additional social and political influences have interacted with labor markets in determining inequality. Changes in taxes and transfers have served to aggravate earnings disparities in the United States over the last decade and a half, as has the increased prevalence of single-parent families. The paper concludes with some observations on past and future research themes.

Changing Returns to Education

The earnings of college graduates and non-college graduates diverged sharply in the 1980s and early 1990s, after showing little relative change during the 1970s (Figure 2). According to the U.S. Department of Labor (1994), between 1979 and 1992, real earnings of full-time year-round male workers rose 5.2 percent for those with a college degree, while falling for those with less education. In 1992, male college graduates earned 74 percent more than high school graduates and 133 percent more than high school dropouts. In 1979, these differentials had been only 37 and 70 percent, respectively. The premium paid for education also rose for women during the 1980s and early 1990s, although all categories of full-time women workers except high school dropouts experienced at least some increase in real earnings. As noted in Levy and Murnane (1992), these trends have been explained by a combination of ongoing increases in demand for col-

Figure 2

Earnings Ratios by Educational Attainment



Source: U.S. Department of Labor (1994). Annual figures computed for year-round, full-time workers.

[1] For a comparison of alternative measures, see, for example, Karoly (1993).

[2] See Blau and Kahn (1994). Bradbury (1996) finds that inequality rose for men and women combined during the 1980s, despite the growing similarity in the earnings of men and women who worked full-time and year-round.

lege-educated workers and shifting rates of growth of different groups in the labor force.

The Supply of Highly Educated Workers

In the United States, the supply of college-educated workers slowed in the 1980s as compared to the 1970s, thereby helping to boost the return to higher education. This swing in the rate of increase in the number of college graduates was largely the result of demographic influences, as most of the baby boom generation came of age in the 1970s. Immigration patterns also played a role in changing the educational composition of the work force. Borjas (1995) reports that in 1990, nearly a quarter of high school dropouts in the United States were foreign-born, compared to only about one-eighth in 1980.[3]

Variation in the supply of labor also has been helpful in explaining international differences in the relative earnings of college graduates and non-college graduates. For example, slower increases in the supply of college graduates during the 1980s contributed to higher education-related earnings differentials in the United Kingdom and Japan (Katz, Loveman, and Blanchflower 1995). On the other hand, a greater expansion in the supply of college graduates in Canada helps to explain a more modest rise in educational earnings differentials, as compared with the United States.

The education of the average American worker increased from about 9 years in 1940 to about 13 years in 1990, while the returns to education increased.

An important question looking forward is whether the current large premium for college-educated workers will prompt higher college enrollments, thereby diminishing the premium in the future. A recent paper by Mincer (1994) finds that educational attainment does respond to wages, and that this response will mitigate the trend toward higher wage premia for college-educated workers. Mincer concludes, however, that the premium is not likely to fall from its current level. For one thing, the demand for college-educated labor is likely to keep rising. Moreover, "lags in the educational pipeline, growing costs [of education], and perverse demographics represent delays and impediments to timely supply effects." Mincer also notes that the recent poor performance of elementary and secondary school students, as measured by the high proportion with poor reading and mathematics skills, may represent a bottleneck for the supply adjustment. John Bishop's paper for this symposium further examines how demand and supply responses are likely to influence the wage premium for college-educated workers.

The Demand for Highly Educated Workers

Demand for more highly educated workers has been increasing for many years. The education of the average American worker increased from about 9 years in 1940 to about 13 years in 1990, while the returns to education increased (Murphy and Welch 1993c).[4] The Levy-Murnane survey noted that "there is a consensus on the importance of shifts in relative demand, and there is no shortage of potential factors to account for the demand shifts. But to date we have an incomplete picture of the relative importance of these factors." A vigorous debate on this topic continues.

Several hypotheses have emerged concerning demand shifts. The first explanation is that the mix of jobs has changed because industries such as manufacturing are a less important part of the economy than they once were, while service-producing sectors have increased in importance. Recent studies appear to be in agreement that the growing inequality between highly educated workers and others is due in part to a changing industrial structure. However, they also indicate that growing inequality is a phenomenon common to many industries, and therefore industrial mix cannot be the dominant factor in explaining trends in inequality.

[3] Immigration may also help to explain different wage trends in regions within the United States. Topel (1994) found that those parts of the country with the greatest increase in wage inequality were those with the smallest improvements in labor-force quality. In particular, he indicated that immigration of low-level Asian and Hispanic workers reduced the wages for non-immigrant workers in the West by about 10 percent. However, Topel measured labor quality according to the distribution of workers by wage categories, which would take account of other factors in addition to education levels.

[4] Murphy and Welch estimate that increases in the returns to education in the 1950s, 1960s, and 1980s more than offset decreases in the 1940s and 1970s.

A second explanation is that international trade has caused the wages of less educated workers to fall, as the United States competes with countries where wages are much lower. Although some studies have found evidence indicating that international competition is an important explanation for growing inequality, the literature on the effects of trade is particularly contentious.

A third explanation is non-neutral technological change. The argument is that American industry has invested in technologies that reduce the demand for low-end workers, while increasing the productivity (and wages) of high-end workers. This hypothesis finds support in correlations between the extent of investment in computers and other high-technology equipment by an industry, on the one hand, and the growth in inequality in its wage structure on the other. This hypothesis is appealing in that it potentially can explain earnings trends across a wide spectrum of industries.

Several hypotheses have emerged concerning the demand for more highly educated workers: a changing industrial structure, international trade, and non-neutral technological change.

The remainder of this section briefly reviews some of the recent studies of the shifting demand for highly educated workers. It divides the literature into studies of industrial mix, international competition, and technological change; studies dealing with more than one theme also are noted under these headings.

Industrial mix. Two recent studies decompose the increased demand for education into "between industry" and "within industry" effects. Murphy and Welch (1993a) find that only 19 percent of the increased demand for highly educated workers between 1968 and 1990 was due to the growing importance of industries such as professional services, finance, and education that traditionally employ a relatively high proportion of college graduates and to the shrinkage of industries such as agriculture, mining, and low- and medium-skilled manufacturing that employ a relatively low proportion. The remaining 81 percent was due to higher demand for college-educated workers among industries across the board.

Berman, Bound, and Griliches (1994) perform a similar decomposition within manufacturing and also attempt to explain the between- and within-industry shifts. They estimate that less than one-third of the shift in employment from production (that is, less educated) to nonproduction (more highly educated) workers during the 1980s can be accounted for by shifting employment across industries, and that these industrial shifts in turn are attributable largely to changes in defense-related demand and international trade. Berman, Bound, and Griliches find that the degree of shift toward nonproduction workers within industries was correlated with industry investment in computers and expenditures on research and development. The authors interpret this latter finding as indicative of the role of non-neutral technological change in causing rising inequality.

Several studies examine the role of industrial structure for middle- and lower-earners. Juhn (1994) notes that the 1980s were distinguished from the previous four decades by the contraction of industries and occupations that predominantly employ moderately educated males. Declining opportunities in the middle of the earnings distribution tended to increase the competition for low-wage jobs. In cross-state regressions, Juhn finds that the decline in the manufacturing sector had an effect on inequality precisely because that is where many moderately educated male workers have traditionally worked.

Acs and Danziger (1993) study men with earnings below a level needed to keep a family of four out of poverty. They conclude that the change in industrial structure during the 1980s had little effect on the earnings of white men in this category. Black men, on the other hand, were adversely affected by the loss of opportunities in manufacturing and in lower-paid industries. The shifts in industrial structure more than offset the benefit of higher educational attainment for black men.

Hutchens (1993) compares paths to success for 18- and 19-year-old men without a high school diploma in 1966 and 1979. He finds that the nature of jobs within certain key industries and occupations changed over time. The earlier cohort could rely on construction and clerical work to provide incomes that would keep them out of poverty; these types of jobs provided less attractive earnings for the later cohort.

Looking forward, the industrial mix of jobs is expected to continue to change. The U.S. Department of Labor projects that service-producing sectors will

account for almost all of the job growth out to the year 2005, as manufacturing and mining jobs continue to disappear and construction jobs grow only modestly (U.S. Department of Labor 1994). Whatever the effects of a changing job mix in the past, however, one recent study suggests that further changes may have only a negligible effect on earnings inequality. Schweitzer and Dupuy (1995) examine the distribution of earnings in the goods-producing and service-producing sectors for full-time workers between 1969 and 1993. They find that the earnings distributions in these two sectors have been converging since 1980 and are now quite similar.

International competition. Among the studies most forcefully setting out a substantial role for international trade are Borjas and Ramey (1994a, 1994b) and Wood (1994). Borjas and Ramey find that U.S. durable goods manufacturing industries involved in international trade traditionally have been more highly concentrated and have paid higher wages (adjusting for observable characteristics of workers) than other industries. Increased competition from imports since the early 1980s lowered the rents earned in these industries as well as the wage bill paid to workers. The decrease in employment opportunities, in turn, has forced more workers into competitive sectors, which has pushed average wages down. Borjas and Ramey examine the ratio of earnings of college graduates to less educated workers, comparing it with a list of potential explanatory variables. Using cointegration analysis for the period 1963–88, they show that the only variable that consistently shares the same long-term trend with the wage inequality series is the durable goods trade deficit as a percentage of GDP. (The level of research and development expenditures per worker appears in a graphical comparison to be correlated with wage inequality, but does not pass muster in a formal statistical test.)

Wood performs a detailed analysis of the economic effects of North-South (that is, developed country-developing country) trade. He concludes that increased trade with developing countries is the main cause of the relative shift in demand for more "skilled" (that is, educated) labor in the developed countries. He notes that not only the magnitude of the effects but also their timing supports the trade hypothesis, and that cross-country variation indicates that countries with larger increases in Southern import competition have experienced a decline in the relative position of unskilled workers.

Wood bases these conclusions on a comparison of the observed demand for labor in developed countries to what it would have been had developing countries not become the site of production for an increased share of manufactured goods consumed in developed countries.[5] He estimates that the cumulative effect of manufacturing trade patterns through 1990 was to increase the demand for skilled (educated) labor in the North, relative to unskilled labor, by 5.5 percent. But two factors omitted from the analysis could quadruple this estimate, according to Wood. First, manufacturers in developed countries have reacted to foreign competition by devising production techniques that use less unskilled labor. Second, trade has also reduced the demand for unskilled labor in service-producing sectors, both because they supply intermediate inputs to domestic manufacturers and because they participate directly in international trade.

The manufacturing sector is relatively small—less than 20 percent of U.S. employment in recent years—and only a subset of these jobs have been directly threatened by trade.

Other writers acknowledge that international competition has reduced the demand for manufacturing production workers in the United States, and that the timing of international trade patterns accords well with the rise in earnings inequality. (For example, see Sachs and Shatz 1994.) But generally they hesitate to attribute a major role to international trade in explaining trends in earnings inequality. The recent literature on this topic has been summarized in thoughtful (albeit somewhat skeptical) reviews by Burtless (1995), Fieleke (1994), and Freeman (1995).[6]

One issue is that the manufacturing sector is relatively small, accounting for less than 20 percent of U.S. employment in recent years. Only a subset

[5] Wood starts by examining the skill and labor content of the imported goods, but then modifies the estimates in light of the fact that different relative prices in developed countries would lead them to use a different mix of inputs, and because a higher price for these goods (were they produced in developed countries) would lead to a reduction in demand for them.

[6] These reviews also cover recent volumes edited by Bhagwati and Kosters (1994) and Bergstrand, Cosimano, Houck, and Sheehan (1994).

of these jobs have been directly threatened by trade. Moreover, at least some of the increase in international trade has been with developed countries with high wages, limiting the extent to which one would expect U.S. wages to adjust downward.

Second, the theory predicts that trade should change the relative output prices of low-skill and high-skill manufactured goods. That is, in the United States, we should expect to see a decline in the relative price of non-skill-intensive, import-competing goods. (In fact, it is this price decline that would cause a drop in U.S. wages.) The evidence on this prediction is mixed. Lawrence and Slaughter (1993) do not find that relative prices of goods that use production labor relatively intensively have declined in the United States. (Instead, their study tends to support the technology hypothesis, as they find that total factor productivity—their proxy for technology—rose more rapidly in industries that used nonproduction workers more intensively.) On the other hand, Sachs and Shatz (1994) use an alternative price series to show support for the trade theory.

Another issue concerns trends in other industries. The release of manufacturing production workers to other sectors should not only have lowered the earnings of other, relatively less educated workers (as it did), but also caused other sectors to increase their use of such workers. Instead, they reduced their demand.

Technological change. A third explanation for the rising earnings premium for college-educated workers is that there has been a general shift in demand in favor of workers with relatively high intellectual as opposed to manual ability. The growing use of computers is thought to have contributed to this phenomenon. To a large degree, the conclusion that technology matters is the result of observing that the earnings distribution has widened in a broad range of industries, and that investment in technology across industries appears correlated with earnings premia for college graduates.

The Berman, Bound, and Griliches (1994) and Lawrence and Slaughter (1993) studies mentioned above are examples of recent research supporting a role for technology. In addition, Brauer and Hickok (1994) examine average pay changes for workers with different levels of educational attainment in 46 industries for the period 1979–89. According to Brauer and Hickok, industry investment in high tech capital such as computers and communication equipment plus overall capital deepening accounted for 60 percent of the explained variation in pay trends for college graduates versus high school dropouts. In agreement with the general findings of Murphy and Welch (1993a) and Berman, Bound, and Griliches (1994), shifts in the demand for the output of different industries was the next most important factor, accounting for about 30 percent of the explained variation. International trade was found to play a lesser role, and contrary to the usual argument, trade with developed countries appeared to play as much of a role as trade with developing countries. Brauer (1995) has extended this mode of analysis to trends across states. This research also indicates a greater role for technology than for trade in explaining the growing premium for a college degree, particularly when the regressions are extended to include the early 1990s.

Employer decisions with respect to training may have exacerbated the tendency of technology to cause incomes to become less equal over time. Most of the workers who receive employer-provided training are technical and managerial workers who have a college degree. Lynch (1994) has estimated that only 4 percent of young workers without a college degree receive formal training at their workplace, and this fraction is lower than in other industrialized countries.

While a growing body of research suggests that technology has caused an increase in the relative pay for college graduates, some questions remain. Howell (1993, 1994) finds that the demand for high-end workers rose before computer usage became widespread in the workplace, and he concludes that institutional and organizational changes have been more influential than technology in affecting relative earnings. More generally, further research is needed on the ramifications of specific types of technological change, as the studies mentioned thus far mostly use very general measures of the state of technology. Some further discussion of preliminary microeconomic investigations is found in a later section.

Institutional Influences on Relative Earnings by Educational Attainment

Aside from shifts in labor supply and labor demand, the more competitive and more conservative social attitudes of the 1980s may have contributed to inequality. To lend support to this argument, researchers have pointed to changes in the role of wage-setting institutions that traditionally have protected the wages of lower-paid (and, typically, less educated) workers. Recent studies have focused on declines in the real value of the minimum wage and in unionization. Institutional differences in how wages are determined may help to explain why inequality has in-

creased so much in the United States compared to other industrialized countries, since demand-side explanations apply similarly across countries.

The U.S. minimum wage remained unchanged in nominal terms throughout most of the 1980s. Horrigan and Mincy (1993) simulate what would have happened to earnings inequality had the minimum wage kept pace with inflation. They find only modest effects for workers with different levels of education (and slightly more noticeable effects on the earnings differences between older and younger workers, and on workers in high- and low-status occupations). They caution, moreover, that the adjustment of the minimum wage would have had virtually no effect on inequality as measured by family income, because of the attenuated relationship between low wages and low family income. That is, some minimum wage earners live in poor families while others live in well-to-do families.

Aside from shifts in labor supply and labor demand, the more competitive and more conservative social attitudes of the 1980s may have contributed to inequality.

From 1969 to 1978, the share of the nonagricultural work force organized in unions in the United States fell from 29 to 25 percent; over the 1980s, the share plummeted to 16 percent. The drop-off in unionization was particularly sharp among younger (that is, 25- to 34-year-old) men who had only a high school education or held blue-collar jobs. Freeman (1993) examines pay differentials between unionized and non-unionized workers, as well as pay changes for workers who changed union status during the 1980s. He concludes that the decline in unionization explains at least 15 percent, and perhaps as much as 40 percent, of the growing disparity between wages for college-educated and high school-educated workers. In a similar vein, Card (1992) finds that changes in unionization account for one-fifth of the increase in the between-quintile variance of adult male wages between 1973 and 1987. His study controls for education, experience, and race, as well as considering whether workers joining unions are similar in "ability" to their nonunionized peers.

DiNardo, Fortin, and Lemieux (1995) consider the influence of both the minimum wage and unionization, as well as supply and demand factors, during the 1980s. They generally find that institutions are quite important for younger workers. For young men (that is, those with less than 10 years of experience), the minimum wage and unionization in combination explain 32 percent of the growing disparity in earnings for college versus high-school graduates—compared to 42 percent for supply and demand (with the remainder unexplained). For young women, the institutional factors (mostly the minimum wage) explain 16 percent. For older men and women, institutions become relatively less important in explaining education-based wage differences, although for men with at least 20 years of work experience unions continue to explain 18 percent of differential earnings trends. DiNardo, Fortin, and Lemieux emphasize that, whatever the explanatory power of institutions in the aggregate, they are important for particular subcategories within the earnings distribution. For example, the lack of indexing of the minimum wage had a sizable impact on low earners. Moreover, they stress that the effects are greater when earnings of part-time workers are also considered.

A growing body of research examines institutions from an international perspective. Most, if not all, advanced countries have been subject to similar influences in terms of sectoral shifts, globalization, and technological change. Gottschalk and Joyce (1992), for example, estimate that a remarkably similar redistribution of employment across sectors has occurred in a number of industrialized countries. Yet the mechanisms by which wages get set differ greatly (Freeman and Katz 1994). In general, wage-setting systems in Continental Europe are far more centralized than in the United States. Freeman and Katz provide the following examples: "In Austria and Sweden . . . peak-level union confederations and employer federations have historically bargained for national wage settlements that cover much of the work force but allow local employers and unions to increase wages above the national settlement through 'wage drift.' In Germany industry or regional collective bargaining determines basic wages for an area and the Ministry of Labor often extends those to all workers. In France the minimum wage is important in determining the overall level of wages, and the French Ministry of Labor also extends contracts. In Italy the Scala Mobile, a form of negotiated wage increase designed to compensate for inflation and which applied effectively to all Italians, increased the pay of low-paid workers faster

than that of high-paid workers throughout the 1980s" (pp. 51–52). Furthermore, the United States—along with the United Kingdom, the Netherlands, and France—experienced a more precipitous drop in unionization during the 1980s than other advanced countries.

In light of these institutional patterns, it is not surprising that the largest overall increases in inequality occurred in the United States and the United Kingdom. In addition, Freeman and Katz note that the largest relative decline in the position of low-wage workers occurred in the United States.

These findings are not without controversy, however. Gottschalk and Smeeding (1995) offer two criticisms. First, it is hard to quantify the extent to which wages are set by institutions. Different measures rank countries somewhat differently, depending on which characteristics of the wage-setting mechanisms receive greater weight. Second, studies err on the side of explaining wage trends by institutions because they do not distinguish between levels and changes. In particular, in a country with strong but weakening institutions, these institutions could be used to rationalize either stability or greater dispersion in wages.

Alternative Explanations: Some Further Thoughts

Most analysts now concede that no one factor is responsible for the rising education wage premium. At a Federal Reserve Bank of New York conference on this topic, the participants indicated in a vote that they believed 60 percent of rising inequality among educational attainment categories has been due to technology, 10 percent to international trade, and 30 percent to other factors—including immigration, a low minimum wage, and changes in wage-setting institutions (Federal Reserve Bank of New York 1995). Indeed, it is striking that so many factors have apparently combined to stretch out the distribution of earnings.

Furthermore, it is difficult—if not impossible—to determine exactly how important a single explanation is because the various explanations are to some extent interlinked. International competition and technological change have caused some industries to decline and others to expand in relative importance. Moreover, technological change and union strength are not entirely exogenous; some investments undoubtedly have taken place under the threat of international competition, and international competition may have been responsible for the changing influence of unions. When different explanations are correlated in an econometric study, their relative effects may be masked. On the other hand, a study that examines only one explanation may exaggerate its influence, to the extent that other relevant (and correlated) factors are omitted.

Changing Returns to Experience

Along with higher returns to education, recent research has found evidence of higher returns to work experience. That is, older workers are being paid relatively more compared to younger workers (Figure 3). The trends vary somewhat between men and women, however, and they seem not to apply as clearly to the old*est* workers. According to the U.S. Department of Labor (1994), men with less than 20 years of potential experience in the work force suffered a real decline in average earnings of close to 7 percent between 1979 and 1992.[7] Men with at least 30 years of potential experience averaged a decline of less than 3 percent, while those with 20 to 29 years of potential experience had no decline. Among women, the earnings of middle-aged workers (that is, women with 10 to 29 years of potential experience) rose by much more than those of younger or older workers.

Along with higher returns to education, recent research has found evidence of higher returns to work experience.

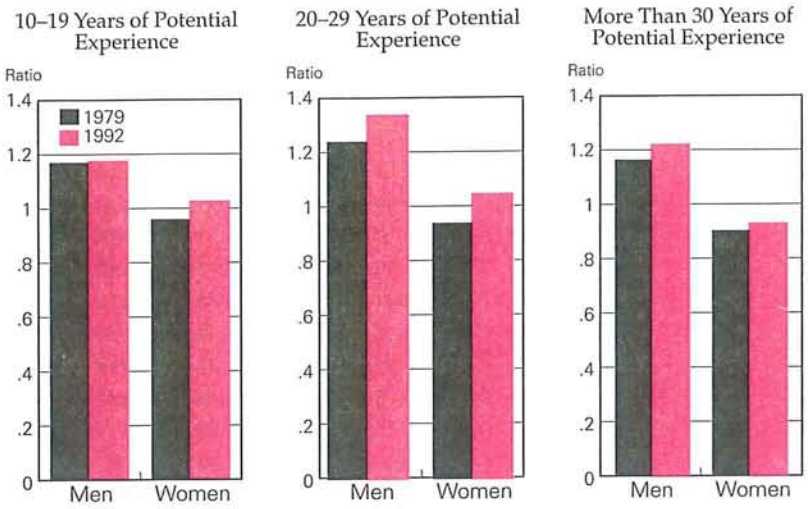
As noted above, it appears that institutional stories apply more strongly to younger workers—that is, their relative wages have fallen as a result of a reduction in the real value of the minimum wage and in unionization. But, in contrast to the proliferation of studies on education, research on the changing returns to experience is not all that extensive.

One important preliminary question is the degree to which the observed wage trends for older and younger workers reflect a cohort effect rather than experience. That is, if the quality of education has fallen over time (as declining college board scores

[7] Potential experience is defined as age minus years of schooling minus six. The statistics refer to annual earnings of full-time year-round workers.

Figure 3

Earnings Ratios of Workers with Various Levels of Potential Experience[a] versus Those with Less than 10 Years of Experience



[a] Potential experience is defined as age minus years of schooling minus six.
Source: U.S. Department of Labor (1994). Annual figures computed for year-round, full-time workers.

would tend to indicate), younger workers would be expected to fall behind, even if the marginal return to experience remained constant. Juhn, Murphy, and Pierce (1993) tend to discount this theory, since they find that the rise in the education premium has been age neutral. Still, this remains an area for further research. For one thing, to the extent that rapid technological change has been important in driving wages, older workers might be expected to be disadvantaged. The rising premium paid to older workers could conceivably be the net outcome of offsetting cohort and technology effects.

Changing Returns to Skill and Other Aspects of Earnings Inequality

The distribution of earnings of persons with similar educational backgrounds and years of experience also has widened. The literature on inequality has dubbed this the "within-group" trend. Juhn, Murphy, and Pierce (1993) estimate that within-group inequality has been increasing since 1970—well before the rising returns to education and experience. They also find that within-group inequality is highly significant. Over the 1964–89 period, 44 percent of the overall rise in inequality as measured by the difference between incomes at the 90th and 10th percentiles is due to trends across education and experience groups and 56 percent to trends within groups.

Juhn, Murphy, and Pierce conclude that the trend in within-group inequality reflects a rising demand for skills that are possessed to different degrees by different workers, since employment has shifted toward industries and occupations that employ skilled workers even in the face of rising relative wages. By contrast, they find little evidence that the rise in inequality is due to growing diversity in the extent of skills possessed by different workers. These skills, which presumably are observable to individual employers, are not yet well understood by researchers. Nor are the reasons for the increased returns to skill. The Levy-Murnane (1992) assessment that within-group inequality is the "most important unresolved puzzle" about earnings trends remains valid, even though we now know more than we did then.

This section reviews studies that attempt specifically to explain the rise in within-group inequality, as well as some more general studies of inequality that do not focus specifically on differences by education and experience. As in Juhn, Murphy, and Pierce, the term "skill" is used here to refer to ability that is not measured by years of education and experience, even though some authors use "skill" either synonymously with these other aspects of ability (particularly education) or as a catchall for all aspects of ability (such as when higher wages are taken as evidence of higher skills). In an attempt to expand our knowledge beyond the studies reviewed here, Peter Cappelli's paper for this symposium explores the characteristics of technology or work organization that are contributing to rising skill requirements for individual employers, and then examines how these skill requirements are reflected in wages paid. Richard Freeman's paper

examines the extent to which wage-setting institutions are responsible for greater earnings inequality.

Uneven Impacts of Structural Change

A possible reason for increased within-group inequality is that broad changes in the mix of industries or occupations inevitably have a more direct effect on some workers than others. For example, workers who are laid off during a period of structural change find it difficult to obtain comparably paid jobs, which would tend to increase differences within a given group in the work force. Or if the number of "bad jobs" is expanding rapidly, a growing number of recent college graduates may be working in positions for which they are overeducated (while others in this education category are more fortunate in their job search). Tyler, Murnane, and Levy (1995) address these topics by asking whether growing numbers of college graduates are taking jobs that pay high school wages. In general, they dispel this hypothesis. The percentage of college graduates with "high-school jobs" fell during the 1980s. By exception, however, the authors estimate that almost 18 percent of college-educated men aged 45 to 54 were in "high-school jobs" in 1989, up from less than 15 percent in 1979.[8] Thus business restructuring appears to have contributed to greater earnings disparities for this group.

A frequently mentioned hypothesis about within-group inequality is that technological change is increasing the demand for skill.

Another aspect of the same theme is that structural change is more pervasive for minority groups or for individuals in certain geographic locations. Bound and Freeman (1991) examine the rising gap in earnings between young black and young white men with similar educational backgrounds from the mid 1970s through the 1980s. The authors find that different economic forces affected different groups of young blacks. In addition to declines in the minimum wage, unionization, and manufacturing jobs, the economic decline in inner cities was found to affect blacks with a high school degree or less—particularly in the Midwest. College graduates, however, did not appear to be affected by geographic factors. By contrast with the Bound-Freeman study, Acs and Danziger (1993) find that low-earning blacks were harmed by a loss of manufacturing jobs, regardless of whether they lived in Northern inner cities or in other locations.[9]

Technology and Workplace Organization

As indicated above, a frequently mentioned hypothesis about within-group inequality is that technological change is increasing the demand for skill. Research by Cappelli (1993) suggests that the relationship between technology and skills may be quite complicated, however. Cappelli examined production workers in a variety of industries using a sample of employers from the late 1970s to the late 1980s. He measured skill requirements using an evaluation system developed by Hay Associates that attempts to capture the autonomy and complexity of jobs. The study found mixed results concerning the role of technology. In manufacturing, individual production jobs required more skill over time, and the mix shifted toward jobs with higher skill requirements. If these changes did not systematically favor production workers with more (or less) education or experience, Cappelli's findings are consistent with rising within-group inequality.[10]

Cappelli found that so-called upskilling of manufacturing jobs was not driven primarily by the implementation of specific technologies such as numerically controlled machines. Rather it seemed to be related to new management views concerning how jobs should be redesigned, as well as to a decline in union power that made their implementation possible. For clerical work, by contrast, changes in skill requirements were related to the introduction of new office technologies, such as word processors and personal computers. Technology had idiosyncratic effects on job requirements, increasing the skill requirements for some and decreasing them for others.

In another study, Scott, O'Shaughnessy, and Cappelli (1994) find that insurance companies have been

[8] Note that this finding conflicts with the generally reported increase in returns to work experience.

[9] Several papers in today's symposium address the role of spatial determinants of inequality within a metropolitan area, with a subset of these also indicating how employment opportunities vary by location.

[10] If the favored workers were more highly educated or more experienced, the results are consistent with the above-noted cross-group trends. Cappelli did not specifically address the issue of whether skills are correlated with education or experience.

moving to a flatter organizational hierarchy. Senior-level managerial jobs are becoming more scarce, but managers' span of control is becoming greater (since a higher fraction of jobs are at lower levels). As a consequence, the payoff to attaining a high-level job has increased.

Research by Osterman (1995) indicates that training practices vary substantially across workplaces. Business establishments that introduce so-called high performance work organizations, that have more "humanistic" values, and whose employees have union representation are relatively more likely to provide training for their workers. While Osterman's research stops short of examining the link between training and pay over time, it does indicate that employers do not react uniformly to economywide influences such as technological change. Future studies of earnings inequality may profitably continue to examine the diversity in employer decision-making.

Training practices vary substantially across workplaces, and employers do not react uniformly to economywide influences such as technological change.

Wage-Setting Institutions

Research on the role of labor market institutions suggests that the declining roles of centralized bargaining and of the minimum wage have given employers more freedom to adjust wages in light of the demands of the workplace. Employers may also have become more inclined in recent years to vary pay to reflect performance for their nonunionized workers.

Freeman (1993) found that, in addition to boosting the wages of their members relative to nonunionized workers, unions tend to reduce the dispersion of earnings within workplaces. Therefore, a decline in unionization could lead to greater within-group inequality. The evidence indicates, however, that inequality of earnings rose roughly as rapidly among union as among nonunion workers between 1978 and 1988. Freeman indicates that this is the result of diminished power of unions in the 1980s, as evidenced by the breakdown of pattern bargaining and the frequency of wage concessions.

Examining almost the same time period as Freeman, DiNardo, Fortin, and Lemieux (1995) concur that unionization is of very limited significance in explaining rising within-group inequality. But they attribute 24 percent of the increase in within-group inequality among men, and 34 percent among women, to the drop in the real minimum wage.

Evidence of a link between changing pay practices for professional and managerial workers and increased inequality is still unavailable. Groshen (1993) examines increasing inequality among nonproduction workers, using a Federal Reserve Bank of Cleveland survey of employers in its district. She finds that changes in human resource management practices, such as linking pay more closely to performance, were not helpful in explaining growing salary differences in the 1980s.

The Relationship between Unemployment, Underemployment, and Inequality

Virtually all of the studies cited so far are limited to individuals with positive earnings. Many of them are restricted to full-time workers or those working a certain number of hours or weeks per year. These adjustments make sense in order to help isolate the causes of growing inequality. But if different groups in the population have different trends with respect to hours worked, these differences could serve to reinforce or offset inequality based on rates of pay.

The evidence suggests that the secular decline in demand for less-skilled workers has resulted in a decrease in both their relative rate of pay and their relative number of hours worked. Topel (1993) finds that the largest declines in wage rates between 1967 and 1989 have occurred for groups for which unemployment and nonparticipation in the work force have increased the most. Furthermore, virtually all of the long-term increase in joblessness has occurred among low-wage men. Haveman and Buron (1994) conclude that the decline in hours worked by low earners (which includes working part-year, part-time, or not at all) plays a large role in the increase in earnings inequality.[11]

[11] The authors indicate that some previous studies underestimated the role of hours worked by choosing a business cycle peak as the starting date for their analysis.

As noted above, it appears that wage-setting institutions in many European countries effectively put a floor on the income earned by those with relatively low wages. If such constraints were introduced in the United States, economic theory suggests that unemployment and underemployment of low earners would increase even more. Indeed, empirical work indicates that unemployment is highest in European countries among low earners. But income inequality is smaller than in the United States because of social welfare programs (Freeman 1994).

The Issue of Permanent Earnings Inequality

The findings on inequality have been interpreted as showing that the poor have become relatively poorer over time, while the rich have gotten richer. But, in fact, the data come from cross sections of workers, rather than tracking of individuals over time. If everyone's income merely became more variable over time, then the data would show greater inequality, but it would not be true that low earners were falling farther behind high earners.

Gottschalk and Moffitt (1994) use panel data for the 1970s and 1980s to distinguish trends in mean income from variation around mean income for individual workers. They find that the permanent and the transitory components of the variance of earnings each increased by 40 percent. Therefore the perception of the poor getting poorer and the rich getting richer is correct—although the change may not be quite as dramatic as had been thought. As for the transitory component, which heretofore had not been studied, Gottschalk and Moffitt find that earnings of union workers and those employed in manufacturing fluctuate less than earnings of nonunion workers and those in service-producing industries. However, deunionization and industrial shifts together explain only 12 percent of the increase in wage instability from the 1970s to the 1980s. Thus, the authors conclude that further research is needed on the sources of transitory income variability.

From Inequality in Earnings to Inequality in Living Standards

Rising inequality in earnings might be viewed as a relatively minor issue if other factors acted to equalize living standards. But, to the contrary, research has shown decisively that in the United States additional influences generally served to reinforce the growing inequality in earnings. Some of these factors are related to the labor market, while others relate to social trends and the role of government.

In contrast to six other major industrialized countries (Australia, Canada, Germany, the Netherlands, Sweden, and the United Kingdom), the United States had a greater increase in family income inequality than in earnings inequality during the 1980s (Gottschalk 1993). For example, the extent of increase in earnings inequality among prime-aged males in the United States and Canada was about the same, but Canada experienced no clear trend in family income inequality as the Lorenz curve shifted in for lower quintiles and out for upper quintiles (Blackburn and Bloom 1993).

One reason for the difference may relate to family structure and associated changes in family work effort. We have evidence on how these factors influenced inequality in the United States without a parallel understanding for other countries. In a comprehensive examination of disparities in the United States, Bradbury (1996) finds that the number of workers per family and hours per worker fell for the poorest quintile and rose for the richest quintile between 1979 and 1993.[12] The United States experienced an increase in female-headed families and in individuals living alone during the 1980s, but Blackburn and Bloom report that Canada did not. Finally, men and women with high earnings in the United States increasingly have tended to marry someone in a similar, rather than a lower, earnings bracket (Murphy and Welch 1993b).[13]

The second reason for the particularly sharp increase in family income inequality in the United States is that decreasing transfer payments and a change in tax structure reinforced the growing disparities in earnings. In Canada, by contrast, public assistance and general social expenditures increased in the 1980s (Blackburn and Bloom 1993; Gramlich, Kasten, and Sammartino 1993; Gottschalk 1993).

[12] As was true for individuals, earnings per hour fell for the poorest quintile and rose for the richest quintile of familiies. Bradbury (1996) indicates this was the most important factor explaining the trend in family income inequality.

[13] The available studies disagree about the effect of the increased tendency of wives to participate in the paid labor force. Murphy and Welch suggest that this trend has led to greater disparities among family incomes since the wife's income is no longer inversely related to that of her husband. However, Cancian, Danziger, and Gottschalk (1993) find that family income inequality in the United States would have increased to an even greater extent over the past 20 years were it not for the increased earnings of wives—especially among black families.

Third, pensions and health insurance in the United States are provided largely at the discretion of individual employers rather than being universal. Little (1995) finds that benefit coverage became less equal in the 1980s.

Finally, looking at the trends of the past several decades in the United States, the 1980s were unique in the relative gains of the rich (Karoly 1993). Presumably, this trend relates to growth in income from capital relative to other sources.

Historically, growth has increased job opportunities for the poor more than for the rich. Given strong macroeconomic growth during much of the decade, the 1980s should have been a period of declining poverty in the United States, all else equal. Instead, the poverty rate rose from 13.6 percent in 1989 to 15.2 percent in 1991. Blank and Card (1993) attribute this increase in poverty to the fact that rising wage inequality and other trends more than offset positive macroeconomic developments. Bradbury (1996) finds that New England, which experienced an economic boom of unusual proportions in the 1980s, was the only region of the country in which the average income of the bottom fifth of families rose during the 1980s, thus indicating that sufficiently strong growth is still able to help the poor.

Conclusions

As studies have increasingly demonstrated the pervasive nature of the rise in earnings inequality, researchers have become more willing to acknowledge that many aspects of labor markets have contributed to the observed trends in the United States. On the supply side, a decrease in the rate of growth of college graduates and an influx of relatively uneducated immigrants help to explain higher returns to education. On the demand side, changes in industrial structure, international trade, and technology all appear to play a role. In addition, wage-setting institutions may cause certain workers to be paid more or less than what the market would indicate. These institutions have changed over time, in ways that have accentuated inequality. Distinguishing the individual effects of different influences remains problematic, however, and may vary with the time period examined and the particular aspect of earnings inequality under examination.

Even as a consensus appears to be building that the rise in inequality has been multi-faceted, some puzzles remain. The papers and discussions at this symposium address such gaps in our knowledge, and their findings are particularly relevant as discussions of inequality turn to possible remedies.

One important question is whether the return to education will continue to increase in the future, given the widespread perception that the U.S. economy is generating many low-quality jobs. If the wage premium for college graduates is expected to hold constant or rise further, then discussions of new policies to augment the supply of educated workers take on greater urgency than if market forces (such as higher college enrollments in response to observed higher earnings) cause the wage premium to decline.

One important question is whether the return to education will continue to increase in the future, given the widespread perception that the U.S. economy is generating many low-quality jobs.

An increasing body of evidence indicates that new workplace technologies are resulting in higher wages for skilled workers (where the concept of skills goes beyond what can be measured by years of education or experience), and that this phenomenon has played an important role in creating wider wage disparities. Yet relatively little is known about how technology influences skill requirements and what can be done to raise the average skill levels of the work force.

Another outstanding puzzle is the extent to which the trend toward inequality can be reversed through reform of U.S. wage-setting institutions. The role of unions and the real value of the minimum wage have been allowed to erode over time. Furthermore, starting in the 1980s reforms of taxes and transfers have tended to reinforce rather than offset the impact of labor market contributions to inequality. If the traditional tools to redistribute income have been neglected in the United States, what can this country learn from foreign experiences and what new institutional options are available?

A final issue is the cost of earnings inequality.

Thus far, studies have not specified clearly what consequences inequality has for macroeconomic performance. Evidence suggests that greater equality in Europe, as compared with the United States, has come at the expense of employment growth. On the other hand, concern is mounting that the United States cannot remain competitive if college-educated workers continue to command higher and higher pay, and if labor skills demanded at high-technology workplaces are in short supply.

References

Acs, Gregory and Sheldon Danziger. 1993. "Educational Attainment, Industrial Structure, and Male Earnings Through the 1980s." *Journal of Human Resources*, vol. 28, no. 3 (Summer), pp. 618–48.

Bergstrand, J.H., T.F. Cosimano, J.W. Houck, and R.G. Sheehan, eds. 1994. *The Changing Distribution of Income in an Open U.S. Economy*. Amsterdam, London, New York, and Toyko: North-Holland.

Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufactures." *Quarterly Journal of Economics*, vol. 109, no. 2 (May), pp. 367–97.

Bhagwati, Jagdish and Marvin H. Kosters, eds. 1994. *Trade and Wages: Leveling Wages Down?* Washington: The AEI Press.

Blackburn, McKinley L. and David E. Bloom. 1993. "The Distribution of Family Income: Measuring and Explaining Changes in the 1980s for Canada and the United States." In David Card and Richard B. Freeman, eds., *Small Differences That Matter: Labor Markets and Income Maintenance in Canada and the United States*. Chicago and London: The University of Chicago Press.

Blank, Rebecca M. and David Card. 1993. "Poverty, Income Distribution, and Growth: Are They Still Connected?" *Brookings Papers on Economic Activity*, no. 2, pp. 285–325.

Blau, Francine and Lawrence M. Kahn. 1994. "Rising Wage Inequality and the U.S. Gender Gap." *The American Economic Review*, vol. 84, no. 2 (May), pp. 23–28.

Borjas, George J. 1995. "The Internationalization of the U.S. Labor Market and the Wage Structure." Federal Reserve Bank of New York, *Economic Policy Review*, vol. 1, no. 1 (January), pp. 3–7.

Borjas, George J. and Valerie A. Ramey. 1994a. "The Relationship Between Wage Inequality and International Trade." In J.H. Bergstrand, T.F. Cosimano, J.W. Houck and R.G. Sheehan, eds., *The Changing Distribution of Income in an Open U.S. Economy*. Amsterdam, London, New York, and Tokyo: North Holland.

———. 1994b. "Time-Series Evidence on the Sources of Trends in Wage Inequality." *The American Economic Review*, vol. 84, no. 2 (May), pp. 10–16.

Bound, John and Richard B. Freeman. 1991. "What Went Wrong? The Erosion of Relative Earnings and Employment among Young Black Men in the 1980s." National Bureau of Economic Research Working Paper no. 3778, July.

Bradbury, Katharine L. 1996. "Growing Family Income Inequality: Differences among Regions." Forthcoming in *New England Economic Review*, July/August.

Brauer, David A. 1995. "Using Regional Variation to Explain Widening Wage Differentials by Skill Level." Mimeo, September.

Brauer, David A. and Susan Hickok. 1994. "Explaining the Growing Gap Between Low-Skilled and High-Skilled Wages." Federal Reserve Bank of New York Research Paper no. 94-18, October.

Burtless, Gary. 1993. "The Contribution of Employment and Hours Changes to Family Income Inequality." *The American Economic Review*, vol. 83, no. 2 (May), pp. 131–35.

———. 1995. "International Trade and the Rise in Earnings Inequality." *Journal of Economic Literature*, vol. 33, no. 2 (June), pp. 800–16.

Cancian, Maria, Sheldon Danziger, and Peter Gottschalk. 1993. "Working Wives and Family Income Inequality Among Married Couples." In Peter Gottschalk and Sheldon Danziger, eds., *Uneven Tides: Rising Inequality in America*. New York: Russell Sage Foundation.

Cappelli, Peter. 1993. "Are Skill Requirements Rising? Evidence for Production and Clerical Workers." *Industrial and Labor Relations Review*, vol. 46, no. 3, pp. 515–30.

Card, David. 1992. "The Effect of Unions on the Distribution of Wages: Redistribution or Relabelling?" NBER Working Paper no. 4195.

DiNardo, John, Nicole M. Fortin, and Thomas Lemieux. 1995. "Labor Market Institutions and the Distribution of Wages, 1973–1992: A Semiparametric Approach." National Bureau of Economic Research Working Paper no. 5093, April.

Federal Reserve Bank of New York. 1995. *Economic Policy Review*, vol. 1, no. 1 (January).

Fieleke, Norman S. 1994. "Is Global Competition Making the Poor Even Poorer?" *New England Economic Review*, November/December, pp. 3–16.

Freeman, Richard B. 1993. "How Much Has De-Unionization Contributed to the Rise in Male Earnings Inequality?" In Peter Gottschalk and Sheldon Danziger, eds., *Uneven Tides: Rising Inequality in America*. New York: Russell Sage Foundation.

———. 1994. "Lessons for the United States." In Richard B. Freeman, ed. *Working Under Different Rules*. New York: Russell Sage Foundation.

———. 1995. "Are Your Wages Set in Beijing?" *Journal of Economic Perspectives*, vol. 9, no. 3 (Summer), pp. 15–32.

Freeman, Richard B. and Lawrence F. Katz. 1994. "Rising Wage Inequality: The United States Vs. Other Advanced Countries." In Richard B. Freeman, ed., *Working Under Different Rules*. New York: Russell Sage Foundation.

Gottschalk, Peter. 1993. "Changes in Inequality of Family Income in Seven Industrialized Countries." *The American Economic Review*, vol. 83, no. 2 (May), pp. 136–42.

Gottschalk, Peter and Mary Joyce. 1992. "Is Earnings Inequality Also Rising in Other Industrialized Countries?" Boston College Working Paper No. 223, October.

Gottschalk, Peter and Robert Moffitt. 1994. "The Growth of Earnings Instability in the U.S. Labor Market." *Brookings Papers on Economic Activity*, no. 2, pp. 217–72.

Gottschalk, Peter and Timothy M. Smeeding. 1995. "Cross-National Comparisons of Levels and Trends in Inequality." Mimeo, March 4.

Gramlich, Edward M., Richard Kasten, and Frank Sammartino. 1993. "Growing Inequality in the 1980s: The Role of Federal Taxes and Cash Transfers." In Peter Gottschalk and Sheldon Danziger, eds., *Uneven Tides: Rising Inequality in America*. New York: Russell Sage Foundation.

Groshen, Erica L. 1993. "HRM Policy and Increasing Inequality in a Salary Survey." Federal Reserve Bank of Cleveland Working Paper no. 9302, March.

Haveman, Robert H. and Lawrence Buron. 1994. "The Anatomy of Changing Male Earnings Inequality: An Empirical Exploration of Determinants." Jerome Levy Institute Working Paper no. 104, February.

Horrigan, Michael W. and Ronald B. Mincy. 1993. "The Minimum

Wage and Earnings and Income Inequality." In Peter Gottschalk and Sheldon Danziger, eds., *Uneven Tides: Rising Inequality in America*. New York: Russell Sage Foundation.

Howell, David R. 1993. "Technological Change and the Demand for Skills in the 1980s: Does Skill Mismatch Explain the Growth of Low Earnings?" Jerome Levy Economics Institute Working Paper no. 101, November.

———. 1994. "The Collapse of Low-Skill Male Earnings in the 1980s: Skill Mismatch or Shifting Wage Norms?" Jerome Levy Economics Institute Working Paper no. 105, March.

Hutchens, Robert M. 1993. "Avoiding a Future of Unemployment and Low Wages: What Opportunities Are Open to Young Unskilled Workers?" Jerome Levy Economics Institute Working Paper no. 100, October.

Juhn, Chinhui. 1994. "Wage Inequality and Industrial Change: Evidence from Five Decades." National Bureau of Economic Research Working Paper no. 4684, March.

Juhn, Chinhui, Kevin M. Murphy, and Brooks Pierce. 1993. "Wage Inequality and the Rise in Returns to Skill." *Journal of Political Economy*, vol. 101, no. 3, pp. 410–42.

Karoly, Lynn A. 1993. "The Trend in Inequality Among Families, Individuals, and Workers in the United States: A Twenty-Five Year Perspective." In Peter Gottschalk and Sheldon Danziger, eds., *Uneven Tides: Rising Inequality in America*. New York: Russell Sage Foundation.

Katz, Lawrence F., Gary W. Loveman, and David G. Blanchflower. 1995. "A Comparison of Changes in the Structure of Wages in Four OECD Countries." In Richard B. Freeman and Lawrence F. Katz, eds, *Differences and Changes in Wage Structures*. Chicago and London: University of Chicago Press.

Lawrence, Robert Z. and Matthew J. Slaughter. 1993. "International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup?" *Brookings Papers on Economic Activity*, no. 2, pp. 161–226.

Levy, Frank and Richard J. Murnane. 1992. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature*, vol. 30, no. 3 (September), pp. 1333–81.

Little, Jane Sneddon. 1995. "The Impact of Employer Payments for Health Insurance and Social Security on the Premium for Education and Earnings Inequality." *New England Economic Review*, May/June, pp. 25–40.

Lynch, Lisa. 1994. "Payoffs to Alternative Training Strategies at Work." In Richard B. Freeman, ed., *Working Under Different Rules*, New York: Russell Sage Foundation.

Mincer, Jacob. 1994. "Investment in U.S. Education and Training." National Bureau of Economic Research Working Paper no. 4844, August.

Murphy, Kevin M. and Finis Welch. 1993a. "Industrial Change and the Rising Importance of Skill." In Peter Gottschalk and Sheldon Danziger, eds., *Uneven Tides: Rising Inequality in America*. New York: Russell Sage Foundation.

———. 1993b. "Inequality and Relative Wages." *The American Economic Review*, vol. 83, no. 2 (May), pp. 104–09.

———. 1993c. "Occupational Change and the Demand for Skill, 1940–1990." *The American Economic Review*, vol. 83, no. 2 (May), pp. 122–26.

Osterman, Paul. 1995. "Skill, Training, and Work Organization in American Establishments." *Industrial Relations*, vol. 34, no. 2 (April), pp. 125–46.

Sachs, Jeffrey D. and Howard J. Shatz. 1994. "Trade and Jobs in U.S. Manufacturing." *Brookings Papers on Economic Activity*, no. 1, pp. 1–84.

Schweitzer, Mark E. and Max Dupuy. 1995. "Sectoral Wage Convergence: A Nonparametric Distributional Analysis." Federal Reserve Bank of Cleveland, Mimeo, September.

Scott, Elizabeth D., K.C. O'Shaughnessy, and Peter Cappelli. 1994. "Management Jobs in the Insurance Industry: Organizational Deskilling and Rising Pay Inequality." The Wharton Financial Institutions Center Working Paper no. 94–28. Forthcoming in Paul Osterman, ed., *White Collar Labor Markets*. New York: Oxford University Press.

Topel, Robert H. 1993. "What Have We Learned from Empirical Studies of Unemployment and Turnover?" *The American Economic Review*, vol. 83, no. 2 (May), pp. 110–15.

———. 1994. "Regional Labor Markets and the Determinants of Wage Inequality." *The American Economic Review*, vol. 84, no. 2 (May), pp. 17–22.

Tyler, John, Richard J. Murnane, and Frank Levy. 1995. "Are Lots of College Graduates Taking High School Jobs? A Reconsideration of the Evidence." National Bureau of Economic Research Working Paper no. 5127, May.

U.S. Department of Labor. 1994. *Report on the American Workforce*. Washington, D.C.: Government Printing Office.

Wood, Adrian. 1994. *North-South Trade, Employment and Inequality*. Oxford: Clarendon Press.

Does Location Matter?

Christopher J. Mayer

Economist, Federal Reserve Bank of Boston. *The author wishes to thank Kathy Bradbury, Jeffrey Kling, Yolanda Kodrzycki, and Bob Triest for helpful comments, and Margaret Enis for excellent research assistance. Any errors, of course, are the author's.*

In recent years, much attention has been paid to the growing gap between the earnings of Americans at the top and at the bottom of the income distribution, as reviewed by Kodrzycki (1996). As the earnings of poor Americans have fallen behind, these households have also become increasingly isolated from the places where middle-class and wealthy Americans live. The growth in inequality by location, however, has received much less attention than inequality by earnings, despite the fact that many neighborhoods in America's inner cities have become crime-ridden areas where few households of any race or income class would choose to live.

As segregation by income has increased, racial segregation has declined only modestly, suggesting that poor black children still grow up in locations that give them little chance to succeed. One study of Washington, D.C., found some particularly striking results. As compared to whites under the age of 14, black youth in the District of Columbia live in neighborhoods that have 11 times the rate of AFDC use, seven times the rate of illegitimacy, six times the rate of drug use and arrests, twice the rate of high school dropouts and long commutes, and a slightly higher rate of violent crime (Galster and Mikelsons 1995). While Washington, D.C., may be an extreme example, blacks in many other cities suffer from similar problems.

In the academic literature, the importance of location in labor market outcomes was first recognized in a series of articles and books that looked at the impact of racial discrimination in the housing market on the earnings of blacks. Developed by Kain (1968), the concept of "spatial mismatch" argues that housing discrimination confines blacks to a few central city neighborhoods where jobs have become increasingly scarce because employers have relocated to the suburbs. Written almost 30 years ago, Kain's article describes conditions that still exist today: growing suburbanization, continuing evidence of differential treatment in the housing market (see Fix and Struyk 1992; Turner 1992), and racial

segregation that, while declining, is still extraordinarily high (Farley and Frey 1993; Harrison and Weinberg 1992).

Researchers have also contended that the segregation of the poor in inner-city ghettos has other serious consequences for residents beyond lack of access to jobs, including the lack of positive role models, concentration of crime, negative peer effects, and poor schools. Wilson (1987) has argued that reduced discrimination against blacks in the housing market has had devastating consequences for the remaining residents of inner-city ghettos, as middle-class blacks increasingly have gone to the suburbs, leaving behind neighborhoods with fewer and fewer positive role models. Wilson and others attribute much of the initial decline in many inner-city neighborhoods to the reduction in urban manufacturing jobs, which previously provided good-paying jobs to low-skilled workers.

As the earnings of poor Americans have fallen behind, these households have also become increasingly isolated from the places where middle-class and wealthy Americans live.

This paper will discuss evidence from a variety of sources exploring the impact of location on the earnings of American households. Although many of the studies have flaws, the preponderance of evidence suggests that location does matter. In particular, spatial segregation by income is having an increasingly detrimental effect on those at the bottom of the income distribution. The Gautreaux program in Chicago provides especially strong evidence on this subject. As a result of a Supreme Court consent decree in 1976, families on the waiting list for public housing were assigned randomly to apartments in primarily white, middle-class suburbs or to units in the city of Chicago. Subsequent tracking of a sample of the Gautreaux participants indicates that those who moved to the suburbs were more likely to be employed than those assigned to city homes. Furthermore, the children of movers to the suburbs performed better in school and had a higher rate of college enrollment (Rosenbaum and Popkin 1991; Rosenbaum 1995).

This paper begins by summarizing recent trends in segregation by race and income, including data from the Current Population Survey showing that the relative concentration in central cities of residents in the bottom quintile of the income distribution continues to grow, while the relative proportion of minorities in the inner cities remains flat or is modestly declining. Next, the paper explores reasons for the continuing racial and income segregation, noting that recent evidence shows that racial discrimination continues, but that such discrimination is not a complete explanation of recent trends.

The second part of the paper explores the impact of spatial isolation on residents of poor neighborhoods. The summary focuses on the most influential articles and most recent evidence on this subject. Some of the literature provides general evidence on the impact of location; other studies are more targeted, testing for the existence of spatial mismatch or neighborhood and peer effects. The final section of this paper offers some conclusions.

I. Changes in Segregation by Race and Income

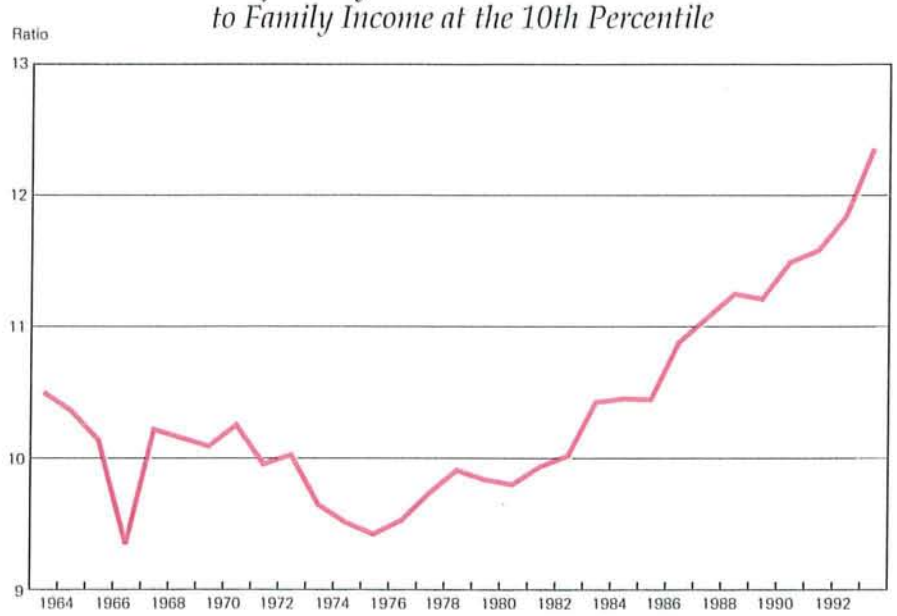
For more than 30 years, researchers have documented that blacks live in significantly more segregated locations than most ethnic groups. Taeuber and Taeuber (1965) and Duncan and Duncan (1955, 1957) showed that blacks lived in cities with severe segregation during the 1950s and 1960s, and that many neighborhoods were transformed from white to black in a relatively short period of time. After the riots of the late 1960s, the Kerner Commission warned that the nation was becoming divided "into two societies; one largely Negro and poor, located in the central cities; the other, predominantly white and affluent, located in the suburbs. . . ." (See Farley and Frey 1993 for a more complete description of the historical context of discrimination.)

Because of the history of racial discrimination in the United States, most research in the past 30 years has looked at segregation by race, as opposed to segregation by income. More recently, however, researchers have recognized that some of the problems associated with segregation (peer and neighborhood effects, for example) are more closely related to poverty than to race. Most of the research summarized

in this section refers to segregation by race. However, the inclusion of a smaller number of papers on income segregation does not imply that segregation by income is unimportant; it is just less well researched. This point is particularly relevant because of the evidence from the last two decades that income segregation is rising, while racial segregation is declining.

Figure 1

Ratio of Family Income at the 90th Percentile to Family Income at the 10th Percentile



Source: Current Population Survey data, 1964 to 1994, except 1969 and 1988, which are interpolated.

Linking Segregation by Income and Race to Trends in Income Inequality

Changes in segregation by income and by race can be linked to the well-documented trend of rising income inequality. Figure 1 displays the ratio of the median incomes of families in the highest and lowest quintiles of the income distribution (that is, the 90th and 10th percentiles) from 1964 to 1994.[1] The figure shows that income inequality began to rise in the mid-1970s.

At the same time that income inequality has increased, poor families (those in the bottom quintile) continue to be disproportionately located in central cities. Figure 2 looks at U.S. families living in metropolitan statistical areas (MSAs) and compares the central city concentration of families in each income quintile to the central city concentration of all families.[2] In 1964, an American family in the bottom quintile of the income distribution was about 1.2 times as likely to be living in the central city as the average family. That number has risen steadily over time, to a high of almost 1.4 by 1994. By comparison, families in the highest two quintiles have been moving out of central city locations.

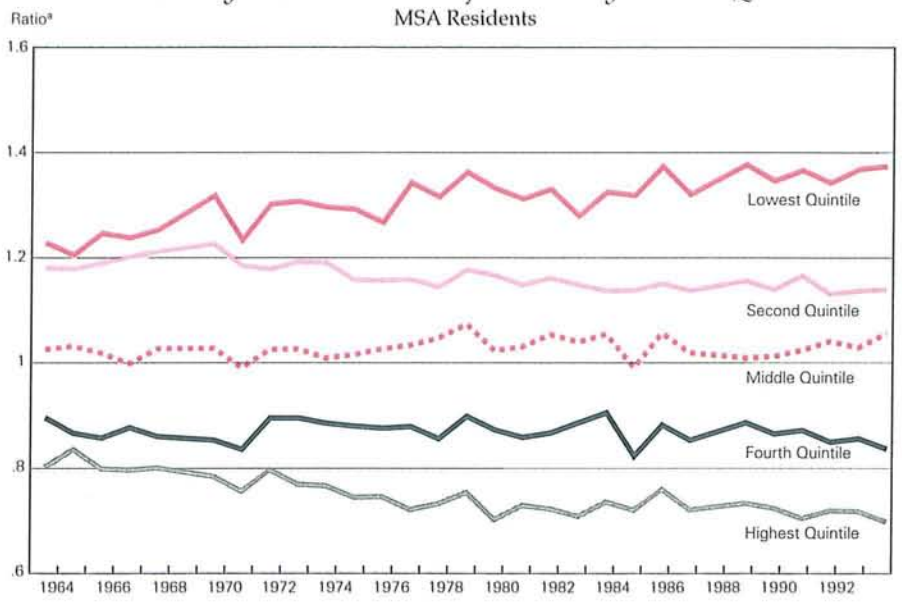
While urban families at the bottom of the income distribution have always disproportionately resided in central cities, this pattern has become more pronounced in the last three decades. Spatial segregation by income has trended upward since the 1960s, well before the aggregate income distribution began widening. This suggests that changes in the income distribution explain only a part of the trend towards greater segregation by income. Indeed, the timing is consistent with causation running from spatial income segregation to increasing income inequality rather than the reverse. To the extent that the harmful effects of concentrated poverty have a lagged response or a minimum threshold (Crane 1991), rising income segregation may well have a role to play in explaining growing income inequality. Alternatively, changes in underlying factors such as the loss of manufacturing jobs (particularly in the inner city) may have an effect on both rising income inequality and spatial segregation by income.

[1] These data were obtained from the March Supplement of the Current Population Survey. The definition of families used here differs slightly from that of the Census Bureau in that the family data in this section include single individuals as well as traditional families (two or more related persons living together).

[2] Since the 1960s, the percentage of families living in an MSA has been rising, while the percentage of MSA families living in the central city has been steadily declining.

Figure 2

Central City Concentrations of the Family Income Quintiles



[a] Calculated as the central city percentage of families in a given income quintile divided by the central city percentage of all families.
Source: Current Population Survey data, 1964 to 1994, except 1969 and 1988, which are interpolated.

Figure 3 presents similar data on the central city concentration of blacks. After an initial rise in the 1960s, the relative concentration of blacks in the central city showed no consistent trend throughout most of the 1970s and fell slightly in the late 1980s and early 1990s. This pattern suggests that blacks have been moving out of the central city at roughly the same rate as all households. However, black families are still very heavily concentrated in the central city. The average ratio of concentration of blacks (between 1.6 and 1.7) is much higher than the average ratio of concentration for families in the bottom quintile of the income distribution (less than 1.4), although the ratios are moving closer together. The locational pattern of black families is described in more detail in Figure 4, which shows the change over time in central city concentration of blacks, by income quintile. Consistent with the observations of Wilson (1987), high-income blacks have been leaving the central cities at above average rates since the late 1960s. Even so, the relative concentration of high-income blacks in the central city remains about 30 percent above the central city concentration of all American families.

Racial Discrimination and Segregation by Location

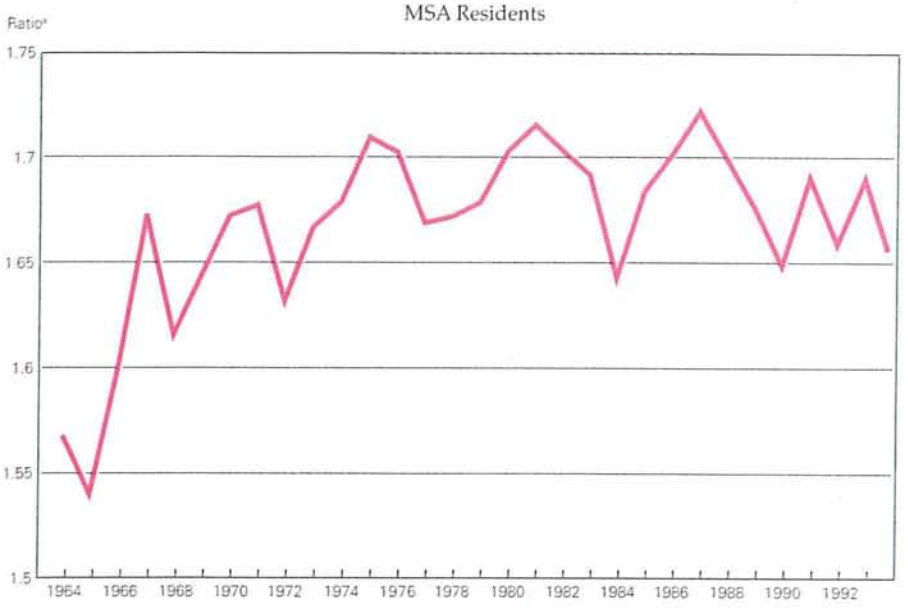
The large concentration of blacks in the central city is not surprising given the high degree of racial discrimination that has persisted in the housing market for a long time. In prior decades, much of the discrimination was codified into law. Before the Congress passed the Fair Housing Act of 1968, local rules effectively restricted blacks from locating in many communities. Prior case law even allowed developers or owners to write deed restrictions that prohibited blacks or other minorities from living in particular developments or properties for as long as 99 years. Kain and Quigley (1975) showed that as a result of such discrimination, blacks actually paid more than whites for equivalent rental housing units, despite living in significantly worse neighborhoods.

Researchers have developed a variety of measures to quantify differences in the segregation of racial or income groups. The most common are the index of dissimilarity—which measures the evenness of the distribution of a particular racial or income group—and the index of isolation—which measures the extent to which members of a particular group are exposed to other members of the same group. (See Massey and Denton (1988) for a further discussion of these measures.) Because most data come from the decennial censuses, these measures are usually defined based on differences in the racial or poverty makeup of census tracts (areas of approximately 4,000 residents).[3]

[3] To the extent that census tract boundaries cross actual neighborhood boundaries, these indexes could underestimate the extent of segregation, by using data for tracts that are more racially mixed than the underlying neighborhoods.

Figure 3

Relative Concentration of Blacks in the Central City



* Calculated as the central city percentage of black families divided by the central city percentage of all families.
Source: Current Population Survey data, 1964 to 1994, except 1969 and 1988, which are interpolated.

The passage of fair housing laws in the 1960s and the growth of the black middle class, which has been ongoing since the end of World War II, led to a modest decline in the extent of racial segregation (measured by the index of dissimilarity) in the 1970s and 1980s. For example, Jakubs (1986) found that segregation fell in a majority of all 318 SMSAs in the 1970s, although Massey and Denton (1993) have observed that segregation remained high in the metro areas with the largest black populations. The data unambiguously support the conclusion of modestly declining racial segregation in the 1980s. Farley and Frey (1993) note that between 1980 and 1990 the average index of dissimilarity in 232 metropolitan areas with significant black populations fell from 69 to 65, with the index declining in 194 of those metro areas. Harrison and Weinberg (1992) and Massey and Denton (1993) find similar results for that decade.

Even though the Fair Housing Act of 1968 has been on the books for more than 25 years, various recent studies have found evidence that minorities are still treated differently when acquiring housing. Evidence of discrimination includes studies of lending patterns (redlining), mortgage approval, and the search process for buying or renting a home. The bulk of these studies support the hypothesis that discrimination limits the mobility of minorities and in many cases restricts their choice of locations and makes search more costly. (See Fix, Galster, and Struyk 1992 and Yinger 1993 for an overview of this literature.) Such discrimination could explain the observed high levels of racial segregation.

Probably the most striking evidence regarding unequal treatment of minorities comes from a pair of national housing audits conducted in 1977 and 1989. (Turner 1992 and Yinger 1992 present a more detailed description of these audits.) In both audits, pairs of testers, one minority, the other white, were sent to investigate randomly chosen housing units that were advertised in major newspapers. The testers were given identical backgrounds and incomes (in some cases the minority testers were actually given slightly higher incomes) and sent out to look for similar units. The testers recorded whether or not they were shown the advertised unit, as well as the number of other similar units they were offered. In the 1989 study, testers also documented the neighborhood characteristics of the units they were offered.

The 1989 audit showed that blacks receive some type of differential treatment in buying or renting a home more than one-half of the time (Turner 1992). The incidence for Hispanics was about one-third lower than for blacks. While the most extreme type of discrimination—the refusal of the agent to do business with the minority home seeker when units were available for the white tester—was experienced by the minorities in less than 10 percent of the cases, less severe adverse treatment was more common. For example, black testers were shown between 20 and 25 percent fewer units for sale or rent than white testers (Yinger 1992). In addition, blacks often received fewer credit offers on sales units and worse terms and

conditions for rentals, including a higher rent or security deposit and fewer offers of special terms (such as one month's free rent). In more than 20 percent of the audits, blacks and Hispanics were shown houses in neighborhoods with a higher percentage of minority residents, lower house values, or lower incomes, although the magnitude of the differences was fairly small. Finally, units for sale in minority areas were less likely to be advertised in major newspapers.

Figure 4

Central City Concentrations of Black Families in the Various Family Income Quintiles

MSA Residents

* Calculated as the central city percentage of black families in a given income quintile divided by the central city percentage of all families.
Source: Current Population Survey data, 1964 to 1994, except 1969 and 1988, which are interpolated.

Although the 1989 results are striking, they appear to be less severe than those found in the 1977 national audit and in a smaller 1981 audit conducted in Boston. In particular, blacks were much more likely to be told that the unit they were inquiring about was unavailable in 1977 than in 1989 (Turner 1992). In the 1981 Boston audit, blacks were shown 30 percent fewer units than comparable whites (Yinger 1986).

In addition to discrimination in the search process, blacks also face impediments to getting credit. Munnell et al. (1996) gathered data on a large number of 1990 mortgage applications in Boston, including virtually all of the information from the mortgage application. Even controlling for differences in observed personal attributes, residence location, and lender, the authors still found that a black applicant with average attributes would face a rejection probability 8 percentage points higher than a white applicant with otherwise identical attributes. While Yezer, Phillips, and Trost (1994) have criticized the conclusions of Munnell et al. because of the specification used in the analysis, their criticism is a theoretical point that cannot be resolved with the existing data. Thus, the Munnell study is the most complete look to date at racial disparities in the mortgage acceptance process, and it provides convincing evidence that minorities are treated differently when seeking a mortgage. (See Yinger 1993, Berkovec et al. 1994, and Browne and Tootell 1995 for more detailed discussions of the evidence relating to mortgage discrimination.)

The net conclusion from most of this literature is that minorities continue to face discrimination in the housing market, although disparate treatment appears to be lessening. The recent reduction in discrimination is likely linked to the modest decline in racial segregation noted in the previous section.

Segregation by Income

More recently, researchers have begun to measure spatial segregation by income as well as by race. While racial segregation in the nation's largest cities has decreased since 1970, income segregation has grown, as middle-class households of all races continue to leave the central cities to live in the suburbs. Abramson, Tobin, and VanderGoot (1995) show that the mean value of the index of dissimilarity for the poor (calculated for census tracts within the MSA) in the largest 100 MSAs rose from 32.9 in 1970 to 34.8 in 1980 to 36.4 in 1990, an increase of 11 percent over the two decades. Massey and Eggers (1990) use a larger

number of income groups and get somewhat smaller index values for the 1970s, but a similar rate of change.

Of particular interest to researchers exploring increased sorting by income is the possibility that the exodus of middle-class households from the inner cities has left the remaining poor residents "socially isolated" (Wilson 1987) with fewer positive influences (successful peers and role models, access to informal employment networks, and so on) and more social problems (such as crime and drugs). In fact, the evidence suggests that an increasing number of poor residents have indeed become isolated in areas with a very high percentage of poor neighbors. Using a sample of the 100 largest cities, Kasarda (1993) shows that the share of the poor living in tracts with a poverty rate over 40 percent increased from 16 to 28 percent between 1970 and 1990, while the percentage living in tracts with a poverty rate exceeding 20 percent rose from 55 to 69 percent. Jargowsky and Bane (1991) found slightly lower increases in the 1970s, using a smaller sample of cities.

The exodus of middle-class households from the inner cities may have left the remaining poor residents "socially isolated" with fewer positive influences and more social problems.

II. Does Location Matter? And If So, Why?

The overall trends described in the previous section suggest that poor Americans have suffered a double blow in the last two decades: decreased relative incomes combined with rising segregation. Policy-makers might wonder, however, whether the increase in segregation by income presents an additional barrier to raising the living standards of those at the bottom of the income distribution. This section summarizes research considering the implications of income and racial segregation. The first subsection presents evidence suggesting that segregation does matter for the labor market outcomes of individuals, while the next two subsections present evidence regarding the specific hypotheses of spatial mismatch and peer and neighborhood effects.

The Relationship between Income Segregation and Labor Market Outcomes

Probably the most provocative evidence suggesting that location matters comes from the Gautreaux program in Chicago. As a result of a Supreme Court consent decree in 1976, families on the waiting list for public housing were given vouchers and assigned randomly to apartments in primarily white, middle-class suburbs or to units in "revitalized" neighborhoods within the city of Chicago. Program participation was mostly a matter of luck, although families with more than four children, large debts, a history of late rent payments, or apartments showing evidence of physical abuse were excluded. Such exclusion criteria never affected more than 30 percent of otherwise eligible residents. Once relocated, participants received little special support to help them adjust to their new communities.

Subsequent tracking of a sample of the Gautreaux participants shows that the suburban movers fared better than city movers in many dimensions (Rosenbaum and Popkin 1991; Rosenbaum 1995). For example, 74 percent of suburban movers who were employed pre-move were also employed post-move, compared to 64 percent for movers to a city location. In addition, 46 percent of previously unemployed suburban movers found jobs, versus 30 percent of city movers. Living in the suburbs had little effect on average hours or wages. More striking, however, was the impact of moving to the suburbs on the children of Gautreaux participants. A 1982 survey found that Gautreaux children had managed to achieve similar grades in suburban schools, despite higher standards. A follow-up survey in 1988 found that 94 percent of the children of suburban movers attended college or were on a college track, compared to 45 percent of city movers' kids. Of those not in college, 41 percent of city-mover children were employed full-time, versus 75 percent of suburban-mover children.[4]

Although the Gautreaux program was fairly large, placing over 5,000 families since 1976, the samples used in these studies of the program were small (342 adults and 98 children), leading to the possibility of selection bias, particularly because researchers were

[4] The differences in means between city and suburban children were significantly different from each other with a p-value of at least 0.90.

unable to contact more than 40 percent of the randomly selected households. Nonetheless, the Gautreaux evidence is the closest that social scientists have come to an experiment that randomly allocates households to different neighborhoods.

Nelson and Edwards (1993) explore the hypothesis that to the extent that minorities face discrimination in finding and acquiring housing in better neighborhoods, they should be less likely to move out of ghettos. They use data from the American Housing Survey to examine flows of households to and from poor zones in 10 cities. They find that blacks are less likely to move out of poor areas than whites, even controlling for other individual characteristics. In Chicago, for example, about 70 percent of blacks who lived in a poor zone remained in a poor zone five years later, while the comparable figure for whites was only 50 percent. In addition to race, however, income and neighborhood of origin were important in predicting mobility, suggesting that factors other than racial discrimination are also important in understanding neighborhood composition. Furthermore, the zones in this study were about 25 times larger than census tracts, so these result may understate barriers to mobility. Nonetheless, Nelson and Edwards' findings suggest that poor minorities face significant barriers to moving, even when the potential gains are substantial.

Most of the research that looks at the problems associated with racial segregation does so within a single metropolitan area, and Cutler and Glaeser (1995) argue that such studies suffer from serious biases if they do not control for the endogeneity of location within the MSA. By looking at the impact of MSA-level variables on individual outcomes across MSAs, Cutler and Glaeser claim that they can better test the hypothesis that the reduction in housing choice associated with discrimination hurts all minorities, regardless of where they live. In particular, with the exception of Gautreaux, most existing within-city studies do not control for sorting (rich people live together by choice, rather than becoming rich because of their neighbors), within-MSA mobility (suburban minorities may be a selected sample of all minorities), or between-MSA mobility (talented minorities avoid segregated MSAs). To address these problems, Cutler and Glaeser use youth observations from the 1990 Census Public Use Micro Sample to estimate whether blacks fare worse in segregated MSAs. They present both OLS and 2SLS estimates, instrumenting for the degree of segregation within a MSA and for the residential location.[5]

They find that blacks in metropolitan areas with more segregation are less likely to graduate from high school, while they are more likely to be idle or to be a teenage mother and to have lower earnings. (Galster 1987 also estimates a simultaneous equations model and finds that segregation has a negative impact on various measures of black welfare.) These results hold even when controlling for whether the individual lives in a central city, suggesting that segregation hurts all blacks in a metropolitan area, regardless of whether they live in the city or suburbs. Cutler and Glaeser also included some specific measures of neighborhood spatial isolation and peer influences, but these measures did not explain a large part of the segregation effect, possibly because of the large size of the "neighborhoods" involved (approximately 100,000 residents).

O'Regan and Quigley (1995) also find evidence of adverse effects of spatial isolation on teenage employment using a sample of at-home youth from the 1980 and 1990 Public Use Micro Samples. In the first stage, the authors estimate a logit model of employment on individual characteristics (except race), including the type of household, whether a parent is working, and whether the individual lives in a central city. The second stage involves regressing the predicted employment probability on individual race dummies and on MSA measures of economic activity, employment composition, and indexes of exposure to whites and the poor. Both exposure measures are highly significant. The coefficients suggest that reduced segregation by race or poverty would have a positive impact on black and Hispanic youth employment, but a negative effect on white employment. The latter result is explained by the fact that reduced segregation will result in whites having increased exposure to the poor and to minorities who have fewer jobs and thus worse peer effects.

Another set of provocative findings showing the importance of location involves the labor market performance of recent immigrants into the United States. Previous evidence had suggested that the performance of children of recent immigrants depends not only on their parents' skills, but also on the average skill levels of their ethnic group (Borjas 1992 and

[5] The set of instruments includes variables relating to the MSA of previous residence, plus the degree of segregation and the number of governments in 1962, the percent of local revenue received from intergovernmental transfers, and the number of rivers between and within the MSA. Cutler and Glaeser suggest that the latter instrument is correlated with segregation because a larger number of communities likely leads to greater sorting.

1994). However, such recent immigrants often live in highly segregated neighborhoods, so the effect attributed to ethnic capital might actually be a neighborhood effect. Borjas (1995) tests for separate neighborhood and ethnic capital effects using data from the public use file of the 1970 U.S. Census and the National Longitudinal Survey of Youth. He finds evidence of very strong neighborhood effects, even controlling for other factors, but a much smaller impact of ethnicity. In fact, ethnicity matters only for persons who live in segregated neighborhoods with a large percentage of persons from the same ethnic background.

The above results provide significant evidence that segregation continues to affect the labor market outcomes of minorities and immigrants and that minorities face impediments to moving, but these results do not help to identify the mechanism through which segregation has these effects. The next subsections explore specific hypotheses about the impact of segregation, including spatial mismatch and peer and neighborhood effects.

Spatial Mismatch and Jobs

Kain's original paper on spatial mismatch (1968) began a long literature that has explored the labor market implications of racial discrimination in the housing market. (The spatial mismatch hypothesis states that housing discrimination confines blacks to living in a few central city neighborhoods, where jobs have become increasingly scarce because employers have relocated to the suburbs.) Using data from Detroit and Chicago in 1952 and 1956, Kain found that restrictions on the residential choice of African-Americans reduced non-white employment in these cities by 9,000 and 24,600 jobs, respectively. Over the next 22 years, more than two dozen papers were written in support of, or arguing against, spatial mismatch. While research on this topic slowed in the late 1970s and early 1980s, interest has recently grown more intense as America's urban problems receive greater attention.

Several recent papers have surveyed the literature on spatial mismatch and come to very different conclusions. Jencks and Mayer (1990b), for example, find that the evidence against spatial mismatch is as compelling as the supportive evidence, suggesting that "support [for the idea that job proximity increases the supply of black workers] is so mixed that no prudent policy analyst should rely on it." Kain (1992), Holzer (1991), and Ihlanfeldt (1992), on the other hand, find significant support for spatial mismatch, relying on more up-to-date research as well as taking a more critical view of previous papers. As Ihlanfeldt (1992) notes, Kain's spatial mismatch theory is actually three separate hypotheses: 1) residential segregation affects the location of jobs that blacks obtain; 2) segregation decreases aggregate black employment; and 3) the decentralization/suburbanization of jobs magnifies the effect of residential segregation.

Much of the subsequent empirical debate over spatial mismatch turns on measurement issues, which are briefly summarized here. For example, many papers compare the earnings of blacks in urban and suburban neighborhoods, despite the possibility that suburban blacks are a selected sample of all blacks in the metropolitan area (even controlling for observable individual characteristics). In fact, the endogeneity of location is a problem that few authors address directly. Several recent papers attempt to avoid the problem by restricting their samples to at-home youth, arguing that a youth's residence is likely chosen by older members of the household. Such papers, however, suffer from the additional problem that, for youth, the choice between work and school is also endogenous. In addition, many researchers treat all suburban locations the same, despite the observation that suburbs with large black populations in many MSAs are significantly different from white suburbs and have poorer access to jobs. Most papers also use a general measure of residential segregation, as opposed to a more complicated measure that takes into account the relative locations of black residents and potential employers.

The spatial mismatch hypothesis states that housing discrimination confines blacks to living in a few central city neighborhoods, where jobs have become increasingly scarce because employers have relocated to the suburbs.

Probably the most well-known and controversial paper that finds evidence against spatial mismatch is Ellwood's (1986) study of Chicago youth employment. Ellwood presents several different types of evidence,

all of which suggest that location has little effect on black employment rates. First, he regresses census tract employment rates on the tract's racial make-up plus three measures of job access, finding that the access variables are insignificant and have little effect on the significant negative coefficient for percent black in tract. Even including neighborhood fixed effects does not change the coefficient on percent black. Other evidence against spatial mismatch comes from Ellwood's finding that the "labor market outcomes for blacks on the West Side ghetto are remarkably similar to those in the South Side, in spite of the dramatic differences in the proximity to jobs." Finally, he shows that differences in employment rates for blacks and whites within the same neighborhood are the same as the relative job differences by race for youth living across town. Ellwood concludes that racial discrimination in the labor market, rather than residential location, explains differences in employment across different neighborhoods. ("Race, not space, remains the key explanatory variable.")

Interest in the spatial mismatch hypothesis has recently grown more intense as America's urban problems receive greater attention. Much of the debate turns on measurement issues.

Several authors have criticized Ellwood's findings on a variety of grounds. Leonard (1986) suggests that Ellwood's measures of job accessibility are unreliable because of the small sample sizes in the Chicago Area Transportation Study. Ihlanfeldt (1992) notes that the use of aggregate census tract data, rather than individual observations, might bias the coefficients on accessibility towards zero. Kasarda (1989) presents evidence that job accessibility really does not differ between the South Side and the West Side ghetto. He also makes the argument that the similarity of relative black-white employment patterns in different neighborhoods can be explained by differences in the timing of job losses in the two neighborhoods.

More recently, Engberg and Kim (1995) present evidence suggesting that place effects are minimal for workers of all education levels, using a sample of white men in Pittsburgh. They use a non-parametric selection model to try to separate place and person effects and assume that highly educated white men face no barriers to moving. Their results suggest that the increased segregation by income may have little effect on the labor market outcomes of white low-skill workers. The study does not address employment outcomes for black workers, who may face greater barriers to moving.

On the other side, several recent papers have found evidence in favor of spatial mismatch. Ihlanfeldt and Sjoquist, together and separately, have written a series of papers that combine data on black and white youth from the 1980 Census Public Use Micro Sample with local measures of job accessibility, to show that job accessibility is strongly correlated with black youth employment prospects. In the Philadelphia MSA, they show that mean travel time for white and black youth in 26 regions is related to the probability of employment for these groups (Ihlanfeldt and Sjoquist 1990). In addition, the authors show that relative differences in mean travel times explain a significant portion of the difference between white and black employment rates. Other regressions extend these results to Chicago and Los Angeles, although the data are not as good.

Ihlanfeldt (1992, 1993) expands on this research by creating separate estimates for Hispanics, as well as for youth in various other income and location categories in 50 MSAs. Among other things, he finds that the relationship between job access and employment probability is stronger for central city than suburban youth. In fact, employment access had a significant effect on job probability for all groups except for youth located in smaller MSAs. Finally, Ihlanfeldt and Sjoquist (1991) study 43 SMSAs using data from youth living at home in the central city (to control for endogenous location), and once again find that mean travel time has a significant effect on the probability of youth employment.

While Ihlanfeldt and Sjoquist's research strongly suggests that proximity to jobs matters, the authors do not fully control for endogenous location and do not allow for neighborhood effects that might be correlated with access to employment. To address the latter issue, Gabriel and Rosenthal (1995) estimate a fixed-effects model of commuting times, using data from the 1985 and 1989 American Housing Surveys. They find that black workers with a high school or college degree have longer commutes than similarly educated Asian or white workers, even after controlling for neighborhood fixed effects and income. Surprisingly, for workers with less than a high school degree,

commutes are similar for all races. The latter finding contradicts the observations of the many other authors who argue that low-skilled minority workers are the group most likely to suffer from long commutes because of barriers to mobility and the loss of inner-city manufacturing jobs.

The results from Gabriel and Rosenthal indicate that neighborhood effects matter and that not controlling for neighborhood fixed effects biases upward the race coefficient in the commuting time regressions.[6] (The coefficient on the black dummy variable in the commuting time regressions was about one-third higher in the specifications that did not include the neighborhood fixed effects.) Finally, Gabriel and Rosenthal find that blacks are less likely than members of other racial groups to move after four years, even controlling for other factors including the potential gains associated with moving.

In contrast to much of the previous literature, which generates variation in commuting times based on cross-sectional data, Zax and Kain (1995) take a natural experiment approach and still find that job access has a differential impact on black workers. They study worker quit behavior in response to the move of a large services industry employer from the Detroit central business district to the predominantly white suburb of Dearborn. The authors divided employees into "winners" (workers whose new commute was shorter) and "losers" (workers with a longer commute). While few, if any, white "losers" quit their jobs in the three years following the move, many black "losers" left the company. As a result of the move, at least 11 percent of the blacks who had worked at the previous location quit.

Neighborhood and Peer Effects

While the spatial mismatch literature posits a well-defined hypothesis, neighborhood and peer effects are more difficult to identify. Wilson (1987), for example, argues that low-income blacks have been negatively affected by the exodus of middle-class blacks from ghettos since the 1970s. The loss of employed households may hurt remaining residents of a poor urban neighborhood, through the loss of informal job networks (Holzer 1987) and positive adult role models and a deterioration in peer influences. Because of the high correlations among these factors within individual neighborhoods, their effects are very hard to identify separately. In addition, because individuals tend to locate in neighborhoods inhabited by people with similar characteristics, the direction of causality between individual outcomes and neighborhood characteristics is unclear. Because of these problems, many fewer papers have looked for separate evidence of neighborhood and peer effects, and the evidence that is available is much weaker than for spatial mismatch.[7]

Jencks and Mayer (1990a) survey the literature on the impact of neighborhoods on five outcomes for children, including educational attainment, cognitive skills, criminal activity, sexual behavior, and economic success. They conclude that "there is no general pattern of neighborhood or school effects that recurs across all outcomes." Jencks and Mayer found only five papers on labor market success and none had results that were reliable.

More recently, Crane (1991) finds evidence in favor of an "epidemic" theory of ghettos in which the individual outcomes are related to neighborhood quality, particularly for very distressed neighborhoods. Using data from the 1970 Census Public Use Micro Sample, he shows that as the percentage of "high status" residents (persons with a professional or managerial job) decreases below a threshold of 10 percent, the probability of a young person having a baby or dropping out of school increases sharply, even controlling for other individual characteristics. To control for endogeneity of residence location, he restricts the sample to at-home youth.[8] One problem with the study is that Crane tested 15 measures of neighborhood quality (which presumably were less strongly associated with social problems) before using the percentage of "high status" residents. In addition, correlations between neighborhood characteristics and personal and parental attributes could further bias the results. (See Borjas 1995.)

Corcoran et al. (1991) do a better job of controlling for family characteristics in their study of men's economic status, finding that parental income, race, and participation in welfare programs play an important role in a son's earnings. They obtain parental information from the intergenerational data in the Panel Survey of Income Dynamics. Once parental attributes

[6] The authors attribute the impact of the fixed effects on commuting times to unobserved compensating differentials in neighborhood house prices and amenities.

[7] This section reviews only papers that relate directly or indirectly to the impact of neighborhood factors on labor market outcomes. See Jencks and Mayer (1990a) for a survey of the much larger literature that explores the determinants of social problems such as teenage pregnancy, illegitimacy, and crime.

[8] These results are consistent across most racial groups and locations, although the mean levels of the dropout and fertility rates were much lower for whites in the sample than for blacks.

are controlled for, however, only one of the neighborhood characteristics is significant—percent on welfare. The neighborhood characteristics are measured at the zip code level, and even the authors concede that zip code level data are inadequate for this task. (See Borjas (1995) for evidence about the imprecision of zip code level neighborhood controls.)

Because individuals tend to locate in neighborhoods inhabited by people with similar characteristics, the direction of causality between individual outcomes and neighborhood characteristics is unclear.

Several recent papers have attempted to use an instrumental variables approach to control for the simultaneity between neighborhood and peer characteristics and (unobserved) household attributes. Evans, Oates, and Schwab (1992) show the problem with ignoring the endogeneity of location and peers. Using data from the National Longitudinal Study of Youth, they estimate the probability of pregnancy and school dropout for teenage women as a function of individual and household variables, including the percentage of students in school who are disadvantaged. In a single equation model, they find that the percentage disadvantaged variable is highly significant and has a positive impact on the probability of pregnancy and a negative impact on the probability of staying in school. Next the authors use a simultaneous equations approach, in which the percentage of disadvantaged students is estimated as a function of instruments that include metropolitan area economic conditions.[9] The coefficient on percentage disadvantaged becomes insignificant in the pregnancy and dropout equations when run in the simultaneous equations framework. While the study can be criticized for its exact choice of instruments and a single peer variable, the results strongly hint at the problem associated with the endogeneity of peers and neighborhoods.

Others find that neighborhood and peer effects do not disappear with suitable instruments for neighborhood effects. Duncan, Connell, and Klebanov (1994) argue that endogenous neighborhood choice could actually lead researchers to underestimate neighborhood effects, if households with motivated parents choose poor neighborhoods because of low house prices. They use data from the Panel Survey of Income Dynamics to estimate the impact of individual and neighborhood characteristics on the probability of high school graduation, using the future neighborhood choice of the mother as an instrument for the neighborhood that the parents occupy while the children live at home. Such an instrument should avoid the problem that parents may choose a neighborhood in order to provide their children with better peers. The authors find a strong and significant neighborhood effect, which increases in magnitude when they use instrumental variables.

Case and Katz (1991) use targeted survey data to separate the effects of neighborhood and family attributes; they find strong evidence that both of these factors have an impact on the behavior of inner-city youths consistent with an epidemic model of neighborhood effects. They use data from a 1989 NBER survey of youths living in low-income neighborhoods that reports a variety of outcome measures, including labor force/school status, criminal activity and drug use, church attendance, and parental status. The survey also asks about the presence and demographic background of the parents and siblings, as well as the respondent's current living arrangements. The estimated neighborhood effects are especially convincing because Case and Katz use a novel approach to control for the potential endogeneity of location. For example, if the dependent variable was whether or not a youth committed a crime last year, Case and Katz include the predicted probability that the youth's neighbors committed a crime in the last year as an independent variable. The predicted value is generated from the individual characteristics of neighboring youths.

As suggested by the conflicting results listed above, Aaronson (1995) shows that instrumental variable equations are very sensitive to the choice of reasonable instruments. Instead, he uses data from siblings who differ in age by at least three years, and whose families move at least once, to estimate a model of educational attainment in which family influences are controlled for using fixed effects. The results show that neighborhood effects remain important in predicting high school graduation even when family-specific fixed effects are included in the equation.

[9] The authors show that the included instruments are correlated with percentage disadvantaged, but uncorrelated with the dependent variables in the second stage equations.

As is clear from the papers just summarized, research on neighborhood and peer effects is less developed than that for spatial mismatch, and the results are more ambiguous. In particular, few authors have been able to identify the exact neighborhood or peer variables that matter most. Recent research shows promise, however, in controlling for the endogenous choice of location, and a number of working papers suggest that neighborhoods and peers do matter in explaining educational outcomes.

III. Conclusions

Despite the attention paid to segregation over the past 30 years, low-income and black households continue to live in neighborhoods that are highly segregated. Trends in the 1970s and 1980s show that the type of segregation is slowly changing, with segregation by race gradually falling while income segregation is rising. Racial segregation remains more pronounced than income segregation, and recent studies have found that racial discrimination in the housing market continues to exist, although the types of discrimination are less severe than in the past.

The evidence presented in this survey strongly supports the proposition that location matters in terms of labor market outcomes, particularly for households who live in distressed inner-city neighborhoods. In addition to the Gautreaux results, several studies show that minorities do worse in MSAs with more segregation (or spatial isolation) and that ethnic neighborhoods play an important role in transmitting ethnic capital. The research is less clear, however, in identifying the exact mechanism through which location affects labor market outcomes. Commuting times appear to be an important factor in explaining reduced employment for black and Hispanic youth, and several authors have found that minority families face significant barriers to mobility. Neighborhood and peer effects are harder to identify, especially because of the endogeneity of location and the strong correlations between various kinds of neighborhood problems and individual and family characteristics.

Despite the large body of evidence, significant research questions remain unanswered. Future research should continue to look for better methods of identifying neighborhood and peer effects. Focusing exclusively on at-home youth presents several problems yet to be addressed, including the choice of work versus school (which presumably depends on the availability of jobs and the quality of local schools). Even if parents make the choice of location for youth, the parents' choice of location may be correlated with attributes of the parent that can have an independent effect on the youth's behavior. (For example, parents who use drugs may live in neighborhoods with other drug users, but also have children who are drug users. Without controlling for parental drug use, researchers cannot separately identify the impact of neighbors' drug use on a youth's drug use.) Finally, results for at-home youth may be difficult to generalize for the larger population.

Trends in the 1970s and 1980s show that the type of segregation is slowly changing, with segregation by race gradually falling while income segregation is rising.

While many studies have explored the reasons for and negative implications of segregation by race, significantly fewer papers have focused on segregation by income. Very little evidence has been developed about why this type of sorting has been rising for the past 25 years. Given this trend, however, the problems associated with the concentration of poverty, including access to education, neighborhood and peer effects, and mobility, should receive significantly more attention in the future.

Finally, most of the evidence regarding spatial mismatch comes from studying individuals, not firms. Even if individuals face barriers to mobility (such as housing market discrimination and information problems), firms could choose to locate closer to minority or impoverished neighborhoods if employers perceived profitable opportunities. Yet the establishment of enterprise zones to provide tax breaks for employers who move to distressed inner city areas has apparently failed to induce significant numbers of employers to respond. Research on the reasons that employers choose not to locate in inner cities might suggest policies that could help improve the conditions for residents of the inner city.

Given current high levels of segregation, America's urban problems are not going to disappear, and

instead they appear to be worsening. The research presented at this symposium will add to our understanding of the problems associated with location. The challenge for policy-makers is to use this research to design policies that address the needs of the inner cities. Solutions to the problem of growing income inequality must also address the problems posed by location.

References

Aaronson, Daniel. 1995. "Using Sibling Data to Estimate the Impact of Neighborhoods on Children's Educational Outcomes." Northwestern University, mimeo, October.

Abramson, Alan J., Mitchell S. Tobin, and Matthew S. VanderGoot. 1995. "The Changing Geography of Metropolitan Opportunity: The Segregation of the Poor in U.S. Metropolitan Areas, 1970–1990." *Housing Policy Debate*, vol. 6, no. 1, pp. 45–72.

Berkovec, James A., Glenn B. Canner, Stuart A. Gabriel, and Timothy H. Hannan. 1994. "Race, Redlining and Residential Mortgage Loan Performance." *Journal of Real Estate Finance and Economics*, vol. 9, no. 3, pp. 263–94.

Borjas, George J. 1992. "Ethnic Capital and Intergenerational Mobility." *Quarterly Journal of Economics*, vol. 107, no. 1, pp. 123–50.

———. 1994. "The Intergenerational Mobility of Immigrants." *Journal of Labor Economics*, vol. 11, no. 1, pp. 113–35.

———. 1995. "Ethnicity, Neighborhoods, and Human-Capital Externalities." *The American Economic Review*, vol. 85, no. 3, pp. 365–89.

Browne, Lynn Elaine and Geoffrey M.B. Tootell. 1995. "Mortgage Lending in Boston—A Response to the Critics." *New England Economic Review*, September/October, pp. 53–78.

Case, Anne C. and Lawrence F. Katz. 1991. "The Company You Keep: The Effects of Family and Neighborhood on Disadvantaged Youths." National Bureau of Economic Research Working Paper No. 3705, May.

Corcoran, Mary, Roger Gordon, Deborah Laren, and Gary Solon. 1991. "The Association Between Men's Economic Status and Their Family and Community Origins." *Journal of Human Resources*, vol. 27, no. 4, pp. 575–601.

Crane, Jonathan. 1991. "The Epidemic Theory of Ghettos and Neighborhood Effects on Dropping Out and Teenage Childbearing." *American Journal of Sociology*, vol. 96, no. 5, pp. 1226–59.

Cutler, David M. and Edward M. Glaeser. 1995. "Are Ghettos Good or Bad?" National Bureau of Economic Research Working Paper No. 5163, June.

Duncan, Greg J., James Connell, and Pamela Klebanov. 1994. "Selection Bias in the Estimation of the Effects of Neighborhood Conditions on Children's Development." University of Michigan, mimeo, October.

Duncan, Otis D. and Beverly Duncan. 1955. "A Methodological Analysis of Segregation Indices." *American Sociological Review*, vol. 20, April, pp. 210–17.

———. 1957. *The Negro Population of Chicago: A Study of Residential Succession*. Chicago, IL: University of Chicago Press.

Ellwood, David. 1986. "The Spatial Mismatch Hypothesis: Are There Teenage Jobs Missing in the Ghetto?" In Richard B. Freeman and Harry J. Holzer, eds., *The Black Youth Employment Crisis*, pp. 147–85. Chicago, IL: University of Chicago Press.

Engberg, John B. 1993. "Person or Place? Spatial Variation Within Local Labor Markets." Heinz School of Public Policy, Carnegie Mellon University, Working Paper No. 93-35, July.

Engberg, John B. and Taeil Kim. 1995. "Person or Place? Parametric and Semiparametric Estimates of Intra-Metropolitan Earnings Variation." Heinz School of Public Policy, Carnegie Mellon University, Working Paper No. 95-22, September.

Evans, William N., Wallace E. Oates, and Robert M. Schwab. 1992. "Measuring Peer Group Effects: A Study of Teenage Behavior." *Journal of Political Economy*, vol. 100, no. 5, pp. 966–91.

Farley, Reynolds and William H. Frey. 1993. "Changes in the Segregation of Whites from Blacks during the 1980s: Small Steps toward a More Integrated Society." *American Sociological Review*, vol. 59, February, pp. 23–45.

Fix, Michael, George C. Galster, and Raymond Struyk. 1992. "An Overview of Auditing for Discrimination." In Michael Fix and Raymond Struyk, eds., *Clear and Convincing Evidence: Measurement of Discrimination in America*. Washington, D.C.: Urban Institute Press.

Fix, Michael and Raymond Struyk, eds. 1992. *Clear and Convincing Evidence: Measurement of Discrimination in America*. Washington, D.C.: Urban Institute Press.

Gabriel, Stuart A. and Stuart S. Rosenthal. 1995. "Commutes, Neighborhood Effects, and Earnings: An Analysis of Racial Discrimination and Compensating Differentials." Forthcoming in *Journal of Urban Economics*. Current draft: March.

Galster, George. 1987. "Residential Segregation and Interracial Economic Disparities: A Simultaneous Equations Approach." *Journal of Urban Economics*, vol. 21, pp. 21–44.

Galster, George and Maris Mikelsons. 1995. "The Geography of Metropolitan Opportunity: A Case Study." *Housing Policy Debate*, vol. 6, no. 1, pp. 73–102.

Harrison, Roderick J. and Daniel H. Weinberg. 1992. "Racial and Ethnic Residential Segregation in 1990." U.S. Bureau of the Census Research Paper, April 13.

Holzer, Harry J. 1987. "Informal Job Search and Black Youth Unemployment." *The American Economic Review*, vol. 77, pp. 446–52.

———. 1991. "The Spatial Mismatch Hypothesis: What Has the Evidence Shown?" *Urban Studies*, vol. 28, no. 1, pp. 105–22.

Ihlanfeldt, Keith R. 1992. *Job Accessibility and the Employment and School Enrollment of Teenagers*. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

———. 1993. "Intra-Urban Job Accessibility and Hispanic Youth Unemployment Rates." *Journal of Urban Economics*, vol. 33, pp. 254–71.

Ihlanfeldt, Keith R. and David L. Sjoquist. 1990. "Job Accessibility and Racial Differences in Youth Employment Rates." *The American Economic Review*, vol. 80, no. 1, pp. 267–76.

———. 1991. "The Effect of Job Access on Black and White Youth Employment: A Cross-sectional Analysis." *Urban Studies*, vol. 28, no. 2, pp. 255–65.

Jakubs, John F. 1986. "Recent Racial Segregation in the U.S. SMSAs." *Urban Geography*, vol. 7, no. 2, pp. 146–63.

Jargowsky, Paul A. 1995. "Take the Money and Run: Economic Segregation in U.S. Metropolitan Areas." University of Wisconsin-Madison Institute for Research on Poverty, Discussion Paper No. 1056-95.

Jargowsky, Paul A. and Mary Joe Bane. 1991. "Ghetto Poverty in the United States, 1970–1980." In Christopher Jencks and Paul E. Peterson, eds., *The Urban Underclass*. Washington, D.C.: The Brookings Institution.

Jencks, Christopher and Susan E. Mayer. 1990a. "The Social Conse-

quences of Growing Up In a Poor Neighborhood." In Lawrence E. Lynn, Jr. and Michael G.H. McGeary, eds., *Inner City Poverty in the United States*, pp. 111–86. Washington, D.C.: National Academy Press.

———. 1990b. "Residential Segregation, Job Proximity, and Black Employment Opportunities." In Lawrence E. Lynn, Jr. and Michael G.H. McGeary, eds., *Inner City Poverty in the United States*, pp. 187–222. Washington, D.C.: National Academy Press.

Kain, John. 1968. "Housing Segregation, Negro Employment and Metropolitan Decentralization." *Quarterly Journal of Economics*, vol. 82, no. 2, pp. 175–92.

———. 1992. "The Spatial Mismatch Hypothesis: Three Decades Later." *Housing Policy Debate*, vol. 3, no. 2, pp. 371–460.

Kain, John F. and John M. Quigley. 1975. *Housing Markets and Racial Discrimination: A Microeconomic Analysis*. New York: National Bureau of Economic Research.

Kasarda, John D. 1989. "Urban Industrial Transition and the Underclass." *The Annals of the American Academy of Political and Social Science*, vol. 501, January, pp. 26–47.

———. 1993. "Inner-City Concentrated Poverty and Neighborhood Distress: 1970–1990." *Housing Policy Debate*, vol. 4, no. 3, pp. 253–302.

Kodrzycki, Yolanda K. 1996. "Labor Markets and Earnings Inequality: A Status Report." *New England Economic Review*, this issue.

Leonard, Jonathan S. 1986. "Comment on 'The Spatial Mismatch Hypothesis: Are There Teenage Jobs Missing in the Ghetto?' " In Richard B. Freeman and Harry J. Holzer, eds., *The Black Youth Employment Crisis*, pp. 185–90. Chicago, IL: University of Chicago Press.

Massey, Douglas S. and Nancy A. Denton. 1988. "The Dimensions of Residential Segregation." *Social Forces*, vol. 67, pp. 281–315.

———. 1993. *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, MA: Harvard University Press.

Massey, Douglas S. and Mitchell L. Eggers. 1990. "The Ecology of Inequality: Minorities and the Concentration of Poverty, 1970–1980." *The American Journal of Sociology*, vol. 95, no. 5, pp. 1153–88.

Munnell, Alicia, Geoffrey M.B. Tootell, Lynn Elaine Browne, and James McEneaney. 1996. "Mortgage Lending in Boston: Interpreting the Data." *The American Economic Review*, vol. 86, no. 1, pp. 25–53.

Nelson, Kathryn P. and John G. Edwards. 1993. "Intra-Urban Mobility and Location Choice in the 1980s." In Thomas Kingsley and Margery Austin Turner, eds., *Housing Markets and Residential Mobility*, pp. 53–95. Washington, D.C.: The Urban Institute Press.

O'Regan, Katherine and John M. Quigley. 1995. "Teenage Employment and the Spatial Isolation of Minority and Poverty Households." Paper presented at the Western Economics Association, July.

Rosenbaum, James. 1995. "Changing the Geography of Opportunity by Expanding Choice: Lessons from the Gautreaux Experiment." *Housing Policy Debate*, vol. 6, no. 1, pp. 231–70.

Rosenbaum, James and Susan Popkin. 1991. "Employment and Earnings of Low-Income Blacks Who Move to Middle-Class Suburbs." In Christopher Jencks and Paul Peterson, eds., *The Urban Underclass*. Washington, D.C.: The Brookings Institution.

Taeuber, Karl E. and Alma F. Taeuber. 1965. *Negroes in Cities: Residential Segregation and Neighborhood Change*. Chicago, IL: Aldine.

Turner, Marjorie. 1992. "Discrimination in Urban Housing Markets: Lessons from Fair Housing Audits." *Housing Policy Debate*, vol. 3, no. 2, pp. 185–216.

Wilson, William Julius. 1987. *The Truly Disadvantaged*. Chicago, IL: University of Chicago Press.

Yezer, Anthony M. J., Robert F. Phillips, and Robert P. Trost. 1994. "Bias in Estimates of Discrimination and Default in Mortgage Lending: The Effects of Simultaneity and Self-Selection." *Journal of Real Estate Finance and Economics*, vol. 9, no. 3, pp. 197–215.

Yinger, John. 1986. "Measuring Discrimination with Fair Housing Audits: Caught in the Act." *The American Economic Review*, vol. 76, December, pp. 881–93.

———. 1992. "Access Denied, Access Constrained: Results and Implications of the 1989 Housing Discrimination Study." In Michael Fix and Raymond Struyk, eds., *Clear and Convincing Evidence: Measurement of Discrimination in America*. Washington, D.C.: Urban Institute Press.

———. 1993. "Discrimination in Mortgage Lending: A Literature Review." Syracuse University, mimeo, June.

Zax, Jeffrey and John Kain. 1995. "Moving to the Suburbs: Do Relocating Companies Leave Their Black Employees Behind?" Forthcoming in *Journal of Labor Economics*.

Spatial Effects upon Employment Outcomes: The Case of New Jersey Teenagers

Katherine M. O'Regan and John M. Quigley

Associate Professor of Economics and Public Policy at Yale School of Management, and Professor of Economics and Public Policy at the University of California, Berkeley, respectively. *Financial support for this research was provided by the Fisher Center for Real Estate and Urban Economics, University of California, Berkeley. The authors are grateful to Daniel Weinberg for providing access to data and to Christian Redfearn for research assistance and programming.*

Two related bodies of research link the intra-metropolitan distribution of households to labor market outcomes. These distinct perspectives extend the standard human capital model of labor markets to consider the effect of space on labor market operations, each presuming a somewhat different mechanism of causation. Research addressing the well-known "spatial mismatch hypothesis" focuses on the impact of job decentralization on the employment prospects of minority households who, through constraints on housing choices, are left behind. In this work, space affects the level and distribution of minority employment through proximity to jobs. As jobs increasingly decentralize and minorities remain concentrated in central cities, minority access to jobs declines, lowering their employment rates and earnings. While the evidence on the importance of the mismatch in jobs is not definitive, it continues to be a focus of scientific and policy interest. (See Kain 1992 and Holzer 1991 for recent reviews.)

Another and distinct hypothesis, associated with William Julius Wilson's (1987) work on the so-called "urban underclass," suggests that the social isolation resulting from the concentration of minorities has a negative effect on individuals more generally, and on their labor market performance specifically. While the empirical evidence on this mechanism is ambiguous (see Jencks and Mayers 1990 for a review and Manski 1993 for a critique), several recent empirical studies support some version of this hypothesis. Using different data but similar approaches, Brooks-Gunn et al. (1993), Clark (1992), and Crane (1991) each found evidence of effects of neighborhood composition on youth high school dropout rates.[1] More directly related to labor market concerns, Case and Katz (1991) analyzed data on poor neighborhoods within Boston, concluding that neighborhood peers substantially influence a variety of youth behaviors, including propensity to work. A neighborhood might affect labor markets through several mechanisms—for example, the absence of positive role models, the lack of informal job contacts, the presence of disruptive

influences. These differ from the presumed mechanism underlying the spatial mismatch hypothesis. According to this latter research, it is the *internal* composition of a neighborhood that matters, rather than the relationship of that neighborhood to *external* employment opportunities.

A unifying theme in all this research is that urban labor market outcomes are influenced by more than the individual characteristics recognized in the standard human capital model. Even beyond characteristics of the local labor market, this work suggests that information about the local *residential* environment may improve our models of urban labor market outcomes.

This paper provides tests of the relative importance of spatial factors. We develop and apply a standardized approach to measuring job access, one that can be duplicated for a large number of metropolitan areas. Using a unique data set created and analyzed within the U.S. Bureau of the Census, we estimate a series of employment probability models based on a standard human capital model. We then expand this model to include information on proximity to jobs and various neighborhood characteristics. This permits us to examine the importance of these spatial attributes, frequently omitted from other models. It also permits us to examine the *relative* importance of these spatial variables.

Throughout our analysis, we find strong evidence of the importance of spatial factors in determining youth employment outcomes. As for which factors matter most, our results suggest that they differ both by the outcome examined and by the city.

I. Methodology

The Data

Through arrangements with the U.S. Bureau of the Census, we have created a data set containing all records of non-Hispanic white (white), non-Hispanic black (black), and Hispanic youth aged 16 to 19, residing with at least one parent and located in one of the 73 largest U.S. metropolitan areas. In this paper, we report on an analysis of the urban labor markets in the state of New Jersey. We have all records, rather than just the 1/10 or 1/100 publicly available samples. Thus, even limiting the analysis to one state, the sample contains more than 28,000 youth who reside in one of New Jersey's four largest metropolitan areas (Newark, Bergen-Passaic, Middlesex, and Monmouth). The most important aspect of the data set is that each record in our 1990 extract is coded by census tract. We have matched this data set with aggregate census tract characteristics, such as the percentage of the census tract population that is poor, lives in a female-headed household, is employed, is black, and so on. This generates a large sample of observations on youth and their labor market outcomes matched to a distinctly rich neighborhood context. (Results are shown below in text Tables 1A and 1B and in Appendix Table A1.)

Throughout our analysis, we find strong evidence of the importance of spatial factors in determining youth employment outcomes.

The second portion of the data is compiled from the transportation subsample of the 1990 Census, available at the tract level through the Census Transportation Planning Package (CTPP) for large Metropolitan Statistical Areas (MSAs). The CTPP provides direct information about commuting patterns and proximity to jobs at the census tract level. The raw data provided by the CTPP, matrices of zone-to-zone commuting patterns and peak commute times, are sufficient to create a variety of well-defined tract level measures of employment access. (The derivation of these measures is discussed in Appendix B.) These job proximity measures are linked to the individual record through tract identifiers, providing us with both neighborhood and job access information for all youth in the sample. As described in Appendix B, we have created several measures of employment access for each census tract in the four metropolitan areas. It is worth noting that these access measures are based on travel time, so they incorporate information on both spatial distance and transportation ease.

The Statistical Model

The first step of the analysis is based on a logit model relating youth employment probabilities to individual and family characteristics:

[1] Crane's results have been questioned by Clark's failure at replication using similar data (Clark 1992) and by the methodological criticism of Manski (1993).

$$\log [p_i/(1 - p_i)] = \alpha X_i, \quad (1)$$

where X_i is a vector of those individual and family characteristics found by previous research to be relevant for youth employment outcomes.[2] We then contrast results from this model with an expanded statistical model that includes both job proximity and neighborhood characteristics:

$$\log [p_i/(1 - p_i)] = \alpha X_i + \beta A_i + \gamma N_i, \quad (2)$$

where A_i is a measure of employment access, and N_i is a vector of neighborhood (census tract) characteristics found to be important through previous empirical work.[3]

II. Results

We estimate equations (1) and (2) for the Newark MSA, examining probabilities of both employment and "idleness" (that is, not-in-school-and-not-employed). First we analyze all youth, then white, black, and Hispanic youth separately. We then present the results of these models for all four metropolitan areas, investigating consistency in the effects of neighborhood and accessibility upon labor market outcomes.

Newark

Table 1A presents estimates of the youth employment model, equation (1), for all Newark youth, and for white, black, and Hispanic youth separately. Most results confirm previous findings. Females and older youth are more likely to be working. School enrollment decreases the likelihood of working, as does the birth of a child for teenaged girls. Youth in female-headed households are somewhat less likely to be working, while those in a family with at least one parent working are also more likely to be working. Differences in the intercepts by race reveal lower employment probabilities for minority youths, particularly for black youth.

Some variation in results is present across demographic groups. Racial groups differ somewhat in the specific measure of education that is most important in affecting employment outcomes.[4] While the coefficient of the head of the household's education is always negative, it is not significant for blacks. The effect of household income (excluding the youth's

Table 1A
Logit Models of Household-Level Determinants of Employment: Newark Teenagers
t-ratios in parentheses

Coefficient	All Youth	White	Black	Hispanic
Sex	.353	.351	.273	.399
(1 = Female)	(8.08)	(6.85)	(2.75)	(2.47)
Age	.305	.315	.279	.415
(years)	(10.82)	(8.77)	(5.04)	(4.47)
Education	.123	.182	.030	.075
(years)	(5.73)	(6.16)	(.84)	(1.24)
HS graduate	−.107	−.398	.408	.175
(1 = yes)	(1.55)	(4.50)	(3.13)	(.76)
Female-headed household	−.134	−.014	−.138	−.493
(1 = yes)	(2.18)	(.17)	(1.26)	(2.15)
Head of household's	−.030	−.031	−.008	−.039
education (years)	(4.29)	(3.89)	(.40)	(1.91)
Parent working	.818	.616	.836	.863
(1 = yes)	(8.63)	(4.34)	(5.51)	(3.04)
Youth in school	−.845	−.945	−.762	−.505
(1 = yes)	(13.19)	(11.27)	(6.54)	(2.36)
Family size	−.011	.012	−.003	−.173
(persons)	(.72)	(.53)	(.11)	(2.97)
Children ever born	−1.010	−.679	−1.048	−1.076
(1 = yes)	(5.59)	(1.89)	(4.46)	(1.69)
Other household income	−.002	−.002	.001	.003
(000 dollars)	(5.02)	(5.49)	(.73)	(1.65)
White	−6.548	−7.140		
(1 = yes)	(13.04)	(11.37)		
Black	−7.420		−6.515	
(1 = yes)	(14.64)		(6.25)	
Hispanic	−7.015			−8.091
(1 = yes)	(13.90)			(4.81)
Number of observations	10245	6900	2529	816
Chi-squared	1728	759	846	201
−2logL	12475	8807	2660	931

[2] See O'Regan and Quigley (1996) for a full description of such a model, and Freeman (1982) for a full description of relevant characteristics.

[3] For examples of such characteristics, see Plotnick and Hoffman (1995) and Duncan (1994). For examples of work similar to this study that have incorporated either job proximity or neighborhood characteristics in this fashion—but not both—see Ihlanfeldt and Sjoquist (1990), Case and Katz (1991), and Duncan (1994).

[4] In models in which years of education is the only measure of a youth's education, this variable is significantly positive for all four models. However, when high school completion is also included, this latter measure significantly (and positively) affects black youth employment rates, while neither is significant for Hispanic youth.

earnings) on employment follows a similar pattern. Increased family resources reduce youth employment.

Measuring the effect of family socioeconomic characteristics is complicated by the relationship between youth work and school decisions. While some interdependence clearly is present in these outcomes, we have simplified our estimation by treating school status as an exogenous control. In terms of family socioeconomic status, higher status decreases the likelihood of in-school youth working, while increasing the likelihood of working for out-of-school youth.

Table 1B
Logit Models of Household-Level Determinants of Idleness: Newark Teenagers
t-ratios in parentheses

Coefficient	All Youth	White	Black	Hispanic
Sex	−.322	−.262	−.308	−.604
(1 = Female)	(3.68)	(2.04)	(2.30)	(2.19)
Age	.636	.618	.626	.702
(years)	(13.45)	(7.95)	(9.29)	(5.07)
Education	−.315	−.406	−.259	−.273
(years)	(11.48)	(8.70)	(6.75)	(3.71)
HS graduate	.362	.632	.225	.381
(1 = yes)	(3.15)	(3.29)	(1.38)	(1.08)
Female-headed household	.364	.382	.265	.611
(1 = yes)	(3.54)	(2.24)	(1.83)	(1.83)
Head of household's	−.062	−.065	−.098	−.017
education (years)	(4.77)	(3.66)	(3.79)	(.52)
Parent working	−.416	−.484	−.513	.532
(1 = yes)	(3.54)	(2.09)	3.37	(1.34)
Family size	.037	−.038	.039	.158
(persons)	(1.48)	(.70)	(1.25)	(2.24)
Children ever born	1.666	1.702	1.618	1.831
(1 = yes)	(9.81)	(4.12)	(7.95)	(3.20)
Other household income	−.004	−.003	−.005	−.008
(000 dollars)	(2.97)	2.06	(1.79)	(1.28)
White	−9.246	−7.607		
(1 = yes)	(10.70)	(5.29)		
Black	−8.463		−8.276	
(1 = yes)	(9.75)		(6.73)	
Hispanic	−8.943			−12.274
(1 = yes)	(10.34)			(4.81)
Number of observations	10245	6900	2529	816
Chi-squared	9749	7399	1684	694
−2logL	4454	2166	1822	438

To eliminate this problem, we have also estimated this model using "idleness" (not-working-and-not-in-school) as the dependent variable. Table 1B reports the results of identical models (except that the school-status variable is omitted). We expect that all variables indicating higher family socioeconomic status will decrease youth idleness. This expectation is borne out. The two sets of results are quite comparable. We include both outcome measures in our analysis, as spatial factors are likely to affect school and work decisions differently.

In the next step of the analysis, the logit model is expanded to include neighborhood information. We examine two categories: employment access and measures of "social access." Employment access is measured by an index of employment "potential" derived from the assumption that work-trip destinations are generated by a Poisson process.[5] A lack of social access is indicated by various measures of neighborhood composition.

Preliminary analysis with a larger set of neighborhood variables[6] established that one measure of racial composition (percent white) and four measures of tract poverty or employment levels (percent poor, on public assistance, unemployed, and adults working) are consistently important in affecting outcomes. Table 2 presents the correlation coefficients of the relevant variables for Newark. Neighborhood demographic measures are highly correlated in Newark; with only one exception the correlation coefficients among these measures exceed 0.76. The job access measure is only weakly correlated with the demographic characteristics of neighborhoods, however.

The appropriate functional form for these variables is not known a priori. Indeed, it is possible that neighborhood effects matter only after some threshold is reached, affecting the logit of employment in a nonlinear fashion. We estimated a series of models to test for nonlinearities, and while there is some evidence that the relationship may be complicated, no nonlinear representation seemed superior to simple

[5] As explained in Appendix B, the relative accessibility of census tracts within each metropolitan area is quite insensitive to assumptions about the trip generation process. Results using the assumption of a Poisson process are similar to those based upon a more general assumption of a negative binomial process. In fact, for these metropolitan areas, the standard gravity model provides job access measures that are correlated with these more sophisticated measures at greater than 0.98.

[6] These included, for example, percent black, Hispanic, in owner-occupied home, and in female-headed household, and tract median income.

Table 2
Correlation Matrix of Neighborhood Measures for Newark MSA

	Percent:					
	White	Public Assistance	Poor	Unemployed	Adults Not at Work	Job Access
Percent White	1.000					
Percent Public Assistance	−.798	1.000				
Percent Poor	−.783	.927	1.000			
Percent Unemployment	−.818	.896	.877	1.000		
Percent Adults Not at Work	−.572	.776	.764	.766	1.000	
Job Access	.318	−.433	−.450	−.436	−.310	1.000

continuous measures of neighborhood attributes.[7] We report results using continuous measures.

We estimated a variety of models of youth employment probabilities with these neighborhood variables. The results for the individual and family-level variables were essentially unchanged, with the exception that family background variables generally decrease slightly in magnitude and statistical significance. This suggests that, while neighborhood characteristics may spuriously capture omitted family influences (Corcoran et al. 1992), the reverse is also the case. Empirical work that does not include information about neighborhoods likely overstates the (direct) influence of family characteristics on employment outcomes.

Results for the neighborhood variables are presented in Tables 3A and 3B. Panel A presents results for all youth, and Panels B through D present results separately for white, black, and Hispanic youth. In Model I of each panel and table, employment access is the sole neighborhood variable included. In the case of youth employment, improved job access has a significant and positive effect for all youth and for black youth. For youth idleness, job access is highly significant for all youth and for black youth.

The independent effect of access does not persist when other neighborhood characteristics are added, singly (Models II to VI) and in pairs (Models VII to X). In almost every case, the measure of access to jobs is insignificant when measures of neighborhood racial composition or neighborhood poverty/employment are included. In the sample of all Newark youth, each neighborhood variable, when entered individually, is significant and is of the expected sign. This is also true for the separate samples of white and black youth.[8]

The high correlation among many of the neighborhood variables means that the relative importance of neighborhood measures cannot be determined with precision. While employment access is not particularly highly correlated with the other tract variables, the correlations among the other variables are quite high. The effect of this is illustrated in the results of models VII to X for white youth employment (Table 3A, Panel B). Each neighborhood composition measure is significant when included separately. However, when pairs of variables are included, generally neither neighborhood variable is significant. Note, however, that according to a standard likelihood ratio test, the set of measures is significantly different from zero. In the aggregate for youth employment and for black youth separately (both employment and idleness), it does appear that neighborhood poverty/employment characteristics have a stronger effect than does the racial composition of the neighborhood. However, idleness of Hispanic youth appears more strongly influenced by neighborhood racial composition.

Some caution is in order in evaluating these results. Several recent papers have highlighted the difficulty of controlling adequately for family characteristics and choice when identifying neighborhood and other potential influences on social outcomes (Corcoran et al. 1992, Evans, Oates, and Schwab 1992, and Plotnick and Hoffman 1995). Other work has emphasized the circumstances in which the logic of the identification of peer influences is problematic (Manski 1993). The potential endogeneity of neighborhoods is also a source of concern in this empirical work. Endogeneity may be manifest in several ways. Our empirical analysis is more successful in dealing with some of the sources of this simultaneity than others.

The most obvious source of statistical problems in the interpretation of findings about youth employ-

[7] We were especially concerned with measuring threshold effects for racial composition and the fraction of the population in poverty.

[8] For Hispanic youth, several neighborhood variables are significant, but not all. In part, this reflects the smaller sample sizes of Hispanic youth.

Table 3A

Neighborhood Determinants of Employment for Newark Youth[a]

t-ratios in parentheses

	I	II	III	IV	V	VI	VII	VIII	IX	X
A. All Teenagers (10245 observations)										
Chi-squared	1732	1757	1772	1772	1772	1835	1775	1775	1774	1839
−2logL	12471	12445	12431	12430	12431	12367	12428	12457	12429	12364
Access	.006	.004	.000	.000	.000	.002	.000	.000	.000	.001
	(2.10)	(1.36)	(.06)	(.10)	(.04)	(.66)	(.05)	(.18)	(.14)	(.47)
Percent White		.608					.266	.252	.237	.249
		(5.05)					(1.83)	(1.71)	(1.57)	(1.96)
Percent Poor			−2.687				−2.153			
			(6.20)				(4.14)			
Percent on Public Assistance				−2.567				−2.074		
				(6.24)				(4.15)		
Percent Unemployment					−4.130				−3.343	
					(6.21)				(4.03)	
Percent Adults Not at Work						−3.400				−3.184
						(9.96)				(8.88)
B. White Teenagers (6900 observations)										
Chi-squared	759	763	766	765	767	822	766	765	767	822
−2logL	8807	8802	8799	8801	8798	8744	8799	8800	8798	8744
Access	.000	.000	−.001	−.001	−.002	.002	−.001	−.001	−.002	.002
	(.02)	(.02)	(.46)	(.33)	(.58)	(.62)	(.40)	(.24)	(.53)	(.62)
Percent White		.393					.087	.179	.060	.005
		(2.14)					(.35)	(.74)	(.24)	(.03)
Percent Poor			−2.495				−2.210			
			(2.78)				(1.82)			
Percent on Public Assistance				−2.093				−1.548		
				(2.42)				(1.37)		
Percent Unemployment					−3.469				−3.209	
					(2.91)				(2.00)	
Percent Adults Not at Work						−3.808				−3.804
						(7.87)				(7.60)

[a]Logit models include household level variables reported in Table 1A.

ment is the omission of individual or family characteristics. In particular, family variables have been shown to be very important determinants of youth outcomes (Corcoran et al. 1992), yet are frequently omitted from empirical work. Since family characteristics are likely to be correlated with neighborhood characteristics, it is possible that measures of neighborhood characteristics are merely proxies for family effects. By using only at-home youth, we have access to the range of census information on the youth's family. These attributes really "matter" in the empirical results.

A second source of concern is the youth's choice of neighborhood. Here again, by limiting attention to at-home youth, we can presume that this choice is made by the parent(s), using the standard transportation-housing cost calculus. Household choice is exogenous to the transport demands of youth. Of course, to the extent that household choices about residential location are influenced by the impact of neighborhood characteristics on youth employment, a focus on at-home youth will not eliminate this source of simultaneity.

A third source of concern is the definition and computation of the accessibility measure itself. We should emphasize that this measure is not computed from the observed commuting patterns of teenagers. Nor is it computed with reference to the location of jobs that might be "suitable" for teenagers (Ihlanfeldt and Sjoquist 1990). It is merely the "standard" acces-

Table 3A continued

Neighborhood Determinants of Employment for Newark Youth[a]

t-ratios in parentheses

	I	II	III	IV	V	VI	VII	VIII	IX	X
C. Black Teenagers (2529 observations)										
Chi-squared	854	860	866	869	867	875	867	869	868	877
−2logL	2652	2646	2640	2637	2639	2631	2639	2637	2638	2629
Access	.018	.013	.003	.002	.006	.001	.003	.002	.005	−.001
	(2.92)	(2.02)	(.44)	(.22)	(.82)	(.07)	(.38)	(.20)	(.76)	(.19)
Percent White		.468					.236	.150	.154	.299
		(2.28)					(1.06)	(.66)	(.66)	(1.43)
Percent Poor			−2.186				−1.890			
			(3.31)				(2.64)			
Percent on Public Assistance				−2.402				−2.194		
				(3.77)				(3.09)		
Percent Unemployment					−3.518				−3.166	
					(3.55)				(2.82)	
Percent Adults Not at Work						−2.908				−2.720
						(4.47)				(4.11)
D. Hispanic Teenagers (816 observations)										
Chi-squared	206	209	209	208	208	210	210	210	210	211
−2logL	925	922	922	923	923	921	921	922	922	920
Access	−.010	.037	.027	.022	.017	−.005	.043	.041	.034	.032
	(.61)	(1.82)	(1.30)	(1.13)	(.81)	(.26)	(2.01)	(1.98)	(1.59)	(1.51)
Percent White		−2.821					−2.548	−2.448	−2.955	−2.923
		(4.77)					(3.82)	(3.52)	(4.36)	(4.84)
Percent Poor			5.692				1.791			
			(3.39)				(.92)			
Percent on Public Assistance				5.474				1.818		
				(3.75)				(1.04)		
Percent Unemployment					6.860				−1.371	
					(2.41)				(.40)	
Percent Adults Not at Work						1.033				−1.272
						(.07)				(.77)

[a]Logit models include household level variables reported in Table 1A.

sibility measure calculated from observations on the work-trip patterns of all workers—adults and teenagers of all races—within the urban area.

This attention to specification does not, of course, eliminate all sources of simultaneity. To the extent that omitted family or individual characteristics exist that are more strongly correlated with neighborhood variables than with other included controls, the results may be spurious. It is also possible that the residence choices of others in a neighborhood are influenced by youth employment outcomes, affecting the characteristics of the neighborhood indirectly. In Appendix C, we present direct tests for the existence of this indirect relationship for Newark youth. We find little evidence of such a spurious relationship.

The high correlation among the various neighborhood characteristics raises a second issue in interpreting these results. Given the high correlation among neighborhood characteristics, it is difficult to separate the effects of various dimensions of related neighborhood characteristics with any precision. For models in which we include one neighborhood characteristic, this measure acts as a proxy for a collection of characteristics, and the results should be interpreted in that light.

New Jersey Cities

In this section, we expand the sample to include all four metropolitan areas in New Jersey. We estimate

Table 3B

Neighborhood Determinants of Idleness for Newark Youth[a]

t-ratios in parentheses

	I	II	III	IV	V	VI	VII	VIII	IX	X
A. All Teenagers (10245 observations)										
Chi-squared	9756	9784	9781	9788	9784	9777	9793	9797	9793	9794
−2logL	4447	4418	4421	4414	4418	4425	4410	4406	4409	4408
Access	−.013	−.007	.000	.001	−.001	−.004	.000	.001	−.001	−.001
	(2.66)	(1.43)	(.04)	(.22)	(.12)	(.69)	(.04)	(.15)	(.20)	(.25)
Percent White		−1.102					−.792	−.695	−.734	−.901
		(5.33)					(3.37)	(2.91)	(3.03)	(4.14)
Percent Poor			2.892				1.862			
			(5.11)				(2.90)			
Percent on Public Assistance				3.116				2.214		
				(5.77)				(3.55)		
Percent Unemployment					4.880				3.192	
					(5.36)				(3.00)	
Percent Adults Not at Work						2.421				1.732
						(4.66)				(3.17)
B. White Teenagers (6900 observations)										
Chi-squared	7399	7405	7411	7408	7406	7406	7411	7408	7407	7408
−2logL	2166	2161	2155	2157	2159	2160	2155	2157	2159	2157
Access	−.004	−.004	.000	−.001	.000	−.004	.000	−.001	−.001	−.004
	(.54)	(.50)	(.06)	(.11)	(.01)	(.58)	(.05)	(.16)	(.11)	(.52)
Percent White		−.008					.−.031	−.222	−.322	.562
		(2.38)					(.06)	(.48)	(.66)	(1.54)
Percent Poor			4.854				4.767			
			(3.55)				(2.47)			
Percent on Public Assistance				4.137				3.547		
				(3.14)				(1.95)		
Percent Unemployment					5.839				4.388	
					(2.73)				(1.42)	
Percent Adults Not at Work						2.621				2.020
						(2.59)				(1.87)

[a]Logit models include household level variables reported in Table 1B.

similar statistical models, but with larger samples and somewhat lower levels of intercorrelation of neighborhood demographic measures. Table 4 presents a subset of the results for all metropolitan New Jersey youth, which conveys the main findings. Panel A includes results for the estimation of employment probabilities, Panel B summarizes results for the estimation of idleness probabilities.

Model I reports estimates of youth employment probabilities as a function of neighborhood access measures and of individual and household characteristics. The cardinal values of the access measure are hardly comparable across MSAs (see Appendix B and Table 5), so we permit the coefficient on access to vary by MSA. Employment access has a highly significant, positive effect on youth employment in each of the four MSAs.

The other five models include access, but introduce other neighborhood characteristics. Models II to IV include the percent white, the percent on public assistance, and the percent of adults not at work, respectively, in the census tract of residence. Each of these neighborhood composition variables is significant and is of the expected sign. Including these characteristics has little impact on the access coefficients. In Models V and VI, which include the access measures, percent white, and one of the two poverty/employment measures, the results are comparable. Both neighbor-

Table 3B continued

Neighborhood Determinants of Idleness for Newark Youth[a]

t-ratios in parentheses

	I	II	III	IV	V	VI	VII	VIII	IX	X
C. Black Teenagers (2529 observations)										
Chi-squared	1696	1703	1703	1708	1710	1709	1706	1710	1711	1713
−2logL	1810	1803	1803	1798	1796	1797	1800	1796	1795	1793
Access	−.027	−.020	−.011	−.006	−.009	−.006	−.009	−.005	−.008	−.001
	(3.50)	(2.38)	(1.11)	(.57)	(.98)	(.56)	(.94)	(.47)	(.85)	(.13)
Percent White		−.846					−.637	−.508	−.447	−.673
		(2.54)					(1.82)	(1.44)	(1.25)	(2.01)
Percent Poor			1.994				1.492			
			(2.62)				(1.84)			
Percent on Public Assistance				2.562				2.138		
				(3.43)				(2.65)		
Percent Unemployment					4.304				3.664	
					(3.67)				(2.87)	
Percent Adults Not at Work						2.767				2.517
						(3.54)				(3.15)
D. Hispanic Teenagers (816 observations)										
Chi-squared	694	720	706	708	700	695	721	721	720	720
−2logL	437	411	426	423	431	437	411	410	411	411
Access	−.010	.037	.027	.022	.017	−.005	.043	.041	.034	.032
	(.61)	(1.82)	(1.30)	(1.13)	(.81)	(.26)	(2.01)	(1.98)	(1.59)	(1.51)
Percent White		−2.821					−2.548	−2.448	−2.955	−2.923
		(4.77)					(3.82)	(3.52)	(4.36)	(4.84)
Percent Poor			5.692				1.791			
			(3.39)				(.92)			
Percent on Public Assistance				5.474				1.818		
				(3.75)				(1.04)		
Percent Unemployment					6.860				−1.371	
					(2.41)				(.40)	
Percent Adults Not at Work						1.033				−1.272
						(.67)				(.77)

[a]Logit models include household level variables reported in Table 1B.

hood composition variables are significant, and the access measure is important in each of the four cities.

In Panel B, the results for predicting teenage idleness differ slightly. The access measure is significant in the simplest model (Model I), but in more complex specifications, access appears to be less important. Individually, and in pairs, other neighborhood measures have important effects upon the probability of idleness of urban youth.

It is certainly possible that the effect of neighborhood composition differs across metropolitan areas. We have investigated models of this general specification (see Appendix Table A1). On purely statistical grounds, the complete disaggregation of neighborhood measures across MSAs does improve the employment probability model, but does not improve the idleness results.[9] The magnitudes, however, are essentially the same.[10]

[9] The χ^2s for the fully interacted models, compared to those without MSA-specific coefficients, are as follows:

Model	Employment χ^2	Idleness χ^2	Degrees of Freedom
II	24	2	3
III	16	2	3
IV	31	4	3
V	31	3	6
VI	39	3	6

[10] In addition, we have estimated these models separately for

Table 4

Neighborhood Determinants of Employment Outcomes for New Jersey Youth[a]

28191 Observations, t-ratios in parentheses

	I	II	III	IV	V	VI
A. Employment						
Chi-squared	3838	3874	3891	3963	3894	3975
-2logL	35243	35207	35190	35118	35187	35106
Access:						
Bergen-Passaic	.030	.024	.017	.025	.017	.022
	(3.47)	(2.78)	(1.96)	(2.92)	(2.00)	(2.56)
Middlesex	.041	.036	.031	.026	.031	.024
	(6.56)	(5.72)	(4.84)	(4.01)	(4.86)	(3.73)
Monmouth	.010	.008	.007	.010	.007	.009
	(5.15)	(4.08)	(3.80)	(5.35)	(3.66)	(4.67)
Newark	.006	.006	.004	.004	.004	.004
	(3.57)	(3.26)	(2.23)	(2.37)	(2.36)	(2.29)
Percent White		.491			.188	.295
		(5.99)			(1.77)	(3.50)
Percent on Public Assistance			−2.208		−1.760	
			(7.14)		(4.42)	
Percent Adults Not at Work				−2.242		−2.074
				(11.02)		(9.94)
B. Idleness						
Chi-squared	27909	27952	27958	27938	27967	27966
-2logL	11172	11129	11123	11143	11114	11115
Access:						
Bergen-Passaic	−.034	−.013	.007	−.015	.006	−.002
	(1.96)	(.74)	(.40)	(.84)	(.33)	(.13)
Middlesex	−.038	−.018	−.005	−.015	−.004	−.005
	(2.82)	(1.33)	(.37)	(1.08)	(.32)	(.35)
Monmouth	−.005	.002	.004	−.002	.005	.003
	(1.17)	(.57)	(1.06)	(.50)	(1.32)	(.79)
Newark	−.008	−.006	.000	−.004	−.001	−.003
	(2.29)	(1.58)	(.12)	(.98)	(.39)	(.75)
Percent White		−.916			−.524	−.768
		(6.58)			(3.00)	(5.29)
Percent on Public Assistance			2.951		2.006	
			(7.12)		(3.84)	
Percent Adults Not at Work				1.884		1.353
				(5.51)		(3.75)

[a]Logit models include household level variables reported in Tables 1A and 1B. Each model also includes separate intercepts for the different metropolitan areas.

white, black, and Hispanic youth. For white youth, results reported in Table 4 and Appendix Table 1 are confirmed. The results are more fragile when the sample is confined to minority youth. Many of the variables that are significant for all specifications with the larger samples are insignificant for the minority samples. The pattern of results suggests that the samples of minority youth are too small to permit estimation of MSA-specific and race-specific coefficients. For that reason, we focus on the all-youth estimates.

III. Implications

The statistical results for this sample of New Jersey youth suggest that neighborhood composition and employment access affect labor market outcomes, although the quantitative estimates differ by area and by outcome. The character of urban neighborhoods and the effect of neighborhood composition on out-

Table 5
Average Characteristics of Neighborhoods in New Jersey MSAs

MSA Residences of	Sample Size	Job Access	Fraction: White	Public Assistance	Adults Not at Work
Newark					
All Youth	10245	27.037	.704	.357	.071
White Youth	6900	28.444	.910	.331	.032
Black Youth	2529	23.491	.194	.416	.164
Hispanic Youth	816	26.129	.536	.395	.116
Bergen-Passaic					
All Youth	6227	5.971	.852	.355	.043
White Youth	5164	6.060	.934	.350	.030
Black Youth	528	5.463	.295	.385	.130
Hispanic Youth	535	5.609	.608	.379	.084
Middlesex					
All Youth	5713	8.136	.899	.309	.033
White Youth	5064	8.105	.929	.307	.029
Black Youth	367	8.836	.661	.319	.060
Hispanic Youth	282	7.799	.688	.342	.068
Monmouth					
All Youth	6006	26.191	.925	.370	.040
White Youth	5446	26.494	.948	.368	.036
Black Youth	352	22.540	.608	.390	.087
Hispanic Youth	208	24.431	.866	.375	.056

comes vary across metropolitan areas. This accounts for some of the observed differences in youth employment outcomes. Moreover, within metropolitan areas, large differences are found in the average characteristics of neighborhoods in which youth of different races and ethnicities reside. For example, in Newark, 81.5 percent of white youth live in census tracts in which 90 percent or more of the population is white. In contrast, slightly less than 20 percent of Hispanic youth, and only 4 percent of black youth, live in such tracts. Table 5 summarizes the average characteristics of neighborhoods in which youth of different races reside. These differences may lead to large differences in employment outcomes for youth.

Table 6 indicates the importance of these differences in employment access and neighborhood demographics in affecting employment outcomes by race and ethnicity.[11] The first column in the table presents the employment probability estimated for the "average" youth in each of these four metropolitan areas. The second column presents the employment probability of the same "average" youth living in the neighborhood in which the average white youth resides, in each metropolitan area. The third and fourth columns present the employment probabilities estimated for the same youth living in the neighborhood inhabited by the average black and Hispanic youths, respectively. Panel B presents the same simulation using idleness instead of employment. Many of these differences are quite large.

In Bergen-Passaic, residence in the neighborhood in which the average white youth lives (compared to that in which the average black lives) increases youth employment rates by 2.3 percentage points, from 39.9 to 42.2 percent. A similar comparison of employment rates for those living in the average white and average Hispanic neighborhoods shows a smaller difference. In Middlesex, the differences are approximately of the same magnitude

Table 6
Employment Outcomes for Youth with Average Capital Characteristics in Different Neighborhoods
Percent

	All Youth	White Youth	Black Youth	Hispanic Youth
A. Employment				
Newark	37.45	43.46	32.76	36.84
Bergen-Passaic	41.77	42.15	39.85	40.02
Middlesex	46.99	47.37	44.61	43.46
Monmouth	44.97	45.00	44.87	44.50
	All Youth	White Youth	Black Youth	Hispanic Youth
B. Idleness				
Newark	4.66	3.83	7.44	5.63
Bergen-Passaic	4.19	3.98	5.92	4.92
Middlesex	3.50	3.41	4.27	4.33
Monmouth	4.29	4.22	5.39	4.56

[11] These probabilities are computed relying upon the coefficients from Model VI in Appendix Table A1. The coefficients of the individual and household demographic variables (not presented) and the average characteristics of the sample of youth are used, together with the coefficients reported in Appendix Table A1 and the average neighborhood characteristics in each MSA.

(a 2.8 percentage point increase for white-black comparisons, and a 3.9 percentage point increase for the white-Hispanic comparison). In Monmouth, located on the New Jersey shore, differences in average neighborhood characteristics have much smaller effects on youth employment rates, while in Newark, the effect is strikingly large. In Newark, predicted employment rates for the average white neighborhood are almost one-third higher than for the average black neighborhood.

Results for youth idleness are comparable. In general, the largest disparities are between probabilities for the average white and the average black neighborhoods. Across these MSAs, the effect varies, and the difference is greatest for the largest and most urban metropolitan area in our sample, Newark.

IV. Conclusion

This paper analyzes employment and "idleness" outcomes for a large sample of urban youth. The analysis is based upon observations on at-home youth and their families, the employment access of the neighborhood in which they reside, and the socioeconomic character of those neighborhoods.

The analysis documents the importance of human capital and family attributes in conditioning the labor market outcomes for youth living at home. In addition to individual-level determinants, we find evidence of substantial spatial linkages to employment outcomes. While not consistently significant across metropolitan areas, measures of access to jobs are important in affecting employment in some areas, especially for minority youth. Access appears to play essentially no role in determining youth idleness, an outcome dominated by youth school-enrollment status. Furthermore, whether as a measure of social access, role models, or peer influence, neighborhood composition matters consistently. Measures of the presence of employed and non-poor individuals (presumably those with knowledge of and contact with jobs) affect youth employment. Even with large samples of data, however, we are less successful in distinguishing among these distinct, but closely related, potential causes.

Simulations using these results demonstrate quite clearly that the constellation of factors that distinguish "good" from "bad" neighborhoods affects teenage employment in profound ways.

Appendix Table A1

Neighborhood Determinants of Employment Outcomes for New Jersey Youth[a]

28191 Observations, t-ratios in parentheses

	I	II	III	IV	V	VI
A. Employment						
Chi-squared	3848	3904	3913	4002	3931	4021
-2logL	35233	35177	35168	35079	35150	35060
Access						
Bergen-Passaic	.066	.068	.069	.070	.069	.071
	(3.45)	(3.49)	(3.52)	(3.63)	(3.51)	(3.65)
Middlesex	.026	.276	.023	.017	.028	.021
	(2.17)	(2.34)	(1.99)	(1.39)	(2.38)	(1.74)
Monmouth	.006	.007	.006	.007	.008	.008
	(1.86)	(2.25)	(1.96)	(2.07)	(2.38)	(2.35)
Newark	.004	.002	.001	.001	.001	.001
	(3.37)	(1.88)	(.45)	(.99)	(.51)	(.71)
Percent White						
Bergen-Passaic		.156			.229	.027
		(1.17)			(1.06)	(.19)
Middlesex		.819			.893	.731
		(3.86)			(2.96)	(3.38)
Monmouth		−.210			−.691	−.268
		(.94)			(2.30)	(1.19)
Newark		.592			.203	.225
		(6.43)			(1.63)	(2.26)
Percent Public Assistance						
Bergen-Passaic			−.269		.443	
			(.42)		(.42)	
Middlesex			−2.798		.521	
			(2.48)		(.32)	
Monmouth			−.760		−2.785	
			(.87)		(2.38)	
Newark			−.753		−2.248	
			(7.62)		(4.58)	
Percent Adults Not at Work						
Bergen-Passaic				−2.049		−2.140
				(3.58)		(3.60)
Middlesex				−1.536		−1.261
				(3.25)		(2.62)
Monmouth				−1.059		−1.115
				(2.99)		(3.14)
Newark				−3.579		−3.285
				(11.03)		(9.24)

[a]Logit models include household-level variables reported in Tables 1A and 1B. Each model also includes separate intercepts for the different metropolitan areas.

Appendix Table A1 continued

Neighborhood Determinants of Employment Outcomes for New Jersey Youth[a]

28191 Observations, t-ratios in parentheses

	I	II	III	IV	V	VI
B. Idleness						
Chi-squared	27913	27955	27960	27944	27970	27969
-2logL	11167	11126	11121	11137	11110	11111
Access						
Bergen-Passaic	−.026	−.011	−.004	−.026	−.005	−.010
	(3.58)	(.27)	(.10)	(.66)	(.11)	(.25)
Middlesex	−.003	−.001	.003	.010	.004	.011
	(.11)	(.04)	(.12)	(.35)	(.16)	(.39)
Monmouth	.001	.002	.002	.000	.001	.001
	(.14)	(.25)	(.26)	(.03)	(.21)	(.21)
Newark	−.007	−.003	.000	−.002	.000	−.001
	(3.16)	(1.37)	(.13)	(.78)	(.08)	(.23)
Percent White						
Bergen-Passaic		−.690			−.543	−.676
		(3.25)			(1.61)	(2.98)
Middlesex		−.855			−.255	−.651
		(2.42)			(.41)	(1.77)
Monmouth		−.811			−.198	−.752
		(2.31)			(.38)	(2.14)
Newark		−.986			−.614	−.808
		(6.23)			(3.13)	(4.71)
Percent Public Assistance						
Bergen-Passaic			2.179		.882	
			(2.34)		(.58)	
Middlesex			4.114		4.033	
			(2.22)		(1.24)	
Monmouth			3.192		3.297	
			(2.37)		(1.65)	
Newark			3.077		2.007	
			(6.35)		(3.28)	
Percent Adults Not at Work						
Bergen-Passaic				.955		.329
				(.96)		(.30)
Middlesex				2.265		2.108
				(2.25)		(2.00)
Monmouth				.909		.908
				(1.36)		(1.33)
Newark				2.400		1.590
				(4.88)		(2.94)

[a]Logit models include household-level variables reported in Tables 1A and 1B. Each model also includes separate intercepts for the different metropolitan areas.

Appendix B: The Computation of Spatial Access

In the text, we employ a measure of the accessibility of each census tract to employment locations. This measure is derived from the "potential access" measures widely used by transport planners. (See Isard (1960) for an early review or Smith (1984) for a more recent treatment.) These measures are derived from observations on the work-trip patterns of commuters and the transport linkages in an urban area.

The accessibility measures are based upon the data available through the Census Transportation Planning Package (CTPP) for large metropolitan areas. The CTPP data are obtained from the Transportation Supplement of the 1990 Census. Each metropolitan area is divided into Traffic Analysis Zones (TAZs). Zone-to-zone peak commute flows (T_{ij}) as well as peak travel times (d_{ij}) are reported. From the elements of the matrix, the number of workers resident in each TAZ (R_i) can be estimated ($R_i = \Sigma_j T_{ij}$). Similarly, the number of individuals working in each zone (W_j) can be estimated ($W_j = \Sigma_j T_{ij}$).

The most widely used empirical model of the accessibility of particular residential locations is based upon the gravity concept:

$$T_{ij} = \alpha R_i^{\beta} W_j^{\gamma} / d_{ij}^{\delta}, \qquad \text{(B1)}$$

where Greek letters denote parameters. Isard (1960) provides a number of physical and social scientific justifications for the formulation. Flows between i and j are positively related to the "masses" of residences and workplaces and inversely related to the "distance" (travel time) between i and j.

Estimates of the parameters yield a measure of the accessibility of each residence zone to the workplaces, which are distributed throughout the region (Isard 1960, p. 510),

$$(A_i = \sum_j \hat{T}_{ij} / R_i^{\hat{\beta}}), \qquad \text{(B2)}$$

where $\hat{T}$ is computed from the parameters estimated by statistical means.

More sophisticated measures of access recognize that the transport flows to each destination are count variables. The Poisson distribution is often a reasonable description for counts of events that occur randomly.

Assuming the count follows a Poisson distribution, the probability of obtaining a commuting flow T_{ij} is

$$pr(T_{ij}) = e^{-\lambda ij} \lambda_{ij}^{Tij} / Tij! \qquad \text{(B3)}$$

where λ_{ij} is the Poisson parameter. Assuming further that

$$\exp[\lambda_{ij}] = \alpha R_i^{\beta} W_i^{\gamma} / d_{ij}^{\delta} \qquad \text{(B4)}$$

yields an estimable form of the count model (since $E(T_{ij}) = \lambda_{ij}$). See Smith (1987) for a discussion. Estimates of the parameters similarly yield a measure of the accessibility of each residence zone to workplaces in the region,

$$A_i = \sum_j \hat{\lambda}_{ij} / R_j^{\hat{\delta}}. \qquad \text{(B5)}$$

A more general model of the flow count between i and j relaxes the Poisson assumption that the mean and variance are identical. For example, following Greenwood and Yule (1920), Hausman, Hall, and Griliches (1984, p. 922) assume that the parameter λ_{ij} follows a gamma distribution $G(\omega_{ij})$ with parameters ω_{ij}. They show that, under these circumstances, the probability distribution of the count is negative binomial with parameters ω_{ij} and η,

$$pr(T_{ij}) = \frac{G(\omega_{ij} + T_{ij})}{G(\omega_{ij})G(T_{ij} + 1)} \left(\frac{\eta}{1 + \eta}\right)^{\omega_{ij}} (1 + \eta)^{-T_{ij}}. \qquad \text{(B6)}$$

Again, assuming that

$$\exp[\omega_{ij}] = \alpha R_i^{\beta} W_j^{\gamma} / d_{ij}^{\delta} \qquad \text{(B7)}$$

yields an estimable form of the count model and the resulting accessibility index for each residence zone.

The count models are clearly nested. If η is infinitely large, then equations (B6) and (B7) specialize to (B3) and

Table B1
Parameter Estimates of Negative Binomial, Poisson, and Gravity Models of Transport Access
Asymptotic t ratios in parentheses

	Newark	Bergen-Passaic	Middlesex	Monmouth
A. Negative Binomial				
α	1.249	.529	.073	.793
β	.342	.474	.545	.421
γ	.341	.378	.384	.445
δ	.705	.842	.856	.872
η	.555	.587	.527	.608
log likelihood	−116818	−71835	−63415	−56296
B. Poisson				
α	−.187	−1.557	−1.327	−.991
β	.511	.718	.666	.530
γ	.424	.474	.465	.598
δ	.806	.967	.894	.918
log likelihood	−296466	−209995	−174066	−156235
C. Gravity Model				
α	.601	−.371	−.337	−.796
β	.307	.427	.473	.486
γ	.274	.325	.313	.358
δ	.485	.569	.622	.593
R^2	.225	.245	.280	.293
Number of Observations	32157	18419	16760	15009

Table B2
Simple Correlation Coefficients among Census Tract Access-to-Employment Measures Derived from Negative Binomial, Poisson, and Gravity Models

	Gravity vs. Poisson	Gravity vs. Binomial	Binomial vs. Poisson
Newark	.980	.994	.988
Bergen-Passaic	.982	.993	.995
Middlesex	.973	.989	.976
Monmouth	.909	.989	.954

(B4). If η is finite, then the mean and the variance of the count variables are not identical (as assumed by the Poisson representation).

The accessibility measure derived from the gravity model, equations (B1) and (B2), may be interpreted as a simple linear approximation to either of these theoretical count models. (Smith (1987) provides a thorough discussion of the link between gravity and Poisson models.)

Table B1 presents parameter estimates of the three models for four metropolitan areas in New Jersey. The models are estimated using the CTPP data from the 1990 Census. For each of these metropolitan areas, the TAZs are coterminous with census tracts. The matrices of tract-to-tract commuting flows are sparse, with many zeros. For example, the Newark metropolitan area has 448 census tracts. Of the 200,704 possible commuting patterns (448 times 448), 168,547 of them are zero. (In part, this reflects the fact that the underlying counts and transportation times are gathered from a sample of about 15 percent of the population.) The estimates of the negative binomial and Poisson models are obtained by maximum likelihood methods, adjusting the likelihood function for this truncation.[12] In contrast, the gravity model is estimated in the most straightforward manner—by applying ordinary least squares to equation (B1) in logarithmic form using the non-zero observations.[13]

As the table indicates, the hypothesis of Poisson flows is rejected in favor of the negative binomial.[14] In each case, the estimate of η is rather precise, and it implies that the ratio of the variance to the mean ($[1 + \eta]/\eta$) is on the order of 2.5 or 3.

Table B2 presents the correlations among the census tract accessibility measures derived from the three models. Although the negative binomial model fits the data better than the Poisson model, the differences in the accessibility measures computed from them are very small. Similarly, the table shows that, for each of the four New Jersey metropolitan areas, the gravity model yields an almost identical measure of census tract access to employment.

Appendix C: Explicit Tests for Endogeneity

As noted in the text, a major concern in designing and interpreting the statistical models of labor market outcomes is the exogeneity of the neighborhood variables that have been measured. The statistical models have been designed to guard against the possibility that these geographic indicators are endogenous to labor market choices. We address the simultaneity issue by considering the decisions of "at home" youth, whose residence choices have been made by parents, and by relying upon extensive measures of household demographics. Despite this, the possibility remains that some unobserved characteristics of households affect both neighborhood choices and youth employment choices.

This appendix provides further evidence on the exogeneity of neighborhood characteristics based upon the Hausman specification test.

In the text, four variables are used to measure aspects of urban neighborhoods: percent white (X_1), percent receiving public assistance (X_2), percent of adults not at work (X_3), and the census tract access measure (X_4). These variables are used in a variety of logit specifications. The most general of these are two logit models including three of the measures: (X_1, X_2, and X_4) and (X_1, X_3, and X_4).

We construct instruments for each of these four variables. We then include the instruments, together with the

Table C1
Tests of Exogeneity of Neighborhood Influences upon Employment Outcomes for Newark Teenagers[a]
χ^2 Statistics

Age Group	In-School Youth	Out-of-School Youth	All Youth
A. Neighborhood Influences: Percent White, Access, Percent on Public Assistance			
Ages 16–20	8.045	3.669	7.513
Ages 16–19	8.596	2.347	6.027
Ages 17–20	9.397	4.014	7.343
Ages 17–19	10.146	3.908	5.395
B. Neighborhood Influences: Percent White, Access, Percent Adults Not at Work			
Ages 16–20	4.536	3.895	5.114
Ages 16–19	4.303	2.364	3.294
Ages 17–20	5.846	4.529	5.169
Ages 17–19	5.616	4.439	2.772

[a]The critical values of χ^2 with 3 degrees of freedom are 7.810 and 11.300 respectively at the 0.05 and 0.01 levels of confidence.

[12] The coefficients are estimated using the programs STATA and TSP. The refinement to recognize the truncated character of the data is more or less irrelevant, empirically. The coefficients are quite similar when this subtlety is simply ignored.

[13] More elaborate treatments are readily available. See, for example, Weber and Sen (1985).

[14] This finding parallels that obtained by Raphael (1995) for San Francisco Bay Area teenagers.

original variables in the logit model, and finally test the joint significance of the instruments. The hypothesis that the neighborhood variables are jointly exogenous can be tested using standard likelihood ratios.

As instruments, we use census tract measures correlated with each of these four neighborhood indicators but not themselves determinants of employment choice. For percent white, we use as an instrument the tenure of the household and the percentage of housing of that tenure type in the tract. (There is abundant evidence that, for reasons of permanent income, racial discrimination, and so on, minority households, other things equal, differ systematically in tenure type from white households. But, practically no one would argue that homeownership causes higher levels of employment.)

For the percent receiving public assistance and the percent of adults not at work, we use a measure of the availability of appropriately sized units, conditioning on household size.[15]

For the access measure, we employ the fraction of workers of common industry and occupation in the MSA residing in the tract. This is a measure of the heterogeneity of industry or occupation of any household member.

Table C1 reports the results of the Hausman specification test for Newark youth in differing age groups. The tests are constructed separately for in-school and out-of-school youth and for all youth.

As the table indicates, in no case can we reject the hypothesis of the exogeneity of the neighborhood influences at the 0.01 level. At the 0.05 level, we can reject the hypothesis of exogeneity for in-school youth of one of the models, but not the other.

As shown in the table, when the model includes a variable measuring the percent on public assistance, the χ^2 is significant for one subsample, in-school youth. However, when the model includes a variable measuring the percent of adults not at work—perhaps a superior measure of the availability of informal information about employment opportunities—each of the three measures of neighborhood effects upon teenage employment is shown to be exogenous, according to conventional statistical criteria.

[15] We can use the same instrument for both neighborhood measures because we never use these variables together in any logit estimation. The housing availability measure weights the fraction of the housing stock in the census tract of each size (number of rooms) by the relative frequency in the MSA that a household of that size (number of individuals) lives in that sized unit. This is a probabilistic measure of residence based on the availability of "typical" housing.

References

Brooks-Gunn, Jeanne, George J. Duncan, Pamela K. Klebanov and Naomi Sealand. 1993. "Do Neighborhoods Influence Child and Adolescent Development?" *American Journal of Sociology*, vol. 102, no. 2, pp. 353–95.

Case, Anne and Lawrence Katz. 1991. "The Company You Keep: The Effects of Family and Neighborhood on Disadvantaged Youths." National Bureau of Economic Research, Working Paper No. 3705.

Clark, Rebecca. 1992. "Neighborhood Effects on Dropping Out of School among Teenage Boys." The Urban Institute, Discussion Paper Series, PSC-DSC-UI-13.

Corcoran, Mary, Roger Gordon, Deborah Laren, and Gary Solon. 1992. "The Association between Men's Economic Status and Their Family and Community Origins." *Journal of Human Resources*, vol. 27, no. 4, pp. 575–601.

Crane, Jonathan. 1991. "The Epidemic Theory of Ghettos and Neighborhood Effects on Dropping Out and Teenage Childbearing." *American Journal of Sociology*, vol. 96, no. 5, pp. 1226–59.

Duncan, Greg J. 1994. "Families and Neighbors as Sources of Disadvantage in the Schooling Decisions of White and Black Adolescents." *American Journal of Sociology*, vol. 103, pp. 20–53.

Ellwood, David. 1986. "The Spatial Mismatch Hypothesis: Are There Teenage Jobs Missing in the Ghetto?" In Richard B. Freeman and Harry J. Holzer, eds., *The Black Youth Employment Crisis*. Chicago, IL: University of Chicago Press.

Evans, William, Wallace Oates, and Robert Schwab. 1992. "Measuring Peer Group Effects: A Study of Teenage Behavior." *Journal of Political Economy*, vol. 100, no. 5, pp. 966–91.

Freeman, Richard. 1982. "The Economic Determinants of Geographic and Individual Variation in the Labor Market Position of Young Persons." In Richard B. Freeman and David A. Wise, eds., *The Youth Labor Market Problem: Its Nature, Causes, and Consequences*. Chicago, IL: The University of Chicago Press.

Greenwood, M. and G. U. Yule. 1920. "An Inquiry into the Nature of Frequency Distribution of Multiple Happenings." *Journal of the Royal Statistical Society*, vol. A, no. 83, pp. 255–79.

Hausman, Jerry, Bronwyn H. Hall, and Zvi Griliches. 1984. "Econometric Models for Count Data with an Application to the Patents–R&D Relationship." *Econometrica*, vol. 52, no. 4, pp. 909–38.

Holzer, Harry J. 1991. "The Spatial Mismatch Hypothesis: What Has the Evidence Shown?" *Urban Studies*, vol. 28, no. 1, pp. 105–22.

Ihlanfeldt, Keith R. 1993. "Intra-Urban Job Accessibility and Hispanic Youth Unemployment Rates." *Journal of Urban Economics*, vol. 33, pp. 254–71.

Ihlanfeldt, Keith R. and David L. Sjoquist. 1990. "Job Accessibility and Racial Differences in Youth Unemployment Rates." *The American Economic Review*, vol. 80, pp. 267–76.

Isard, Walter. 1960. *Methods of Regional Analysis*. Cambridge, MA: The MIT Press.

Jencks, Christopher and Susan Mayers. 1990. "The Social Consequences of Growing Up in a Poor Neighborhood." In Laurence E. Lynn, Jr. and Michael McGeary, eds., *Inner City Poverty in the United States*. Washington, D.C.: National Academy Press.

Kain, John F. 1992. "The Spatial Mismatch Hypothesis: Three Decades Later." *Housing Policy Debate*, vol. 3, no. 2, pp. 371–462.

Leonard, Jonathan S. 1987. "The Interaction of Residential Segregation and Employment Discrimination." *Journal of Urban Economics*, vol. 21, pp. 323–46.

Manski, Charles F. 1993. "Identification of Endogeneous Social Effects: The Reflection Problem." *Review of Economic Studies*, vol. 60, pp. 531–42.

O'Regan, Katherine M. and John M. Quigley. 1996. "Teenage

Employment and the Spatial Isolation of Minority and Poverty Households." *Journal of Human Resources*, vol. 30, no. 3, forthcoming.
Plotnick, Robert and Saul Hoffman. 1995. "Fixed Effect Estimates of Neighborhood Effects." University of Washington, mimeo.
Popkin, Susan J., James E. Rosenbaum, and Patricia M. Meaden. 1993. "Labor Market Experiences of Low-Income Black Women in Middle-Class Suburbs: Evidence from a Survey of Gautreaux Program Participants." *Journal of Policy Analysis and Management*, vol. 12, no. 3, pp. 556–73.
Raphael, Steven. 1995. "Intervening Opportunities, Competing Searches, and the Intra-Metropolitan Flow of Male Youth Labor." Unpublished paper, University of California, Berkeley.
Smith, Tony E. 1984. "Testable Characterizations of Gravity Models." *Geographical Analysis*, vol. 16, pp. 74–94.
———. 1987. "Poisson Gravity Models of Spatial Flows." *Journal of Regional Science*, vol. 27, no. 3, pp. 315–40.
Weber, James S. and Ashish K. Sen. 1985. "On the Sensitivity of Gravity Model Forecasts." *Journal of Regional Science*, vol. 25, no. 3, pp. 317–36.
Wilson, William J. 1987. *The Truly Disadvantaged: The Inner City, The Underclass, and Public Policy*. Chicago, IL: The University of Chicago Press.

Discussion

Edward L. Glaeser, Associate Professor of Economics, Harvard University.

Katherine O'Regan and John Quigley have written an excellent paper, using intra-urban spatial variation to try to isolate the connection between neighborhood and employment and schooling outcomes for teenagers. They find strong effects of neighborhood poverty and unemployment on teenage employment and idleness (not being at school or at work). They also find that actual physical access to jobs is relatively unimportant. It seems like another victory for the loose form of the spatial mismatch hypothesis (segregation by race and income affects employment outcomes), although something of a loss for the strict form of the spatial mismatch hypothesis (location matters because of transportation distance to work).[1] The paper is clear and well done, and it is truly "state of the art" in using cross-neighborhood variation within cities to identify the effects of neighborhood on outcomes.

My thoughts on this topic will be arranged in two categories: (1) discussion of the implications of these results for policy and for future research, and (2) discussion of the basic approach of using intra-urban variation to identify neighborhood effects. The first section accepts O'Regan and Quigley's results and discusses what they mean for policy; the second section discusses the perils of using within-city data for these purposes and how one might eliminate some of those dangers.

The Implications of O'Regan and Quigley's Results

The empirical issues involved in estimating the importance of space are extremely dense and often daunting. Issues of omitted variables, endogeneity, and measurement error plague the research in this area (including, of course, my own work). O'Regan and Quigley's research represents a superb effort, but there can be no doubt that we are still far from being able to establish conclusively (1) a firm connection between neighborhood and outcomes, or (2) the neighborhood mechanisms that really matter, or (3) the way these neighborhood mechanisms influence childhood development and employment outcomes. However, these issues are so important, and they extend to so much of the work in social science and to such a wide range of policy-making, that we must welcome truly significant contributions like that of O'Regan and Quigley quite warmly. We also must hope that this conference represents a renewed commitment to continue the quest for more understanding and better methods for dealing with these problems. This first section of my comments presents a brief description of why these issues are so important and what O'Regan and Quigley's results in particular mean, both for policy and for social science.

[1] Kain (1968) is the father of the spatial mismatch hypothesis. I have taken to splitting the hypothesis into strong and weak forms, where the strong form states that minority problems are related to distance from jobs and the fact that minorities are constrained to live in their neighborhoods, whereas the weak form argues that segregation, which is a result of discrimination, leads to poor minority outcomes.

Implications of a Connection between Neighborhood and Outcomes

The very existence of a strong causal connection between neighborhood and individual outcomes immediately implies the existence of strong, spatially related externalities, especially if that connection does not work through the provision of local public goods. If a person's identity influences, to even a small degree, the outcomes of his entire neighborhood, then private, free market outcomes there may be not only inequitable but also, quite possibly, highly inefficient. A classic externality exists, because an individual's skill level and work habits influence his neighbors' outcomes in a way that is not regulated through the market.

Location-specific spillovers stemming from the effects of concentration of poverty may suggest, among other things, a need for strongly subsidized education for the poor. As the education of one member of the neighborhood will benefit all of his neighbors, that person's education choice will not internalize all of the neighbors' benefits, and that person will underinvest in education relative to the social optimum. Individual migration decisions will also fail to internalize effects on local neighborhoods. In principle, such results could provide a rationale for a federal government role in reducing white flight, for example, or subsidizing other migration decisions. Once we have clearly established the connection between neighborhood attributes and outcomes, the floodgates have been opened for justifying a myriad of governmental policies. Of course, the standard cautions (which this author believes strongly) about the tendencies of governmental policies to exacerbate rather than improve existing market failures also apply in this case.

If we believe in neighborhood effects, then by altering where the poor live or who their neighbors are, we can improve their lives.

A particular example of this last point occurs when local governments take actions that change the neighborhood composition of adjoining areas. One locality may create attractive zoning regulations that draw the wealthy from another area and thus impose significant externalities on the poor remaining in the other area. While I believe strongly in the benevolent effects in many cases of local competition among governments, just as I believe in the benefits of local competition among firms, the presence of substantial externalities may limit the extent to which we want to decentralize certain types of power to local hands. In particular, local control over redistributional activities is known to lead to sorting by income classes. If neighborhood effects are real, then this income sorting may be highly inefficient and socially costly in a way that will not be internalized by local governments.

Of course, these are primarily efficiency issues, and much of the discussion in this area relies on equity concerns. If neighborhood effects are clearly established, then it becomes tempting to ask whether we cannot use these neighborhood effects to achieve equity goals of redistribution between races or between income groups. In other words, if we believe in neighborhood effects, then by altering where the poor live or who their neighbors are, we can improve their lives. Of course, it is still a matter of debate whether space-based redistributional methods (which might include programs helping minorities relocate or community-based redevelopment projects) are particularly efficient means of achieving equity goals. It may well be that cash or simple in-kind transfers are cheaper and more effective means of achieving equity goals than attempts to guide which neighborhood people choose to live in. Naturally, even the most recalcitrant opponent of space-based programs would be forced to accept that it would be of clear social benefit to eliminate spatial distortions created by government policies, such as greater availability of or more access to AFDC payments in high poverty areas, or police discrimination in white neighborhoods.

Finally, it is worthwhile mentioning that documenting the kinds of neighborhood connections that operate is of huge relevance to economics and other social sciences. Much of modern growth theory hinges on externalities in the production of knowledge. Issues in labor economics and macroeconomics are also possibly related to the presence of spillovers across workers in the accumulation and use of human capital. This type of research is invaluable in helping us to document the presence or absence of such forces.

Implications of How Neighborhoods Change Outcomes

One of the strongest implications of O'Regan and Quigley's work is that local poverty matters, while

physical distance to jobs does not matter nearly as much. The authors do not really try to distinguish between different forms of poverty or joblessness, but rather restrict themselves to distinguishing between the two fairly different hypotheses. They make a strong case for the importance of local poverty, relative to local job access.

Ideally, we would be able to sort out which types of poverty matter most in creating neighborhood effects. Do neighborhood effects work through the percentage of the population relying on the government? In that case, the admittedly odd implication would be to eliminate all social programs. Is the important attribute the raw income level of the neighborhood? Then, the implication might be to hand out cash. Is the important attribute the concentration of the adult idle? In this case, the goal of policy should be getting people to work. Alternatively, racial composition or some other variable might represent the crucial neighborhood effect.

As pleasant as it might be to believe that we can simply use multiple variable regressions to distinguish among these hypotheses, I am dubious at best about the possibilities for this type of work (O'Regan and Quigley are, too). These poverty-related neighborhood characteristics are tightly correlated in the data. Distinguishing between the effects of unemployment versus poverty versus single-parent families is enormously difficult. The selection and endogeneity problems differ for each one of these variables and further complicate the analysis, and I am not sure that we ever will believe anything we see that differentiates between these forces.

Given these problems, I believe that Quigley and O'Regan adopt the right approach. They basically look at two hypotheses: Is it neighborhood composition that is the major difficulty in poor neighborhoods? Or is it the lack of proximity to employment? These two variables, neighborhood composition and physical location of employment, are not tightly connected, and the authors do seem to be able to effectively distinguish between them. They reject the idea that the lack of proximity to jobs is the major problem. My own work in this area (Cutler and Glaeser 1995) has also found that proximity to jobs is not a particularly large determinant of neighborhood effects. It does seem that the problem of poorer neighborhoods is not the absence of local employment but rather the presence of broader social problems that leave lasting scars on youths growing up in poverty-stricken areas.

The most straightforward interpretation of O'Regan and Quigley's work is that job access, the variable that relates to immediate benefits from legal-sector employment, is relatively unimportant. The variable that appears related to a culture of poverty and its effect on long-term human capital development is important, however. The findings suggest that we should not expect that an individual who is whisked away from a poor neighborhood and dropped into a high-employment neighborhood will immediately see an improvement. More likely, the children of this individual will have better peers and better role models and will eventually learn from the new location. The implication is that neighborhoods are about long-term accumulation of skills or attributes and not about an immediate return to paid work.

Such a policy conclusion casts doubts on the effectiveness of employment zones, enterprise zones, improvements in transportation for inner-city residents, or any policy focused primarily on cutting the costs of moving between ghettos and jobs. While such programs surely will not hurt, and may even be of some benefit, they will not address the primary problems of inner-city neighborhoods. The benefits of these programs will show up only gradually, and through an indirect effect of employment levels on long-run human capital accumulation. Neighborhoods will change, if the O'Regan and Quigley results are right, only if the cycles of poverty are broken and if their residents become employed and acquire human capital. Unfortunately, this type of policy implication goes against any kind of quick fix. Urban policy must be about changing long-run human capital accumulation and altering the patterns of family responsibility.

Implications of How These Mechanisms Work

Quigley and O'Regan do not really begin to tell us how locational unemployment levels actually drive youth idleness. The reader can immediately imagine several mechanisms by which this effect could work through the public sector or the provision of locational services. For example, even when different census tracts are part of the same school district, they may not have access to the same schools, and it may be school quality that is driving this effect.

Are crime levels higher in these poverty areas? The number of poorer youths involved in some form of crime is quite high: About 35 percent of the National Longitudinal Survey of Youth's 20-year-olds have committed crimes recently. Are these young adults just avoiding the legal sector? Is drug use and

availability important for this group? Is gang membership important?

Are the poverty effects working through an absence of role models? An easy way to test this is to see whether neighborhood effects become important for children who have both parents present and "successful," where successful may just mean employed. These mechanisms should not be seen as alternatives to a basic poverty effect; rather, analysis should first document the role of poverty and then try to decompose the ways that poverty drives poor outcomes.

It would also be helpful to know if neighborhood effects are seen for younger children, and at what age these forces start to be important. When do we begin to see school dropout rates respond to local area attributes? Naturally, all of these questions form an agenda for many future papers and go far beyond the scope of this work, but they are important if we are to formulate policy on the basis of these types of results. For example, if we found that all the neighborhood effects worked completely through school quality, and school quality was a function of spending, then it would make sense to consider equalizing school spending. If neighborhood effects worked through school quality, but the relevant school quality effect worked through peer interactions at the school, then busing or, alternatively, a measure for paying children with high human capital to go to school with children with low human capital might be preferable. If neighborhood effects worked through high crime rates, and these crime rates discouraged legal activities and encouraged illegal activities, then altering the policing structure might be appropriate.

The point is not that a clear mandate exists on what should be done, but rather that determining *how* neighborhoods affect outcomes, if indeed neighborhoods do affect outcomes, is critically important for determining our overall policy approach. We cannot even begin to think about the right steps to take to eliminate the problems of the inner city without first being convinced that neighborhoods, rather than individuals, are important factors in creating social problems; without knowing which types of neighborhood characteristics drive poor outcomes; or without understanding the mechanisms by which they drive these outcomes.

A Discussion of the Intra-Urban Approach

As I have argued elsewhere (Cutler and Glaeser 1995), using intra-urban variation to identify the effects of neighborhood characteristics on individual outcomes poses two major problems. O'Regan and Quigley are aware of both, but it is worthwhile discussing the assumptions needed to avoid these problems and whether or not we think that these assumptions are palatable.

The first problem is that omitted family and child characteristics surely are highly correlated with neighborhood choice. Neighborhoods are endogenously chosen, and individuals select into different locations based on their characteristics. Some of these characteristics will be the observables that O'Regan and Quigley do use in their work. Other relevant characteristics relating to neighborhood choice might be the willingness to sacrifice for future benefit (patience), unobserved human capital and skills, or connections with and attitudes toward mainstream society. If negative attributes are correlated with choices to live in poorer neighborhoods, then our estimates of neighborhood effects will be biased upward, since neighborhood characteristics will be correlated with omitted variables that work in the same direction (as long as bad neighborhoods attract low-potential individuals).

The price of going to inter-urban variation is a tremendous loss of the variation found in neighborhood differences.

The second problem, which also stems ultimately from the endogeneity of neighborhood choice, is that identical individuals must in equilibrium be indifferent between neighborhoods. Thus, the marginal individual making the decision about neighborhood location must be indifferent between living in a poor neighborhood and living in a rich neighborhood. (Housing prices surely go a major part of the way to induce this indifference.) This effect will mean that we should not see neighborhood differences in utility levels of the decision-makers, if we are able to control for all individual attributes.

My approach to these problems has been sheer cowardice. David Cutler and I avoided using intra-urban variation entirely and identified neighborhood effects from inter-urban variation. We were able to use governmental and topographic features of different

urban areas to instrument for the degree of segregation within the area. Unfortunately, we had only weak methods of dealing with inter-urban mobility, which is also endogenous. More important, the price of going to inter-urban variation (also the approach used in O'Regan and Quigley 1995b), is a tremendous loss of variation. In the extreme case, where every urban area was identical but had huge neighborhood differences, inter-urban variation would yield no evidence whatsoever. While the world is less extreme than that, all researchers lose a large amount of information when they give up the information contained in within-city data, and a huge cost is attached to adopting that type of strategy. I think that in the long run we will be better off figuring out ways to use the intra-urban data than we are relying solely on inter-urban variation.

However, using intra-urban variation requires dealing seriously with all the potential biases that such data create. Consider the following earnings equation:

$$E_i = X_i'\beta + Z_j'(\theta(Z) + \theta_i) + \alpha_i + \varepsilon_i \qquad (1)$$

where E reflects some outcome variable (perhaps earnings, or some propensity towards idleness), X represents observed individual characteristics, β the returns to those characteristics, Z observed neighborhood characteristics, $\theta(Z)$ the average returns to those characteristics, θ_i the individual specific returns to those characteristics, α_i omitted ability, and ε_i an independently distributed error term. The potential problems with using ordinary least squares to estimate the equation, and the possible solutions, are discussed below.

Case One—Garden Variety Omitted Variables

In this case, $\theta(Z) = \theta$, $\theta_i = 0$, and the covariance of α_i and Z is not equal to zero. Ordinary least squares will yield biased coefficients, because neighborhoods are correlated with unobserved attributes. O'Regan and Quigley (1995a) are aware of this problem and handle it by implicitly assuming that parental job attributes determine location and that these attributes are orthogonal to teenage attributes. In their words, household choice is "made by the parent(s), using the standard transportation-housing costs calculus. Household choice is exogenous to the transport demands of youth." As the equation illustrates, the necessary condition for unbiased estimates is not the exogeneity of location choice with respect to youth's employment concerns, but rather the orthogonality of location with respect to youth's employment concerns.

The authors assert, perhaps correctly, that households do not choose location based on what will make employment more probable for their children. I am skeptical of this comment in many cases, especially given what we know about how sensitive parents are to school quality in their location choice. Nevertheless, even accepting this assertion, the parental factors that induce parents to locate in high-poverty areas are surely correlated with the characteristics of youth that determine employment probabilities. Indeed, O'Regan and Quigley assert that, in their data, family characteristics "really 'matter' in the empirical results." If the observables matter so much, surely the unobservables matter too, and the results are biased.

How can we work to improve this problem? First and most classical is the instrumental variables approach. The goal is to find a parental characteristic that determines location but is clearly orthogonal to omitted youth characteristics that drive location. One possibility is that the industrial or occupational training of parents might influence locational choice.

Naturally, we would have to control for the overall quality of industry or occupation as well. The method would involve creating a location measure for each industry/occupation pair and also an average wage and average skill measure for each industry/occupation pair. The location measures (where the industry/occupation employment is located in the city) might be clean instruments if the industry/occupation quality measures are also included in the regression. Alternatively, in data samples where we know when the parents came to the city, we could use the areas of the city being built then to get a sense of where the parent would have been attracted to initially, and use that as an instrument. Ideally, we could use randomized data (such as the Gautreaux or Moving to Opportunity experiments) to get better instruments as well.

A second approach is to get a sense of how big the selection problems are. How much is sorting by parental observables? How strong is the correlation between parents and children? How big would the unobservables need to be, relative to observables, to invalidate the results? These kinds of sensitivity analyses are made possible by Quigley and O'Regan's use of Census variables with a battery of parental background data, and I believe that the authors should exploit this information as much as possible.

In a final approach, the authors could separate individuals into long-term and short-term residents of the community. Presumably location choice would be less of an issue for long-term residents. If the data

showed that neighborhood was most important for long-term residents, this would lead us to believe that it is neighborhood that drives outcomes. If neighborhood is more important for short-term residents, then we would have to believe that outcomes drive neighborhood choice.

Case Two—Random Coefficients

In this case, $\theta(Z) = \theta$, and $\theta_i \neq 0$, but $\alpha_i = 0$, and the covariance of θ_i and the Z variables is not equal to zero. This is a version of the standard Roy model, where individuals have different returns to different neighborhoods and will select into the neighborhoods that give them higher returns. While the relative returns may be parental returns, so long as they are parental returns, ordinary least squares will yield biased coefficients, because neighborhoods are correlated with unobserved attributes. The problem here is not that omitted variables are present that positively affect employment and are also correlated with neighborhood, but rather that the returns to neighborhood location itself differ across neighborhoods. A particular, real world example of this concern is the fact that the minorities who have selected to live in rich neighborhoods are minorities for whom that neighborhood is particularly valuable, so that it is impossible to translate from information about those people to general results about the importance of location for minorities.

This version of the problem has two approaches. The first tends to be highly parametric and involves assumptions about the distribution of the returns to neighborhood. Luckily a large literature exists on this topic, stemming from Heckman's work in the 1970s, and well-worked-out techniques are available for dealing with this problem parametrically. However, while the robustness of the neighborhood results to Heckman-type corrections would be an extremely pleasant thing to see, I am not sure that skeptical readers would be completely convinced by this type of approach.

A second approach to this topic examines whether the returns to neighborhood location differ much, using observable characteristics. This type of test is readily performable and amounts to looking at the cross-effects between individual and neighborhood characteristics. These cross-effects are in fact intrinsically interesting, as well as useful in providing evidence about the extent to which returns to neighborhood differ over varying types of people. Of course, it is worthwhile remembering that even if little difference is found in the returns to neighborhood variables by observables, significant differences still might exist in the returns to neighborhood by unobservables.

Case Three—Endogenous Average Returns

In this case, $\theta(Z) = \theta(Z)$, $\theta_i = 0$, and $\alpha_i = 0$. Here the returns to different neighborhoods are the function of market forces, and in equilibrium the same people will be indifferent between neighborhoods; that is, the distributions of populations will select to the point where individuals are indifferent between different neighborhoods. In part, this issue is the most easily resolved by O'Regan and Quigley's argument that parents select on the basis of their own needs, not the needs of their children. If they are right, then parents will be indifferent but children need not be, and identification still makes sense. In this case, it is enough that location be exogenous, and we are not concerned about the correlation of location with unobservables.

While the argument that they use is both technically correct and quite possibly true, the authors could take this issue much more seriously. It would help to show the factors that parents select on and try and predict what determines the parent's choice of location, and to show that it has little to do with variables that affect children's outcomes. More generally, to the extent that the authors are able to indicate compensating differentials in other areas—high housing costs in the areas where children benefit most—it will be more plausible to believe that the equilibrium does not rely completely on children being indifferent. Indeed, in some ways this problem is the least troublesome, because it does not involve any estimation bias. Instead, what is involved here is the question of why we would expect to find neighborhood effects, if the ability to migrate between neighborhoods exists. Much of the answer assuredly lies in the nature of the equilibrium and of the forces that equilibrate the system.

These three problems with intra-urban data are potentially quite serious. I have presented them separately, but further problems arise if all three problems occur at once. However, approaches to these problems can be developed and O'Regan and Quigley have made invaluable steps forward, both by formalizing some of their responses to these criticisms and by using such a rich, strong data source.

References

Cutler, David and Edward L. Glaeser. 1995. "Are ghettos good or bad?" National Bureau of Economic Research working paper no. 5163.

Kain, John F. 1968. "Housing Segregation, Negro Employment and Metropolitan Decentralization." *Quarterly Journal of Economics*, vol. 82, pp. 175–97.

O'Regan, Katherine and John Quigley. 1995a. "Spatial Effects upon Employment Outcomes: The Case of the New Jersey Teenagers." *New England Economic Review*, this issue.

———. 1995b. "Teenage Employment and the Spatial Isolation of Minority and Poverty Households." Mimeo. Forthcoming, 1996, *Journal of Human Resources*.

Spatial Factors and the Employment of Blacks at the Firm Level

Harry J. Holzer and Keith R. Ihlanfeldt

Professor of Economics at Michigan State University and Professor of Economics at Georgia State University, respectively. *The authors thank the Rockefeller Foundation for financial support.*

The notion that the employment and earnings of blacks might be adversely affected by housing discrimination that limits their residential choices, and by employer decisions to locate away from black neighborhoods, has long been embodied in the "spatial mismatch hypothesis." This hypothesis has been heavily debated over the past 25 to 30 years, and the most recent evidence seems to support the hypothesis. These results also suggest that the negative effects of spatial factors on black employment may have grown more serious over time, as more and more employers relocate away from central city areas where low-income minorities continue to be concentrated.[1]

Still, important questions remain about the magnitude and nature of these spatial effects. For instance, what are the specific mechanisms or processes that limit black access to employment in suburban areas? To what extent is it because blacks frequently lack low-cost and direct *transportation* to many suburban employers, especially when they do not own their own cars? Do they lack *information* about these jobs, especially by not having access to informal networks that frequently link workers and jobs? Or are there other factors at work here as well (for example, perceptions of hiring discrimination or local hostility)?[2]

A better understanding of the underlying mechanisms through which spatial factors operate is a precondition for developing appropriate policy responses to the mismatch problem. For instance, many urban areas have developed public transit lines to specifically aid "reverse commuters" who are traveling from central city residences to suburban job sites; but these are likely to be ineffective if firms' proximity to public transit has little effect on their likelihood of hiring blacks.

A variety of other "job mobility" strategies, emphasizing more flexible types of transportation (such as van pools) and job placement services, also are based on the notion that transportation and information are the key barriers to suburban employment for inner-city residents. Alternatively, proponents of "residential mobility" (through improved

enforcement of antidiscrimination statutes in housing, rental housing vouchers for inner-city low-income residents, and the like) often argue that these other methods are likely to be insufficient, and that eliminating barriers to minority residential locations in suburban areas must be the top priority.[3]

More generally, all of these approaches assume that spatial factors per se are major independent determinants of black employment and earnings. But a variety of other barriers on the *demand* side of the labor market seem to limit black employment prospects as well, such as the demand among employers for skilled labor and discrimination against black applicants. The first of these factors clearly seems to be growing more serious over time, thereby reducing the relative earnings and employment of blacks and of the less-educated more generally as overall labor market inequality grows.[4]

Thus, it is possible that improving the access of central city black workers to suburban employers might do little to improve their employment and earnings, if they continue to face these additional barriers to employment. This would especially be the case if the employers who are the least accessible to central city blacks (for spatial reasons) also have relatively high skill demands or relatively strong preferences for whites (or for other nonblack minorities).[5] Yet, few studies of spatial effects have taken account of these other demand-side factors in the labor market.

The negative effects of spatial factors on black employment may have grown more serious over time, as more employers relocate away from central city areas.

This study uses data from a new survey of over 3,000 employers in four large metropolitan areas to analyze the determinants of black employment and wages at the firm level. We focus specifically on two factors likely to influence the spatial distribution of black employment: the proximity of firms to the residential locations of various racial groups and the proximity of firms to public transit.

By using firm-level data, we can control for many of the demand-side barriers that allegedly limit the employment of blacks. These include the skill requirements of new jobs and the racial preferences of employers. As is generally the case, we do not have a direct measure of preferences, but we should be able to capture much of this effect through an extensive set of proxy variables: the racial composition of the firms' customers; the race of the person responsible for hiring; the use of Affirmative Action in hiring; and the size of the establishment.[6]

[1] The strongest recent evidence in favor of "spatial mismatch" has been provided by Ihlanfeldt and Sjoquist (1990, 1991), while Kasarda (1995) presents data on employer relocations away from central-city areas and the declining employment rates of less-educated blacks in these areas over time. For various reviews of this literature see Holzer (1991), Jencks and Mayer (1989), and Kain (1992). Spatial factors can also affect black employment and earnings more indirectly, through "neighborhood" effects that limit the acquisition over time of human capital and social contacts among blacks; see, for instance, O'Regan and Quigley (1996). The more general notion that segregation adversely affects black economic outcomes (for either of the above reasons) is forcefully argued in Massey and Denton (1992) and is supported recently in Cutler and Glaeser (1995). Clear evidence of housing market discrimination against blacks has also been found in a variety of studies—for example, Turner (1992) and Yinger (1995).

[2] Holzer, Ihlanfeldt, and Sjoquist (1994) provide evidence that black workers experience higher travel costs than whites, at least partly because of lower automobile usage; but this factor does not appear to account fully for spatial effects on black employment rates. For evidence on disadvantages for blacks in gaining employment through informal networks see Holzer (1987).

[3] See Hughes and Sternberg (1992) for arguments in favor of providing "job mobility" through transportation and job placement services. They describe a variety of these programs at the local level, though none has ever been formally evaluated. Kain (1992) is more skeptical about traditional public transit and newer placement approaches, and instead argues forcefully for "residential mobility" approaches. For evidence that the latter approach can successfully increase the earnings or employment of inner-city minorities see Rosenbaum and Popkin (1991) on the Gautreaux housing program in Chicago.

[4] The recent deterioration in the earnings and employment of blacks is analyzed by Bound and Freeman (1992); Moss and Tilly (1992) and Holzer (1994) review the recent evidence on demand-side barriers facing blacks. The argument that blacks have been particularly disadvantaged by growing employer demand for skills has been made by Juhn, Murphy, and Pierce (1993) but is somewhat disputed by Card and Lemieux (1994); and evidence of hiring discrimination against blacks can most clearly be found in the audit studies reviewed in Fix and Struyk (1994).

[5] The claim that suburban employment of blacks is limited by "race, not space" (Ellwood 1986) becomes more valid if employer locational decisions are driven at least partly by their racial preferences, so that those who locate farthest away from blacks do so specifically to avoid hiring them; see, for instance, Mieszkowski and Mills (1992).

[6] The effects of customers' racial composition on discrimination by employers was first suggested by Becker (1971). Empirical evidence to date has been limited, though some has been found by Nardinelli and Simon (1990), Ihlanfeldt and Young (1996) and Carrington and Troske (1995). The best known studies of Affirma-

In the next section we describe the survey of employers that generated these data and some of the empirical evidence we will present. The evidence itself is described in the following section, and then we conclude with a summary of our findings and their implications for public policy.

I. Data and Estimation Issues

The survey from which the data in this paper are drawn was administered to 800 employers in each of four metropolitan areas: Atlanta, Boston, Detroit, and Los Angeles.[7] The survey was administered between June 1992 and May 1994.

Interviews were done over the phone with "the individual responsible for hiring" at the establishment and averaged roughly 35 minutes in length. Questions focused on overall employer and employee characteristics (for example, establishment size, presence of collective bargaining, recent hiring and turnover behavior, and composition of current employees by race and gender); the numbers and characteristics of all currently vacant jobs; and the characteristics of the most recently filled job in the establishment and of the worker hired into that job.

The sample of firms was drawn from two sources: 1) a random sample of firms and their phone numbers provided by Survey Sampling Inc. (SSI), stratified by establishment size; and 2) the employers of respondents in the household surveys that were also administered in each of these four metropolitan areas.[8] The SSI samples were drawn across establishment size categories so as to reproduce the distribution of employment across these categories in the work force; the household-generated sample implicitly weights firms in the same way.[9] No additional size-weighting of observations is therefore necessary when analyzing the data; and the sample of recently filled jobs at these firms should reasonably represent the universe of new jobs that are currently available to jobseekers.[10]

The overall response rate for the survey was roughly 67 percent among firms that were successfully screened. This response rate compares favorably with other recent surveys of employers that have been administered over the phone.[11] In addition, because we have some measured characteristics (for example, establishment size, industry, and location) of firms in the SSI sample that did not complete the survey, we could check for differences in response rates across these *observable* categories that might indicate sample selection bias. Few significant differences were found in response rates across the categories measured by these variables.[12]

As a further check on the representativeness of the sample, we performed comparisons of the industries and sizes of firms in our sample with those in *County Business Patterns* and with Census data on occupations for the relevant areas. These comparisons also indicated that our sampling procedures generated representative samples of firms and jobs in these areas.[13]

In this study we analyze the effects of various firm characteristics on the tendency to hire blacks and pay them a certain wage. Our data contain two variables for black employment at the firm: the percentage of non-college employees at the firm who are black, and whether or not the last worker hired is black. These are the primary dependent variables in our analysis.[14]

---

tive Action effects on minority employment are summarized in Leonard (1990). Firm-size effects on the hiring of blacks might occur because large firms use more formal human resource activities or because they feel more susceptible to legal pressure or bad publicity; and such effects have been found in Carrington, McCue, and Pierce (1995). See also Holzer (1995, 1996a, 1996b) for more evidence on these factors using these employer data.

[7] The survey is part of a broader project known as the Multi-City Study of Urban Inequality, which consists of household surveys and an in-depth, qualitative study of a small sample of employers in each of these four metropolitan areas. The overall project has been financed by the Ford and Russell Sage Foundations.

[8] Roughly 1,000 firms were generated from the household surveys, while the rest were generated from SSI.

[9] SSI firms were questioned about the most recent job that they had filled that did not require a college degree, whereas the household-generated firms were asked about the same occupations as were held by household respondents. Sample weights were constructed to correct for the undersampling of college jobs in the SSI sample, as well as for other sources of nonrandomness in the sample of households that generated employers.

[10] Establishments that do a lot of hiring will be heavily represented in this sample of new hires if they are large, but not if their hiring rates are driven by high turnover or net new employment growth. The lack of extra weight for high turnover firms seems appropriate, given that the stock of jobs they represent at any point in time may not be large.

[11] See, for instance, Kling (1995) for data on surveys recently administered to employers.

[12] For more information on these tests for selection on observables see Holzer (1996b).

[13] Holzer (1996b). Comparisons of the occupational, educational, and race distributions between the last filled jobs and employees overall at these firms also indicated relatively small differences between "marginal" and "average" employees, and little effect of any overrepresentation of high-turnover jobs within the firms.

[14] The equations we estimate are in the spirit of Kain (1968), Leonard (1987), and others who analyzed the effect of location on *where* people are employed rather than whether they are employed. These equations attempt to measure the effects of employer location on the *supply* of black labor to firms and implicitly on the *demand* for labor faced by black workers. The effects of demand shifts associated with employer locations on the employment and wages of

Since "spatial mismatch" should affect primarily the flow of black applicants to a firm (rather than the tendency of firms to hire from the pool of black applicants), equations were also estimated in which the dependent variable is the fraction of a firm's *applicants* who are black. Evidence is therefore provided on the extent to which locational variables influence black employment through their effects on the race of applicants. We also estimated equations in which the dependent variable is the log of hourly wages for the last worker hired, to see whether location affects earnings as well as employment.

The primary independent variables of interest are the distance of the firm from the closest public transit stop (asked of respondents in the survey and then recoded as a series of dummy variables) and the firm's average distance from the black, white, or Hispanic populations in the Metropolitan Statistical Area (MSA).[15] To compute the latter variable, we first had to "geocode" our firms—that is, match each one to a census tract on the basis of its address.[16] We then computed weighted averages of the distances from the centroid of the firm's own census tract to each other census tract in the relevant metropolitan area, weighted by the fraction of each group's local population that resides in each of these tracts. The dummy variable that defines each firm's location in either the central city or the suburbs is also defined on the basis of its census tract.[17]

Additional control variables are primarily designed to capture other effects on firms' demand for black labor that operate through their need for skills and their racial preferences. The former are measured only for the most recently filled job. They include dummy variables for hiring requirements into that job—whether firms required the applicants to have college or high school diplomas, general or specific experience, references, and previous training[18]—and dummies for whether each of a set of tasks is performed on a daily basis—direct customer contact, reading or writing paragraphs, arithmetic calculations, and computer use.[19]

As noted above, the endogeneity of employer location with respect to desired racial employment may cause us to incorrectly attribute effects of employer preferences to location.[20] We therefore try to control for these preferences through a variety of measures; namely, the percentages of the customers who are members of each racial group, dummies for the race of the respondent to the survey (since the respondent is generally the person responsible for new hiring at the firm), establishment size (measured as a series of dummy variables), use of Affirmative Action in either recruitment or hiring,[21] and controls for 1-digit industry and collective bargaining at the establishment.[22]

II. Estimation Results

Table 1 presents summary data on employment outcomes by race and on a variety of their determinants. All means are sample-weighted. Part A of the table gives these measures for the overall sample and separately for central city and suburban firms, using the pooled sample of MSAs. Part B presents the data separately by MSA, broken down by central city versus suburban location.

Results of Summary Measures

The results show that blacks account for roughly 27 percent of the applicants in these firms, 20 percent

blacks then depend on the relevant elasticities of labor supply and demand, the presence of wage rigidities in the relevant markets, and so on; see Freeman (1977).

[15] The question on proximity to public transit did not differentiate across different modes of transit, such as subway versus bus.

[16] In each MSA, 80 to 90 percent of the firms were successfully geocoded. The program MAPINFO was used in this procedure.

[17] "Central city" here refers only to the primary central city in each metro area: the cities of Atlanta, Boston, and so on. The Census Bureau defines other cities as "central cities" within each area (based on the ratios of jobs to residents, size, and the like) but we include these other municipalities in our "suburban" category.

[18] The variables for hiring requirements take on a value of "one" if they are "absolutely necessary" or "strongly preferred."

[19] For more evidence on the effects of these skill measures on employment and wage differences across race/gender groups, see Holzer (1995).

[20] While a number of studies have dealt with the endogeneity of household location (Hughes and Madden 1991; Cutler and Glaeser 1995), none have explicitly treated the possible endogeneity of employer location.

[21] The Affirmative Action variable is self-reported, and not based on federal contractor status, as was the case in Leonard (1990). Though it may be measured with some error, this variable should also capture firms who engage in Affirmative Action for voluntary reasons or because of state/local regulations.

[22] In Holzer (1996b), we analyze a much wider range of survey questions on employer hiring procedures (for example, the use of tests, interviews, and reference checks) and attitudes towards various types of applicants (for example, welfare recipients or those with criminal records). We limit ourselves here to the set of skill and racial preference variables that had the most explanatory power in that analysis and are most directly related to the issues of concern here. We have also included occupational dummies in many of our estimated equations, which reduce the estimated effects of hiring requirements on racial outcomes but have little effect on the estimated effects of location.

Table 1
Means (Standard Deviations) of Key Variables Related to Employment Outcomes

	Total Sample	Central City	Suburbs
A: Pooled Sample Across Metro Areas			
Outcome Variables			
Last hired is black	15.7 (39.4)	23.4 (43.3)	15.3 (40.0)
Percent workers black	19.5 (25.0)	27.1 (30.0)	14.3 (22.6)
Percent applicants black	26.8 (32.3)	34.8 (34.1)	24.6 (31.5)
Log hourly wage			
Black	2.02 (.39)	2.07 (.37)	2.00 (.41)
White	2.28 (.58)	2.42 (.56)	2.25 (.59)
Distance and Transit Measures			
Mean distance (miles) to:			
Whites	22.4 (5.8)	19.8 (2.7)	23.4 (6.5)
Blacks	17.6 (8.2)	12.7 (5.0)	19.4 (8.4)
Hispanics	20.5 (7.7)	16.5 (4.5)	22.1 (8.1)
Distance black/Distance white	.76 (.20)	.62 (.16)	.81 (.18)
Distance black/Distance Hispanic	.86 (.25)	.77 (.20)	.89 (.26)
Transit distance (miles):			
0	33.5 (51.1)	46.0 (50.9)	33.8 (52.5)
.01 to .25	23.4 (45.8)	37.5 (49.0)	19.3 (43.8)
.26 to .50	6.2 (26.2)	6.2 (24.7)	7.2 (28.6)
.51 to 1.00	6.2 (26.2)	3.6 (18.9)	7.3 (28.8)
Greater than 1.00	22.7 (45.3)	6.6 (25.4)	32.5 (52.0)
Distance to CBD center (miles)	14.2 (9.5)	6.6 (6.1)	17.7 (8.7)
Racial Measures			
Percent customers:			
Black	12.6 (19.8)	23.1 (23.8)	16.5 (20.4)
Hispanic	13.5 (21.5)	17.8 (25.0)	11.4 (19.2)
Respondent's race:			
Black	5.8 (25.3)	10.9 (31.8)	3.7 (21.1)
Hispanic	3.6 (21.1)	6.4 (24.9)	3.2 (19.5)
Affirmative Action used	61.8 (52.7)	67.6 (47.6)	58.3 (54.7)
Skills			
Math performed daily	67.7 (50.8)	62.7 (49.2)	70.1 (50.8)
Computer performed daily	56.4 (53.8)	59.7 (50.0)	55.3 (55.1)
Talk to customers daily	72.9 (48.2)	73.0 (45.0)	72.7 (49.4)
Read/Write daily	68.4 (50.4)	68.3 (47.4)	67.7 (51.9)
Requirements for hiring			
College diploma	24.6 (46.6)	21.8 (42.0)	24.7 (47.8)
High school diploma	78.4 (44.6)	79.0 (41.4)	77.0 (46.6)
General experience	70.0 (49.7)	75.2 (43.9)	69.2 (51.2)
Specific experience	64.2 (57.0)	72.2 (45.6)	61.8 (53.9)
Reference	75.9 (46.4)	76.3 (43.3)	75.5 (47.7)
Vocational training	42.5 (53.5)	45.2 (50.6)	40.2 (54.3)
Industry			
Manufacturing	19.5 (43.0)	15.1 (36.5)	21.0 (45.3)
Services	48.9 (54.3)	55.0 (50.7)	46.9 (55.5)

of the non-college employees, and somewhat smaller percentages of new hires. Unadjusted hourly wages are roughly 25 percent less for blacks than whites, even though these are starting wages and therefore do not reflect racial differences in job tenure or wage growth over time.

Table 1 (con't.)

Means (Standard Deviations) of Key Variables Related to Employment Outcomes

	Atlanta		Detroit		Boston		Los Angeles	
	City	Suburbs	City	Suburbs	City	Suburbs	City	Suburbs
B: By Metropolitan Area								
Outcome Variables								
Last hired is black	38.0	26.9	45.0	18.5	15.4	4.9	9.4	9.7
Percent workers black	43.9	26.2	44.3	14.2	22.6	5.6	13.2	9.5
Percent applicants black	52.6	35.1	52.1	27.5	33.4	11.7	17.1	24.4
Log hourly wage								
Black	2.00	1.99	2.07	1.90	2.17	2.06	2.20	2.25
White	2.35	2.20	2.37	2.11	2.29	2.39	2.66	2.39
Distance and Transit Variables								
Mean distance (miles) to:								
White	20.9	25.5	18.9	20.5	17.1	23.7	20.6	23.9
Blacks	13.6	27.5	9.5	17.4	7.6	19.5	15.4	17.9
Hispanics	15.5	21.5	19.7	26.3	13.5	21.0	17.4	18.6
Distance black/Distance white	.65	.88	.50	.83	.45	.78	.73	.73
Distance black/Distance Hispanic	.89	1.07	.48	.65	.57	.91	.88	.96
Transit distance (miles):								
0	41.7	24.8	53.4	28.0	59.6	38.2	40.3	47.4
.01 to .25	37.5	13.1	27.0	23.5	27.5	12.2	45.7	35.7
.26 to .50	5.3	3.5	8.9	12.9	3.3	5.8	7.3	7.8
.51 to 1.00	2.8	3.7	.2	11.1	7.7	8.0	3.4	6.9
Greater than 1.00	12.7	54.8	10.4	24.4	1.9	35.7	3.3	2.2
Distance to CBD center (miles)	4.1	18.2	5.2	19.9	4.7	16.6	10.2	15.2
Racial Measures								
Percent customers:								
Black	31.8	23.5	39.4	17.6	21.7	11.3	14.1	12.6
Hispanic	5.1	6.0	5.6	3.8	12.3	8.7	31.1	31.5
Respondent's race:								
Black	16.1	6.5	24.6	2.0	4.9	.8	5.3	7.0
Hispanic	1.8	1.4	1.4	2.2	5.5	1.0	11.3	11.0
Affirmative Action used	67.9	57.9	64.0	54.2	70.2	57.9	67.5	65.4

Perhaps surprisingly, the data indicate that firms on average are located *closer* to the black residential population than to Hispanics or whites, and they are closer to Hispanics than to whites. This likely reflects the greater proximity of minority residences to the central business districts of these areas and the relatively greater concentrations of white residences in outlying suburban areas. It does *not* necessarily imply that distances to employment are less of a problem for blacks than for whites, since the cost per mile traveled to work appears to be significantly higher among employed blacks than among whites.[23] Indeed, the distribution of white residences likely reflects their choices (between commute times and housing costs) to a much greater degree than the residences of blacks, whose choices appear to be constrained by housing market discrimination.

A number of differences between firms located in central city versus those in suburban areas are apparent. Those located in central cities are more likely to have black employees and applicants, and they pay

[23] The results of Holzer, Ihlanfeldt, and Sjoquist (1994) show that the time spent per mile of travel is roughly 50 percent higher for blacks than for whites. The observed racial differences in average travel times may well understate true racial differences, since they are based on *employed* workers and the distances traveled to jobs that they have chosen. Blacks who are not employed because of spatial reasons, such as long-distance jobs that they do not choose to apply for, would likely exacerbate racial differences in travel costs if they were included in these calculations.

more to both groups of employees but especially to whites.[24]

Central city firms are closer to the populations of all groups, but they are especially close to blacks—in other words, they are *relatively* as well as absolutely closer to blacks. They are also closer to public transit, with over 80 percent within a quarter mile of a public transit stop (the corresponding percentage for suburban firms is 53 percent). The relatively higher fractions of black applicants at these establishments is therefore not surprising.

Firms located in central cities are more likely to have black employees and applicants, and they pay more to both groups of employees but especially to whites.

The data also suggest that central city employers have stronger preferences for black applicants than do suburban employers. This is seen in the higher percentages of central city firms that use Affirmative Action in hiring and the higher percentages of black customers and survey respondents at these firms. Some confirmation of the expectation of greater preferences for black applicants in central city firms is provided by the fact that the ratios of black employees or new hires to black applicants are higher in central cities than suburban areas.[25]

Finally, we note the relatively high average skill needs and hiring requirements of firms in newly filled jobs. Only one-fourth of the recently filled jobs at these firms require college diplomas; yet over two-thirds of the jobs require daily use of arithmetic and reading/writing of paragraph-length material, and well over half require use of computers. Experience (both general and specific) and references are each required at the time of hiring in roughly two-thirds of these firms, while previous training is required at over 40 percent. In general, skill requirements are somewhat higher in central city jobs than in suburban jobs;[26] and manufacturing firms now are more likely to be located in the suburbs, while services are more heavily concentrated in the central cities.

Part B of Table 1 indicates the variance across the four metropolitan areas in racial outcomes and in their determinants.[27] The percentages of blacks among employees, applicants, and customers are higher in Atlanta and Detroit than in Boston and Los Angeles, reflecting their fractions of the residential populations in the former areas. The percentage-point gap between black representation in central-city and suburban firms is highest in Detroit, apparently reflecting a relatively high degree of residential segregation (Frey and Farley 1993). Mass transit is relatively more available in some places (for example, Boston) than others, while central city/suburban gaps in Los Angeles are generally smaller than elsewhere in virtually every measure.

The strong parallels across MSAs between racial populations and employment patterns in central cities and suburbs suggest that housing market discrimination and segregation do indeed have consequences, at least for *where* blacks and whites work in metropolitan areas, if not for whether they work or at what wage. These results also suggest a need to disaggregate our analysis by MSA at least some of the time, to allow for potentially different effects of location, transit, and racial variables across these areas.

Equations Explaining the Percentage of Blacks among Employees and Applicants

Table 2 presents the results of estimated equations explaining the percentage of non-college employees at each firm who are black. The independent variables include a set of dummy variables for proximity (in miles) of the firm to a public transit stop and for the firm's distance from the black population in its MSA divided by its distance from the white popu-

[24] The relatively higher compensation among whites for central city employment is consistent with their relatively longer commutes to these jobs (since on average they live farther away) and with greater compensation for commute times among whites than blacks (Holzer, Ihlandfeldt, and Sjoquist 1994; Zax 1991). Of course, these comparisons do not control for any differences in the relative characteristics of workers and jobs in the central cities and suburbs between whites and blacks.

[25] See Holzer (1996a, 1996b) for more evidence and discussion of this last finding. Although it is at least theoretically possible that racial differences in applicant or job quality account for this, it does not appear to be the case empirically— as we note below, required skills are generally higher in central-city jobs than suburban ones, and the average educational attainment of blacks in the central cities is relatively lower than in the suburbs.

[26] The skills gap in central city versus suburban firms is clearer when the sample is limited to jobs that do not require college degrees, since this particular requirement is higher in the suburbs and is correlated with all other task and hiring requirements listed.

[27] Since the skill needs and hiring requirements of employers displayed little variation across these metropolitan areas, we did not list these variables in part B of the table.

Table 2
Percent of Non-College Employees Who Are Black: Estimation Results

Estimation Technique:	OLS	Tobit	OLS	Tobit	OLS	Tobit
Equation:	1	1	2	2	3	3
Transit distance (miles):						
0	.052	.074	.045	.067	.024	.036
	(.012)	(.017)	(.012)	(.017)	(.012)	(.017)
.01 to .25	.051	.067	.041	.057	.028	.039
	(.013)	(.018)	(.013)	(.018)	(.013)	(.019)
.26 to .50	.040	.037	.035	.031	.008	−.012
	(.017)	(.025)	(.017)	(.025)	(.017)	(.025)
.51 to 1.00	.011	.006	.009	.003	.010	.009
	(.019)	(.028)	(.019)	(.027)	(.018)	(.026)
Distance black/Distance white	−.283	−.389	−.224	−.328	−.095	−.155
	(.025)	(.035)	(.027)	(.038)	(.028)	(.039)
Percent customers black	.473	.580	.465	.572	.224	.269
(multiplied by 100)	(.025)	(.033)	(.025)	(.033)	(.026)	(.034)
Black respondent	.190	.203	.186	.199	.146	.149
	(.017)	(.022)	(.017)	(.021)	(.016)	(.020)
Central City			.058	.056	.058	.053
			(.011)	(.015)	(.011)	(.015)
Percent applicants black					.004	.005
					(.000)	(.000)
Observations	2186	2186	2186	2186	1682	1682
R^2	.499		.496		.644	
Log Likelihood		−484		−477		−179

Standard errors in parentheses. All equations include dummies for industry, establishment size, whether Affirmative Action is used in recruiting or hiring, and metropolitan area. Also included are the percentage of non-professional/managerial employees covered by collective bargaining and a constant term.

lation.[28] A wide range of additional variables are included to control for other potential determinants of the employer's relative demand for black labor. These include the variables listed in Table 1 and sets of dummies for metropolitan area, establishment size, industry, and the percentage of employees covered by collective bargaining.[29]

Three specifications are presented in Table 2: one includes the variables described above; the second adds a dummy variable for the presence of the firm in the central city; and the third adds a variable for the percent of blacks among applicants to the firm. All of these specifications are estimated using both Ordinary Least Squares (OLS) and Tobit.[30]

The results show that the employer's proximity to both public transit and the black residential population affects the likelihood of hiring black employees. Being within a quarter mile of a transit stop (relative to being more than a mile away) raises the probability of hiring blacks by 5 to 7 percentage points, and being within a quarter to one-half mile raises the probability by a smaller amount. A firm's being 10 percent closer in distance to blacks relative to whites (or roughly 2.2 miles closer to blacks) raises the probability of hiring them by about 3 to 4 percentage points.

Controlling for the percentage of blacks among applicants reduces the coefficients on the transit and population measures by 50 to 60 percent. Since it is primarily through the racial composition of applicants to firms that we expect spatial factors to affect the employment of blacks, these results suggest that a large fraction of the estimated effects of proximity to public transit and to blacks reflects these spatial factors per se, rather than unobserved racial preferences of employers. This point is also observed in Table 3, where estimated equations are directly comparable to those listed in the first four columns of Table 2, except that the dependent variable is now the fraction of blacks among *applicants* rather than em-

[28] We use the *ratio* of distances to blacks and whites since the two separate measures are highly correlated (above 0.80) across firms. Including the two measures separately in estimated equations generated coefficients on each that were never significantly different from each other in absolute value. Using the arithmetic difference in distances to blacks and whites rather than the ratio generated virtually the same results, as the correlation between these two measures is roughly 0.96. Relative distance to the Hispanic population is not included here, given its high correlation with distance to the white population (above 0.9). However, it is used in separate equations for Los Angeles that are reported below.

[29] Also estimated were equations that included the distance from the firm to the center of the city's Central Business District. This variable was found to have no significant effect on the racial composition of employment and had virtually no effect on the estimated effects reported in Tables 2 through 4.

[30] The percentage of firms with no blacks among their employees is roughly 30 percent, while the fraction with only blacks is much smaller (roughly 5 percent).

Table 3
Percent of Job Applicants Who Are Black: Estimation Results

Estimation Technique:	OLS	Tobit	OLS	Tobit
Equation:	1	1	2	2
Transit distance (miles):				
0	.103	.127	.101	.126
	(.018)	(.021)	(.018)	(.021)
.01 to .25	.080	.098	.078	.096
	(.020)	(.023)	(.020)	(.023)
.26 to .50	.053	.073	.051	.072
	(.026)	(.030)	(.026)	(.030)
.51 to 1.00	.018	.029	.017	.028
	(.028)	(.032)	(.028)	(.032)
Distance black/Distance white	−.308	−.348	−.294	−.339
	(.037)	(.042)	(.040)	(.047)
Percent customers black	.590	.639	.589	.638
(multiplied by 100)	(.035)	(.040)	(.035)	(.040)
Black respondent	.096	.097	.095	.097
	(.024)	(.027)	(.024)	(.027)
Central City			.014	.008
			(.016)	(.018)
Observations	1682	1682	1682	1682
R^2	.445		.445	
Log Likelihood		−441		−441

Standard errors in parentheses. All equations include dummies for industry, establishment size, whether Affirmative Action is used in recruiting or hiring, and metropolitan area. Also included are the percentage of non-professional/managerial employees covered by collective bargaining and a constant term.

ployees. The coefficients on relative distance in Table 3 are comparable or larger than those in Table 2, while those for proximity to transit are substantially larger than (or roughly double) those in Table 2.[31]

On the other hand, a variety of other measures in Tables 2 and 3 suggest that the racial preferences of employers also affect their tendencies to hire blacks. In particular, firms with black respondents to the survey and firms with more black customers are more likely to hire black employees. In addition, results not reported in these tables suggest that blacks are more likely to be hired by establishments with larger numbers of employees.[32]

As noted above, all of these findings likely reflect the racial preferences of employers vis-à-vis applicants, affecting employment results independently of location per se. The importance of controlling for these factors when analyzing spatial effects is thereby confirmed.[33]

Equations Estimating the Probability That the Last Hire Is Black

Results from estimating the probability that the last employee hired by the firm is black are presented in Tables 4 through 7. The specifications of these equations are comparable to those presented in Tables 2 and 3, with the central city dummy first omitted and then included. All of the *firm*-specific independent variables from those tables (except for the fraction of applicants who are black) are included; several more *job*-specific measures are now added as well, measuring daily task-performance, hiring requirements, and recruitment methods used in filling this job.[34] The equations are estimated using a linear probability model, with standard errors corrected for heteroskedasticity.

Table 4 presents results for equations pooled across the four metropolitan areas, with separate estimates for the entire sample, non-college jobs, and jobs filled by employees with high school degrees or less. But given the very different sizes, locational patterns, and racial compositions of the four metropolitan areas, separate estimates for the high school or less sample in each of the

[31] To the extent that the applicants select employers partly on the basis of expected likelihood of being hired, the racial composition of applicants is endogenous, and therefore may be capturing employer preferences to some extent. But the fact that various measures of employer preference affect hiring in Table 2 even after controlling for the racial composition of applicants suggests that this self-selection process is limited and does not fully offset the effects of these preferences on outcomes.

[32] The smallest establishment size category (firms with 1 to 20 employees) had 10 to 20 percentage points fewer black employees than the largest category (>500). The use of Affirmative Action does not significantly raise the coefficient for the fraction of black employees in our equations, although it does raise the fractions of employees who are white females and Asians (Holzer 1996a).

[33] On the other hand, the relatively high correlations between these variables and our distance and transit measures also suggest the possibility that we are "overcontrolling" by including them, since the racial variables may partly capture spatial effects.

[34] The applicant measure is excluded here, since spatial effects seem to occur at least partly through this measure, and because it is a firm-wide variable that performs more weakly in this equation for job-specific employment outcomes.

Table 4

The Probability That the Last Worker Hired Is Black: Estimated Equations for Pooled Sample

	Total Sample		Non-College Jobs		Last Hire Has High School or Less	
Equation:	1	2	1	2	1	2
Transit distance (miles):						
0	.081	.077	.088	.083	.105	.098
	(.021)	(.021)	(.022)	(.022)	(.029)	(.029)
.01 to .25	.078	.071	.098	.090	.082	.071
	(.023)	(.023)	(.025)	(.025)	(.033)	(.033)
.26 to .50	.052	.047	.061	.055	.088	.082
	(.029)	(.029)	(.030)	(.031)	(.041)	(.041)
.51 to 1.00	.053	.052	.072	.069	.080	.075
	(.032)	(.032)	(.034)	(.034)	(.051)	(.051)
Distance black/Distance white	−.243	−.195	−.251	−.198	−.354	−.293
	(.043)	(.045)	(.045)	(.047)	(.061)	(.064)
Percent customers black (multiplied by 100)	.528	.522	.514	.508	.427	.414
	(.049)	(.049)	(.051)	(.051)	(.071)	(.071)
Black respondent	.178	.175	.184	.180	.182	.177
	(.035)	(.035)	(.037)	(.037)	(.053)	(.052)
Tasks performed daily:						
Math	−.063	−.062	−.060	−.058	−.066	−.065
	(.017)	(.017)	(.018)	(.018)	(.024)	(.024)
Computer	−.026	−.027	−.032	−.032	−.044	−.044
	(.016)	(.016)	(.017)	(.017)	(.024)	(.024)
Talk to customers	.004	.004	−.005	−.006	−.007	−.005
	(.019)	(.019)	(.020)	(.020)	(.026)	(.026)
Read/write	−.028	−.028	−.025	−.025	−.027	−.027
	(.017)	(.017)	(.017)	(.017)	(.023)	(.022)
Requirements for hiring:						
College diploma	−.058	−.058				
	(.026)	(.026)				
High school diploma	−.008	−.007	−.007	−.006	.013	.015
	(.019)	(.019)	(.019)	(.019)	(.025)	(.025)
General experience	−.004	−.005	−.006	−.009	−.005	−.007
	(.018)	(.018)	(.019)	(.019)	(.025)	(.025)
Specific experience	−.019	−.020	−.013	−.015	−.017	−.019
	(.018)	(.018)	(.018)	(.018)	(.024)	(.024)
References	−.004	−.004	.008	.008	.024	.025
	(.018)	(.019)	(.019)	(.019)	(.024)	(.024)
Vocational training	−.032	−.032	−.045	−.045	−.050	−.050
	(.016)	(.016)	(.017)	(.017)	(.023)	(.023)
Central City		.045		.052		.061
		(.019)		(.020)		(.027)
Observations	2375	2375	2168	2168	1259	1259
R^2	.275	.276	.279	.281	.289	.292

Standard errors in parentheses. All equations include dummies for industry, establishment size, whether Affirmative Action is used in recruiting or hiring, and metropolitan area. Also included are the percentage of non-professional/management employees covered by collective bargaining and a constant term.

four are also presented, in Table 5.[35]

The results show that proximity to transit and proximity to the black residential population have significant effects on the probability that the last hired worker is black. The magnitudes are comparable to those reported in Table 2, although the transit effects are somewhat larger (being at a transit stop raises black employment by 0.08 relative to being over a mile away), and residential proximity effects are a bit smaller. The effects of both sets of variables rise somewhat when the sample is limited to less-educated workers or to jobs not requiring a college degree.

As above, the presence of blacks among customers and respondents raises the probability of hiring black workers, and the effect of a central city location is substantially reduced. In addition, important effects are found for the variables measuring skill requirements on these jobs. For instance, daily use of arithmetic on the job reduces the likelihood of hiring blacks by 6 percentage points. Daily reading/writing of paragraphs and use of computers also have marginally significant negative effects on black employment, with each reducing such employment by 2 to 3 percentage points. Requirements that individuals have college diplomas or previous vocational training also reduce black employment by several percentage points each.

On the other hand, these skill measures are not highly correlated with the proximity

Table 5

The Probability That the Last Worker Hired Is Black: Estimated Equations for Each Metro Area, for Sample with High School or Less

	Atlanta		Detroit		Boston		Los Angeles		
Equation:	1	2	1	2	1	2	1	2	3
Transit distance (miles):									
0	.097	.086	.173	.180	.018	.019	.122	.119	.137
	(.059)	(.060)	(.068)	(.069)	(.039)	(.038)	(.062)	(.061)	(.057)
.01 to .25	.158	.145	.164	.170	.016	.024	.084	.078	.088
	(.067)	(.069)	(.072)	(.071)	(.061)	(.062)	(.064)	(.063)	(.059)
.26 to .50	.110	.097	.124	.139	−.019	−.019	.174	.171	.183
	(.096)	(.096)	(.085)	(.085)	(.054)	(.053)	(.080)	(.080)	(.077)
.51 to 1.00	−.012	−.024	.062	.072	.034	.040	.243	.244	.265
	(.135)	(.135)	(.113)	(.113)	(.066)	(.067)	(.103)	(.102)	(.099)
Distance black/Distance white	−.460	−.397	−.592	−.474	−.092	−.144	−.183	−.186	.018
	(.146)	(.167)	(.129)	(.166)	(.094)	(.116)	(.103)	(.104)	(.129)
Distance black/Distance Hispanic									−.363
									(.158)
Percent customers black	.506	.506	.434	.418	.569	.581	.343	.314	.308
(multiplied by 100)	(.127)	(.126)	(.136)	(.136)	(.133)	(.135)	(.160)	(.158)	(.161)
Percent customers Hispanic									−.001
									(.000)
Black respondent	.057	.057	.158	.131	.189	.191	.071	.074	.089
	(.081)	(.080)	(.100)	(.104)	(.178)	(.176)	(.103)	(.101)	(.103)
Hispanic respondent									.098
									(.053)
Central City		.048		.088		−.048		.044	.002
		(.063)		(.085)		(.069)		(.031)	(.037)
Observations	367	367	273	273	312	312	308	308	308
R^2	.334	.335	.385	.388	.290	.292	.223	.228	.255

Standard errors in parentheses. Sample restricted to jobs held by workers with a high school education or less. All equations include dummies for industry, establishment size, whether Affirmative Action is used in recruiting or hiring, work tasks, and hiring requirements. Also included are the percentage of non-professional/management employees covered by collective bargaining and a constant term.

of the firm to transit or to the minority population, and their omission from or inclusion in these equations does little to change the results on those effects. Some question[36] also remains as to whether these results represent the real skill deficiencies of black applicants or just those suspected or perceived by employers.[37] Nevertheless, the skill requirements of jobs must be considered when analyzing black employment rates at these firms.

The separate estimates in Table 5 for each metropolitan area show relatively strong effects of proximity to transit and to black residences in Atlanta and

[35] F-tests consistently reject the equality of coefficients across the four metropolitan areas at conventional levels of statistical significance in these equations.

[36] The requirement of specific experience becomes more significantly negative when general experience is omitted, and especially in separate estimates for black males. See Holzer (1995).

[37] For instance, statistical discrimination models (Cain 1986) would predict that employers' perceptions of skills across groups are correct on average, but that misperceptions might occur in individual cases. Since some of these skills (such as computer use) have grown much more important in recent years, a period of learning may be needed, during which employers' expectations about skill levels across groups adjust; the actual skill gaps across groups may themselves adjust over time, as relative improvements in test scores among blacks seem to suggest (Grissmer et al. 1994). On the other hand, these results are consistent with those found by O'Neill (1990), Ferguson (1993), and Neal and Johnson (1994), who find large effects of gaps in test scores on the relative wages of blacks.

Table 6
Accounting for Central City/Suburbs Difference in the Probability That the Last Worker Hired Is Black

	Pooled Sample	Atlanta	Detroit	Boston	Los Angeles without Hispanics	Los Angeles with Hispanics
Central City–Suburbs Difference	.183	.274	.380	.170	.050	.050
Percentage Explained By:						
Transit	12.7	20.6	8.3	5.6	−8.9	−9.9
Distance black/Distance white	30.9	33.7	36.8	30.0	2.2	−.2
Percent customers black	20.6	17.7	15.9	56.8	22.2	22.2
Black respondent	7.8	1.8	8.4	5.5	−.4	−.5
Percent customers Hispanic						−6.6
Hispanic respondent						−.3
Distance black/Distance Hispanic						71.1

especially Detroit, and relatively weak effects in Boston. The spatial pattern of public transit effects in Atlanta and Detroit is comparable to that observed in Table 2 with the pooled data: The effects are strongest for firms within a quarter mile of a transit stop and then dissipate for those more than one-half mile away.

To some extent, the relatively stronger estimated effects in some metropolitan areas than others may just reflect the relative concentrations of blacks in the populations of these areas; the larger this concentration, the greater should be the magnitude of a given change in proximity (to either transit or the black population) on the probability of employing blacks.[38] Alternatively, the differences in estimates across areas may reflect differences in factors such as the availability of public transit or the degree of segregation across these areas, with Detroit and Atlanta ranking relatively low on the first and high on the second.

In addition to the equations presented above, an equation was estimated for Los Angeles that included the firm's distance to the black population divided by its distance to Hispanics as well as the ratio of its distances to blacks and to whites. This specification was limited to the sample of firms in Los Angeles because that metropolitan area is the only one with significant variation between the locations of the white and Hispanic populations. We also control for the presence of Hispanics among customers and among survey respondents in this equation.

The results suggest that, in Los Angeles, a firm's relative distances to blacks and Hispanics play a greater role in determining black employment outcomes than does its relative distance to blacks and whites. This suggests greater substitutability between black and Hispanic labor in this area than between blacks and whites. A greater presence of Hispanics in the customer pool also reduces black employment probabilities, though Hispanic respondents have a more positive effect than whites on black employment.

To what extent do these explanatory variables account for gross racial differences in the data, such as the tendency of central city firms to hire more blacks than suburban firms? This question is addressed in Table 6, where decompositions are presented of the gross central city/suburban differences in black employment probabilities, based on the estimated coefficients from equations that include central city dummies reported in Tables 4 and 5.[39] In Table 6, results are presented only for those variables that account for major fractions of the gross central city/suburban differences.[40]

[38] This is true because changes in outcomes are measured in *percentage points* rather than percent terms (where the latter decline as the base grows). The effects of a given change in distance on the percentage points of black employment at a firm should be larger when that distance involves a larger change in the number of blacks located nearby, even though the percent effects might not be larger.

[39] Decompositions were done using an analog of the standard formula for omitted variable bias (see, for instance, Johnston 1972), multiplying each coefficient from the relevant equation in Table 4 or 5 by the corresponding coefficient from a regression of that variable on a central city dummy.

[40] The skill variables have negligible effects on the central city/suburban difference, which would be expected from the fact that some of these are actually higher in the central city (and would therefore contribute *negatively* to this differential). Differences in

The results show that the relative distance of the firm from the black population accounts for over 30 percent of the central-city/suburban racial employment difference in the pooled equation, while proximity to transit accounts for roughly 13 percent. Only in Los Angeles are these two effects negligible, with the relative distances to blacks and Hispanics accounting for most of the small central city effect.

The percent of customers who are black also has an important effect on this differential, in each of the four metropolitan areas. Also, the presence of a black respondent in the firm has noteworthy but more modest effects on the central city differential.[41]

One final consideration involves the extent to which the estimated effect of relative distance varies according to the method of recruitment used by the firm.[42] Since recruitment methods vary in the extent to which they rely on local populations as sources of job applicants, we might expect the effects of local distance to vary across these methods. Furthermore, the pattern of variation might tell us something about the underlying mechanisms through which distance effects operate.

Table 7 presents the coefficients (and standard errors) on the relative black/white distance variable, estimated separately for each recruitment method.[43] The results are presented for the entire sample and for workers with only a high school education or less.

The results show that relative distance has its strongest negative effects on black employment when recruitment is done through the posting of help-wanted signs. Similarly, the use of walk-ins results in strong negative distance effects, especially among the less-educated. Referrals from current employees and from other sources are also associated with significant negative distance effects. Referrals from various institutions (such as schools, unions, community agencies, or employment services) are generally associated with negative effects of varying magnitudes and significance levels that are limited by sample sizes. In contrast, the effects of distance when recruiting is done through newspapers are smaller and relatively insignificant.

Table 7
The Effect of Relative Distance to Blacks on the Probability that the Last Worker Hired Is Black: By Recruiting Method

Recruiting Method	Total Sample Distance Coefficient	High School or Less Distance Coefficient
Post help-wanted sign	−.768	−1.187
	(.208)	(.253)
Listed ad in newspaper	−.040	−.155
	(.082)	(.123)
Accepted walk-in	−.254	−.526
	(.114)	(.150)
Referrals from current employees	−.232	−.206
	(.077)	(.101)
Referrals from state employment service	−.040	−.291
	(.293)	(.389)
Referrals from private employment service	−.214	−.028
	(.171)	(.318)
Referrals from community agency	−.368	−.468
	(.362)	(.484)
Referrals from schools	−.055	−.647
	(.213)	(.321)
Referrals from union	.586	.286
	(.696)	(.837)
Referrals from other sources	−.253	−.243
	(.102)	(.167)

Standard errors in parentheses.

That distance has its most negative effects on blacks when firms recruit through walk-ins or signs is not surprising, since one would expect these methods to generate mostly applicants who live in close proximity to the firm. The general association between referral networks and distance is striking, and seems to confirm that such networks are at least partly geographically based.

In contrast, the relatively small estimated effects when recruiting is done through newspapers indicate that when firms choose to use this method in recruiting particular types of employees, they can overcome the adverse effects of distance by disseminating information over a wide geographic area.[44] The role of

industrial composition also contributed just a few percentage points to the locational difference in employment.

[41] Including the percentage of applicants at the firm who are black in these equations reduces the extent to which these variables, including the percentage of blacks among customers, account for the central city effect, but only by a few percentage points each.

[42] The estimated effects of proximity to public transit did not differ significantly by recruitment method.

[43] The results are based on an equation comparable to no. 2 in Table 4, except that the relative distance term is now interacted with each recruitment method.

[44] We note, however, that the choice of newspapers (or any other recruiting mechanism) may be endogenous with respect to the skill levels and characteristics of the workers whom the firm seeks to hire and to the jobs they are trying to fill. Results for any particular method might therefore not generalize to other types of

Table 8
Effect of Relative Distance to Blacks on Log Wage

A: Estimated Equations for Pooled Sample

	All Workers	Black Workers	Non-Black Workers
Equation No.			
1	.153 (.071)	.329 (.147)	.118 (.081)
2	.108 (.059)	.237 (.125)	.085 (.069)
3	.073 (.060)	.152 (.129)	.065 (.069)
4	.084 (.061)	.165 (.132)	.077 (.069)
Observations	2318	539	1779

B: Estimated Equations for All Workers By Metro Area

	Atlanta	Detroit	Boston	Los Angeles
Equation No.				
1	.195 (.118)	.448 (.263)	.261 (.124)	.053 (.155)
2	.278 (.103)	.333 (.213)	.086 (.110)	.032 (.139)
3	.175 (.105)	.262 (.218)	.057 (.107)	.013 (.144)
4	.196 (.109)	.290 (.223)	.191 (.129)	−.052 (.144)
Observations	622	567	548	581

C: Estimated Equations for Black Workers By Metro Area

	Atlanta	Detroit	Boston	Los Angeles
Equation No.				
1	.599 (.183)	.769 (.411)	−.325 (.500)	−.230 (.489)
2	.392 (.163)	.571 (.322)	−.447 (.677)	.039 (.650)
3	.295 (.170)	.500 (.345)	−.414 (.796)	.346 (.865)
4	.315 (.176)	.476 (.350)	−.564 (.723)	.664 (.922)
Observations	243	175	55	66

Standard errors in parentheses. Control variables entering each equation are as follows:

Equation 1: proximity of firm to transit; age, education, gender, and race of worker; distance to center of Central Business District; metro dummies.

Equation 2: variables in Equation 1; job tasks and hiring requirement variables; industry and size of firm; percentage of non-professional/managerial workers covered by collective bargaining.

Equation 3: variables in Equation 2; percent customers black; whether respondent is black; whether Affirmative Action used in hiring and recruiting.

Equation 4: variables in Equation 3; central city dummy.

information as a mechanism through which spatial effects sometimes operate is therefore suggested by these results.

Results of Wage Equations

If firms that locate relatively far away from the black population or from public transit effectively shift labor demand away from the black labor force, and if blacks cannot offset the effects of these shifts with their own residential relocations, then the wage levels of blacks should be lower. The wages of whites who work together with blacks (those who are complements to them in the production process) might be affected as well.[45]

Table 8 presents the results of estimated equations in which the dependent variable is the log of the starting hourly wage for the most recently hired employee. Results are presented for pooled samples across the metropolitan areas and across racial groups, as well as for all workers and for black workers only in each area separately. Coefficients are presented only for the relative distance of the firm to the black population.

workers or jobs. In this sample, the distance is somewhat more negative for newspapers when the sample is restricted to less-educated workers, though it remains statistically insignificant at conventional levels.

[45] This assumes, of course, that wages for these groups are not rigid, and that labor supply among blacks is not highly elastic.

Four specifications of each equation are presented that are similar to those estimated for Tables 4 and 5, above. Unlike the earlier equations, each contains a set of control variables for personal characteristics of the last worker hired, such as age, education, gender, and race (unless separate estimates are presented for blacks). All equations also control for the distance to the center of the Central Business District, in addition to the variables for transit and relative distance to blacks. The various firm- and job-specific variables (such as industry, size, collective bargaining, and the skill/task requirements) are added in the second equation, and the various other racial variables (for customers, firm respondent, and use of Affirmative Action) are added in the third, since these controls may partly capture the effects of relative distance.[46] The central city dummy is then added, in the fourth equation.

The employer's proximity to both public transit and the black residential population affects the likelihood of hiring black employees.

The results show that, *when controlling for the firm's distance to the Central Business District*, wages for employees rise with distance of the firm from the black population.[47] Controlling for additional characteristics of firms and jobs, as well as for various racial factors, reduces the magnitudes and significance levels of the estimates (though most remain at least marginally significant).[48] As before, effects of distance are generally largest in Detroit and (to a lesser extent) Atlanta; they are especially larger for blacks than for non-black workers in these two areas.

The magnitudes of these effects are not trivial. Using the smallest and largest coefficients for black workers in Detroit and Atlanta, we find that a standard deviation increase in firms' relative distance from blacks (while keeping distance from the Central Business District constant) raises the wages of their black employees by 5 to 10 percent in Atlanta and by 9 to 14 percent in Detroit.[49]

III. Discussion and Policy Implications

In this study, we have shown that employers' proximity to black residences and to public transit both increase the likelihood that they will hire black employees. It is likely that these effects occur at least partly because of reduced black access to firms located farther away, rather than solely because of a tendency of discriminatory employers to locate away from blacks. We also find that wages are somewhat lower for those who work relatively close to the black population. Both of these findings appear consistent with the notion of spatial mismatch, in which labor demand shifts away from black areas and labor supply adjustments among blacks are limited by housing segregation and other factors.

The fact that employers are, on average, relatively closer to the black populations than to the white ones does not imply that spatial factors play no role in the employment and earnings disadvantages of blacks. As we have noted above, the costs per mile of travel are substantially higher for black workers than for whites, and the jobs located relatively close to blacks (that is, those in central cities) have somewhat higher skill needs. More important, the greater distances for whites likely reflect their freedom to trade off longer commute times for better housing, whereas the locations of blacks are more constrained by housing market discrimination. Eliminating these constraints (either by reducing discrimination or providing housing vouchers) might enable at least some blacks to locate closer to suburban rather than central-city employers.

Furthermore, it would be incorrect to infer from these results that both blacks and whites merely

[46] If these firm and job characteristics are differentially distributed by location, and if the resulting differences in relative distances to the white and black populations are the primary reasons that these characteristics differ across workers by race, then controlling for these characteristics would reduce estimated racial differences that really should be attributed to spatial factors. But if these firm and job characteristics have major effects on who gets hired by race *independent of location*, then the controls should be included.

[47] Distance of the firm to the CBD has a strong negative effect on wages, thereby generating a fairly typical urban wage gradient. Relative distance to the black population has insignificant effects on wages in equations that fail to control for distance to the CBD.

[48] Distance coefficients in the third and fourth specifications are only marginally significant for blacks (that is, at the 10 percent level in a one-tailed test) and not at all for non-blacks in the pooled sample. Results for Boston and Los Angeles are generally quite weak, especially for blacks.

[49] These ranges represent changes of roughly 0.14 to 0.29 standard deviations of wages for blacks in Atlanta and of 0.21 to 0.33 standard deviations for blacks in Detroit.

choose to work relatively close to home, without there being any adverse effects on their employment outcomes. Elsewhere, we have shown that the ratios of vacant jobs to resident unemployed workers are higher in heavily white suburbs than in central cities and other areas with heavily black populations, thus suggesting that relative labor demand is lower near the residences of blacks (Ihlanfeldt 1995; Holzer 1996b).

The lower wages in areas closer to the residences of blacks reinforce the view that the labor demand is lower relative to supply in these areas. If wages in these areas were lower only for blacks, one might infer that those who work near their own communities are merely forgoing compensation for commute times. But we have found lower wages near black residences not only for blacks but for non-blacks as well (though the latter effects are smaller and less significant than those for blacks); and the finding in earlier work of a relative lack of compensation for commute times among blacks suggests that this phenomenon cannot explain the lower wages that we find among blacks working closer to their residences.

Another issue of interest is whether or not the spatial gap in relative labor demand is growing over time. Our evidence is limited to the percentages of jobs and people located in central city areas in the decennial Censuses, and even this evidence is somewhat mixed. Between 1980 and 1990, the percentages of the metropolitan area's employment and population located in the central city declined in all of the areas in our sample except Los Angeles; and percentage declines in employment were greater than percentage declines in population in the cities of Atlanta and especially Detroit (although in Boston the declines were more comparable).[50] Thus, in the two areas where the vast majority of blacks in our sample are located, and where relative distance was found to have its greatest effects on black employment and earnings, it appears that the spatial gap in relative demand for blacks grew worse in the 1980s, thereby contributing to their deteriorating employment and earnings rates during that time.[51]

Regarding the racial preferences of employers, our findings suggest that they do not fully account for the fact that employers farther away from blacks tend to hire them less frequently. Nonetheless, we do find evidence that these preferences matter; the percentages of blacks among customers, the presence of black survey respondents (who control hiring in these firms), and establishment size all are positively related to levels of black employment at firms, even when controlling for the firm's proximity to the black population and the presence of blacks among applicants.

Racial preferences of employers matter; the percentages of blacks among customers, the presence of blacks who control hiring, and establishment size all are positively related to levels of black employment at firms.

The variety of skill needs on the job also is associated with reduced hiring of blacks. Elsewhere, we have shown that these skill needs have grown in magnitude over time, and that they are associated with higher wages (Holzer 1995). Taken together, these results imply that rising skill needs have also contributed to the relative declines in the employment and earnings of blacks in recent years.

Regarding the policy implications of our findings, by specifying at least two of the mechanisms through which spatial factors affect black employment rates, the results do suggest some particular responses to the mismatch problem. Transportation programs to generate more reverse commuting, whether implemented

[50] The declines in employment and population during the decade were roughly 7 and 6 percentage points in Atlanta and 4.5 and 3.5 percentage points in Detroit. In both areas, the fractions of suburban residents commuting into the city for work declined quite substantially (26 percent to 21 in Atlanta and 16 percent to 12 in Detroit), while commuting patterns of central-city residents changed much less, again suggesting that relative distances improved for suburban workers.

[51] The greater declines in employment and population in Atlanta and Detroit than in Boston and Los Angeles are consistent with the pattern noted by Frey and Farley (1993) in which rising immigrant populations caused some central-city areas to grow substantially while white and black residents in most areas continued to suburbanize. Indeed, they note that residential segregation among blacks declined the most in areas with substantial numbers of immigrants, which is consistent with the relatively greater and growing distance problems of blacks in Atlanta and Detroit. Kain (1992) also argues that central-city and suburban patterns in population growth and employment understate the rising distance problems for blacks in many areas, since black suburbanites generally locate relatively near the central city while employers and white suburbanites both locate farther away. The latter observation parallels the one made by Kasarda (1995) on the growth of "edge cities" in many metropolitan areas.

through mass transit or other approaches such as van pools, may be relatively more effective in raising the employment of blacks among suburban firms than was previously thought. Residential mobility programs (such as Gautreaux or the more recent "Moving to Opportunity" programs), which might enable more blacks to locate near suburban employers, also appear to have some real potential for raising employment rates and earnings among blacks. Our evidence on recruiting methods suggests that efforts to better disseminate information about jobs distant from blacks could have some payoff as well, especially if combined with residential mobility or transportation programs.

Of course, the large estimated effects of employer skill needs and racial preferences on racial hiring patterns also suggest the importance of education and job training policies and antidiscrimination efforts by the government. Indeed, the spatial policies described above should be thought of as *complements* to these other approaches rather than substitutes; combining mobility programs with skill enhancement of inner-city minorities and government monitoring of their prospective employers is likely to make such programs all the more effective.

Although a more complete appraisal of the costs and benefits of various mobility policies is well beyond the scope of this paper, our findings give us at least some hope that successful policy responses can be developed to the adverse spatial conditions that currently plague many blacks.

References

Becker, Gary S. 1971. *The Economics of Discrimination*. Chicago: University of Chicago Press.

Bound, John and Richard Freeman. 1992. "What Went Wrong? The Erosion of Relative Earnings and Employment for Blacks." *Quarterly Journal of Economics*, vol. 107, no. 1, pp. 201–32.

Cain, Glen. 1986. "The Economic Analysis of Labor Market Discrimination: A Survey." In O. Ashenfelter and R. Layard, eds., *Handbook of Labor Economics*, Amsterdam: North-Holland.

Card, David and Thomas Lemieux. 1994. "Changing Wage Structure and Black-White Wage Differentials." *The American Economic Review*, vol. 84, no. 2, pp. 29–33.

Carrington, William, Kristin McCue, and Brooks Pierce. 1995. "On Using Establishment Size to Measure the Impact of Title VII and Affirmative Action." Working Paper No. 347, Johns Hopkins University, June.

Carrington, William and Kenneth Troske. 1995. "Interfirm Segregation and the Black-White Wage Gap." Working Paper No. 349, Johns Hopkins University, August.

Cutler, David and Edward Glaeser. 1995. "Are Ghettoes Good or Bad?" National Bureau of Economic Research, Working Paper No. 5163.

Ellwood, David. 1986. "The Spatial Mismatch Hypothesis: Are There Jobs Missing in the Ghetto?" In Richard Freeman and Harry Holzer, eds., *The Black Youth Employment Crisis*. Chicago: University of Chicago Press.

Ferguson, Ronald. 1993. "New Evidence on the Growing Value of Skill and Consequences for Racial Disparity and Returns to Schooling." Mimeo, Harvard University.

Fix, Michael and Raymond Struyk. 1994. *Clear and Convincing Evidence*. Washington, D.C.: Urban Institute Press.

Freeman, Richard. 1977. "Fixed Coefficient and Manpower Analysis of Labor Markets: A Synthesis." In Ronald Ehrenberg, ed. *Research in Labor Economics*, Volume 1. Greenwich, CT: JAI Press.

Frey, William and Reynolds Farley. 1993. "Latino, Asian, and Black Segregation in Multi-Ethnic Metro Areas: Findings from the 1990 Census." Working Paper No. 93–278, Population Studies Center, University of Michigan.

Grissmer, David, Sheila Kirby, Mark Berends, and Stephanie Williamson. 1994. "Student Achievement and the Changing American Family." Rand Corporation.

Holzer, Harry J. 1987. "Informal Job Search and Black Youth Unemployment." *The American Economic Review*, vol. 77, no. 3, pp. 446–52.

———. 1991. "The Spatial Mismatch Hypothesis: What Has the Evidence Shown?" *Urban Studies*, vol. 28, no. 1, pp. 105–22.

———. 1994. "Black Employment Problems: New Evidence, Old Questions." *Journal of Policy Analysis and Management*, vol. 13, no. 4, pp. 699–722.

———. 1995. "Employer Skill Needs and Labor Market Outcomes." Working Paper No. 84, Russell Sage Foundation, December.

———. 1996a. "Employer Hiring Decisions and Antidiscrimination Policy." In Richard Freeman and Peter Gottschalk, eds., *Demand-Side Strategies for Low-Wage Labor Markets*. New York: Russell Sage Foundation.

———. 1996b. *What Employers Want: Job Prospects for Less-Educated Workers*. New York: Russell Sage Foundation.

Holzer, Harry J., Keith R. Ihlanfeldt, and David J. Sjoquist. 1994. "Work, Search and Travel Among White and Black Youth." *Journal of Urban Economics*, vol. 35, no. 2, pp. 320–45.

Hughes, Mark and Janice Madden. 1991. "Residential Segregation and the Economic Status of Black Workers: New Evidence for an Old Debate." *Journal of Urban Economics*, vol. 32, no. 1, pp. 28–49.

Hughes, Mark and Julie Sternberg. 1992. *The New Metropolitan Reality*. Washington, D.C.: Urban Institute.

Ihlanfeldt, Keith R. 1995. "Information on the Spatial Distribution of Job Opportunities Within Metropolitan Areas." Mimeo, Georgia State University.

Ihlanfeldt, Keith R. and David J. Sjoquist. 1990. "Job Accessibility and Racial Differences in Youth Employment Rates." *The American Economic Review*, vol. 80, no. 3, pp. 267–76.

———. 1991. "The Effect of Job Access on Black Youth Employment: A Cross-Sectional Analysis." *Urban Studies*, vol. 28, no. 2, pp. 255–65.

Ihlanfeldt, Keith R. and Madelyn Young. 1996. "The Spatial Distribution of Black Employment between the Central-City and the Suburbs." *Economic Inquiry*, forthcoming.

Jencks, Christopher and Susan Mayer. 1989. "Residential Segregation, Job Proximity and Black Job Opportunities: The Empirical Status of the Spatial Mismatch Hypothesis." In Michael McGeary and Lawrence Lynn, eds., *Concentrated Urban Poverty in America*. Washington, D.C.: National Academy Press.

Johnston, John. 1972. *Econometric Methods*, Second Edition. New York: McGraw Hill.

Juhn, Chinhui, Kevin Murphy, and Brooks Pierce. 1993. "Wage

Inequality and the Rising Returns to Skill." *Journal of Political Economy*, vol. 101, no. 2, pp. 410–42.

Kain, John. 1968. "Housing Segregation, Negro Employment and Metropolitan Decentralization." *Quarterly Journal of Economics*, vol. 82, no. 3, pp. 175–97.

———. 1992. "The Spatial Mismatch Hypothesis Three Decades Later." In *Housing Policy Debate: Discrimination in the Housing and Mortgage Markets*. Washington, D.C.: Fannie Mae.

Kasarda, John. 1995. "Industrial Restructuring and the Consequences of Changing Job Locations." In Reynolds Farley, ed., *State of the Union*. New York: Russell Sage Foundation.

Kling, Jeffrey. 1995. "High Performance Work Systems and Firm Performance." *Monthly Labor Review*, vol. 18, no. 5, pp. 29–36.

Leonard, Jonathan. 1987. "The Interaction of Residential Segregation and Employment Discrimination." *Journal of Urban Economics*, vol. 21, no. 4, pp. 323–46.

———. 1990. "The Impact of Affirmative Action Regulation and Equal Opportunity Law on Black Employment." *Journal of Economic Perspectives*, vol. 4, no. 4, pp. 47–63.

Massey, Douglas and Nancy Denton. 1992. *American Apartheid*. New York: Basic Books.

Mieskowski, Peter and Edwin Mills. 1992. "The Determinants of Employer Location." Paper Presented at the TRED Conference, Lincoln Institute, October.

Moss, Philip and Chris Tilly. 1992. "Why Black Men Are Doing Worse in the Labor Market: A Review of Supply-Side and Demand-Side Explanations." New York: Social Science Research Council.

Nardinelli, Clark and Curtis Simon. 1990. "Customer Racial Discrimination in the Market for Memorabilia: The Case of Baseball." *Quarterly Journal of Economics*, vol. 105, no. 3, pp. 575–96.

Neal, Derek and William Johnson. 1994. "The Role of Pre-Market Factors in Black-White Wage Differences." Mimeo, University of Chicago.

O'Neill, June. 1990. "The Role of Human Capital in Earnings Differences Between White and Black Men." *Journal of Economic Perspectives*, vol. 4, no. 4, pp. 25–45.

O'Regan, Katherine and John Quigley. 1996. "Spatial Effects upon Employment Outcomes: The Case of New Jersey Teenagers." *New England Economic Review*, this issue.

Rosenbaum, James and Susan Popkin. 1991. "Employment and Earnings of Low-Income Blacks Who Move to Middle-Class Suburbs." In Christopher Jencks and Paul Peterson, eds., *The Urban Underclass*. Washington, D.C.: The Brookings Institution.

Turner, Marjorie. 1992. "Discrimination in Urban Housing Markets: Lessons from Fair Housing Audits." *Housing Policy Debate*, Washington, D. C.: Fannie Mae.

Yinger, John. 1995. *Closed Doors, Opportunities Lost*. New York: Russell Sage Foundation.

Zax, Jeffrey. 1991. "Compensation for Commutes in Labor and Housing Markets." *Journal of Urban Economics*, vol. 30, no. 2, pp. 192–207.

Discussion

James E. Rosenbaum, Professor of Sociology, Education, and Social Policy, Northwestern University.

This paper by Harry Holzer and Keith Ihlanfeldt is an important contribution to the study of the "spatial mismatch hypothesis." Much of our knowledge has come from worker surveys, and their employer survey gives a different perspective, with better information about types of jobs, skill demands, and hiring requirements than most worker surveys offer. I have a number of quibbles about some measures, but these strong findings are remarkable. Indeed, better measures might give even stronger results.

The analyses show that employer proximity to black residences and to public transit increases the likelihood that employers will hire black employees. This is a strong finding, and it holds up after many controls. Task requirements of math or computer skills reduce black hiring, although talking to customers and reading/writing tasks do not. While two hiring requirements affect black hiring (college diploma and vocational training), others have no effect.

Recruiting method, which Holzer (1987) has studied elsewhere, is discussed only briefly here. Holzer and Ihlanfeldt stress that employers using help-wanted signs, walk-ins, and employee referrals have strong negative distance influences on black hiring, especially for applicants with high school education or less. They also find that school referrals have a strong effect (about twice its standard error), a point we will return to later.

The authors find that employers' relative distance from blacks increases wages. However, these effects may largely reflect firm attributes, for they nearly vanish after firm attributes are controlled in the total model, and they are severely reduced in the equation for blacks' wages. The authors say that the estimated distance effects "remain at least marginally significant," but the table suggests that after controls, few coefficients are twice their standard error, and then mostly in one city—Atlanta. At best, the wage effects seem ambiguous.

As is always the case with nonexperimental data, one must wonder about some of the findings: in this case, whether the black workers hired in white suburbs are somehow distinctive individuals in ways not captured by controls. The controls are as good as one finds in most studies, but such doubts can never be completely dispelled by survey methods.

Here I can provide some supportive evidence. In Chicago's Gautreaux residential mobility program, low-income blacks who applied to the program were randomly assigned to move to city or suburban areas, creating a quasi-experimental design. We studied city moves to predominantly black, low-income areas, and suburban moves to predominantly white, middle-income areas, scattered over 120 towns in the six counties around Chicago. The study of 300 adults found significantly higher employment among those in the suburbs than among those in the city, but earnings and hours per week were not different, even after extensive controls (Popkin, Rosenbaum, and Meaden 1993). In a study of 107 children, suburban movers were more likely to graduate from high school, attend college, and attend four-year colleges. Among those who did not attend college, suburban movers were more likely to get jobs and to get jobs with better pay and benefits (Kaufman and Rosenbaum 1992). The outcome differences between city and suburban movers were large for adults and even larger for children (Rosenbaum 1995; Rosenbaum et al. 1991; and see my Tables 1 to 3).

The adult findings in that quasi-experimental study support Holzer and Ihlanfeldt's findings that

Table 1
Percent of Respondents Employed Post-Move, Classified by Pre-Move Employment, for Movers to City and to Suburbs

	Pre-Move		
	Employed	Unemployed	Total
City Post-Move			
Employed	42 (64.6%)	13 (30.2%)	55
Unemployed	23 (35.4%)	30 (69.8%)	53
Total	65	43	108
Suburb Post-Move			
Employed	106 (73.6%)	37 (46.2%)	143
Unemployed	38 (26.4%)	43 (53.8%)	81
Total	144	80	224

[a]Numbers in parentheses are column percentages.
Source: Popkin, Rosenbaum, and Meaden (1993).

Table 2
City and Suburban Comparison on Wages and Hours Worked

	Pre-Move Mean	Post-Move Mean	t	p
City Movers	N = 55	42		
Hourly wages	$5.04	$6.20	6.52	.00
Hours/Week	33.27	31.92	−.60	.55
Suburban Movers	N = 143	106		
Hourly wages	$4.96	$6.00	6.50	.00
Hours/Week	33.62	33.39	−.60	.55

Source: Popkin, Rosenbaum, and Meaden (1993).

reduced distance can improve employment, but their findings also suggest that reduced distance may not raise adults' wages. To improve adults' wages, I suspect that programs must not only get people to the job, they must also provide people with the qualifications employers seek and with signals of those qualifications that employers trust. This suggests an interaction term—that applicants with trusted signals of qualifications will get larger pay gains from mobility programs than other applicants. People who lack qualifications, or lack trusted signals of them, will only get the same kinds of low-paid jobs in the suburbs that are available in the city.

To understand why, we must consider what qualifications employers want. According to most employer surveys, the employer's highest priority is the worker's personality. While scholars argue that employers ought to stress academic skills, one cannot ignore employers' stated concerns. In interviews with 51 employers, we found that employers' concerns about workers' personalities do not arise from subtle preferences but from terrible experiences with workers who do not come to work, do not do their share, disobey supervisors, harass or fight co-workers, and damage property (Rosenbaum and Binder 1994). Unfortunately, some employers feel such behaviors are associated with urban blacks and urban public schools, so mobility programs must do more than transport black workers to an employer's door.

What signals do employers use to infer applicants' qualifications? Many studies show that employers do not use high school diplomas, grades, or references in hiring (Bishop 1989; Rosenbaum et al. 1990; Rosenbaum 1996), even though cognitive skills predict wages six years after graduation (Murnane, Willett, and Levy 1994). Holzer and Ihlandfeldt also find that many hiring requirements have no effect. The employers we interviewed suggest an explanation: They believe that high school diplomas and good recommendations say little about applicants' work habits and do not even guarantee eighth-grade math and reading skills.

Instead of using such indicators, employers devise a variety of procedures that they believe screen out bad risks, but unfortunately their procedures are likely to be both ineffective and discriminatory. Employers report that they expect good workers to have a firm handshake, traditional hair styles, certain clothing styles, and so on (Rosenbaum and Binder 1994). Some of their "tests" entail conflicting demands, like those of the employer who expected applicants to speak assertively but not be insolent to supervisors.

This kind of desperate quasi-rational grasping for signals about applicants sounds a lot like statistical discrimination. This is both bad news and good news. It is bad news, because it indicates racial bias. But while bias based on prejudice can be reduced only by attitude change or coercive policies, statistical discrimination can be reduced simply by giving employers better signals than the discriminatory ones they are now using. For instance, a study of 185 employers finds that employers' hiring practices "do not discriminate against all black applicants, but simply against those they perceive as lower-class" and lacking in certain skills (Neckerman and Kirschenman 1990, p. 20). That study also finds that employers who use skill tests to discern applicants' abilities are

Table 3
Youths' Education and Job Outcomes: City-Suburban Comparison

Percent	City	Suburb	Sig.[a]
Number of youths	39	68	
Drop out of school	20	5	*
College track	24	40	**
Attend college	21	54	***
Attend four-year college	4	27	**
Employed full-time (if not in college)	41	75	****
Pay under $3.50/hour	43	9	****
Pay over $6.50/hour	5	21	****
Job benefits	23	55	****

[a]Significance of chi-square or t-test: *p < .10, **p < .05, ***p < .025, ****p < .005.
Source: Rosenbaum (1995); Rosenbaum et al. (1991).

more likely to hire blacks than those who do not use such tests. Apparently, if employers are reassured about applicants' skills, they are more likely to hire blacks.

These considerations have important implications for transportation programs, since transportation programs may have difficulty providing such information, for two reasons. First, residential location, which is usually considered a distance factor, is also a signal. It is among the ad hoc procedures employers use for assessing applicants. Many employers consider a housing-project address, a central-city address, or attendance at a city public school as signals of poor workers. Transportation programs will not fix these residential barriers.

Second, transportation programs do not help applicants present dependable information about themselves to employers. Indeed, they may move people away from the informal networks that could signal their positive attributes. Studies by Granovetter (1995) and Holzer (1987) find that informal contacts improve hiring. Holzer and Ihlanfeldt show that school referrals affect hiring. Bishop (1993) finds that references from vocational teachers and previous supervisors (particularly ones known by an employer) have significant positive effects on worker productivity. In contrast, more anonymous recommendations, from previous personnel offices and public employment agencies, have negative effects on productivity. (See also Kariya and Rosenbaum 1995.)

In a detailed qualitative study of 51 employers, we found that some employers use teacher contacts as a way of getting trusted information about students' work habits. Moreover, these contacts are particularly important for minorities. If a trusted teacher recommends a black to be as good as previously recommended whites, then employers are willing to take a chance that they would not have taken otherwise (Rosenbaum and Miller 1995; Rosenbaum and Jones 1995).

In another study, analyses of the High School and Beyond data find that school help is an important source of first jobs for some students. We find that females and minorities are more likely to get their first jobs from school help than are white males. We also find that while white males get the largest wage benefits from school help, black males also get significant wage benefits that they would not have gotten without that help (Rosenbaum, Roy, and Kariya 1995).

Thus, while Holzer and Ihlanfeldt advocate both transportation and residential mobility programs, our analysis suggests some difficulties with transportation programs. While they can make distant employers more available, they do not counteract employers' use of urban addresses as negative signals and they do not necessarily get trustworthy information about workers to employers. In contrast, residential integration gives blacks "non-stigmatized addresses," and it may help residents get informal signals from their church, neighbors, or schools that employers may trust.

Of course, the strongest findings in my studies have been for children. The biggest gains from residential mobility appear in the second generation. I do not know of another program for low-income black youth that doubles the rates of college attendance, employment, good pay, and job benefits. The employment gains came in part from informal contacts that teenagers made with local employers. Obviously, children's gains cannot come from adult transportation programs, unless we also provide school busing.

The biggest gains from residential mobility appear in the second generation. I do not know of another program for low-income black youth that doubles the rates of college attendance, employment, good pay, and job benefits.

In sum, I conclude that reducing distance barriers may be necessary, but not sufficient. For urban blacks to get better-paid jobs, they must be able to present credentials that reassure employers about their qualifications. Mobility programs will be most effective at raising wages if they can certify participants. They must reassure employers that these urban blacks differ from employers' stereotypes, which now create their statistical discrimination. Mobility programs that also provide certification of workers' academic skills, school attendance and behavior, previous work experience, or previous volunteering experience will have greater effectiveness at overcoming employers' statistical discrimination. Transportation programs may be able to do this, but they may have greater difficulties than residential mobility programs. To the extent that informal networks are employers' most trusted source of information (as our studies imply), residential integration is more likely than transportation programs to

help blacks get their qualifications communicated through such informal networks.

Interestingly, housing programs can also make use of signals to overcome statistical discrimination by landlords and neighbors. The Gautreaux program used some selection criteria to reassure landlords that participants had good rent payment records and did not destroy their apartments. These were not stringent selection criteria. They eliminated only one-third of applicants, but they helped persuade landlords to take participants. Cincinnati's HOME program used similar selection criteria to win landlord support. Unfortunately, a federal demonstration program to replicate Gautreaux, Moving to Opportunity, did not clearly state such assurances, and the city of Baltimore panicked over nightmarish visions of felony criminals sweeping through the suburbs. Failure to deal with statistical discrimination can undermine the effectiveness of housing mobility programs, just as it undermines employment.

References

Bishop, John. 1989. "Why the Apathy in American High Schools?" *Educational Researcher*, vol. 18, no. 1, pp. 6–10.

———. 1993. "Improving Job Matches in the U.S. Labor Market." *Brookings Papers: Microeconomics*, pp. 335–400. Washington, D.C.: The Brookings Institution.

Granovetter, Mark. 1995. *Getting a Job*. 2nd Ed. Chicago, IL: University of Chicago Press.

Holzer, Harry. 1987. "Informal Job Search and Black Youth Unemployment." *The American Economic Review*, vol. 77, no. 3 (June), pp. 446–52.

Kariya, Takehiko and James Rosenbaum. 1995. "Institutional Linkages between Education and Work as Quasi-Internal Labor Markets." *Research in Social Stratification and Mobility*, vol. 14, pp. 101–36.

Kaufman, Julie and James Rosenbaum. 1992. "The Education and Employment of Low-Income Black Youth in White Suburbs." *Educational Evaluation and Policy Analysis*, vol. 14, no. 3 (Fall), pp. 229–40.

Murnane, Richard J., John B. Willett, and Frank Levy. 1994. "The Growing Importance of Cognitive Skills in Wage Determination." Unpublished paper, Graduate School of Education, Harvard University.

Neckerman, Kathryn M. and J. Kirschenman. 1990. "Hiring Strategies, Racial Bias, and Inner-City Workers." Paper presented at the annual meeting of the American Sociological Association, Washington, D.C., August 11.

Popkin, Susan, James Rosenbaum, and Patricia Meaden. 1993. "Labor Market Experiences of Low-Income Black Women in Middle-Class Suburbs." *Journal of Policy Analysis and Management*, vol. 12, no. 3, pp. 556–73.

Rosenbaum, James. 1995. "Housing Mobility Strategies for Changing the Geography of Opportunity." *Housing Policy Debate*, vol. 6, no. 1, pp. 231–70.

———. 1996. "Policy Uses of Research on the High School-to-Work Transition." *Sociology of Education* (forthcoming).

Rosenbaum, James and Amy Binder. 1994. "Do Employers Really Need More Educated Youth?" Presented at the annual meeting of the American Sociological Association. Los Angeles, August 7.

Rosenbaum, James and Stephanie Jones. 1995. "Creating Linkages in the High School-to-Work Transition." In *Restructuring Schools*, ed. Maureen Hallinan, pp. 235–58. New York: Plenum.

Rosenbaum, James and Takehiko Kariya. 1991. "Do School Achievements Affect the Early Jobs of High School Graduates?—Results from the High School and Beyond Surveys in the United States and Japan." *Sociology of Education*, vol. 64, no. 2 (April), pp. 78–95.

Rosenbaum, James, Takehiko Kariya, Richard Settersten, and Tony Maier. 1990. "Market and Network Theories of the Transition from High School to Work: Their Application to Industrialized Societies." *Annual Review of Sociology*, vol. 16, pp. 263–99.

Rosenbaum, James and Shazia R. Miller. 1995. "Moving In, Up, or Out: Tournaments and Other Institutional Signals of Career Attainment." In *Boundaryless Careers*, ed. M. Arthur and D. Rousseau. Oxford, U.K.: Oxford University Press.

Rosenbaum, James, Susan Popkin, Julie Kaufman, and Jennifer Rusin. 1991. "Social Integration of Low-Income Black Adults in Middle-Class White Suburbs." *Social Problems*, vol. 38, no. 4 (November), pp. 448–61.

Rosenbaum, James, Kevin Roy, and Takehiko Kariya. 1995. "Do High Schools Help Some Students Enter the Labor Market?" Paper presented at the annual meeting of the American Sociological Association, Washington, D.C., August.

Equality of Educational Opportunity Revisited

John F. Kain and Kraig Singleton

Henry Lee Professor of Economics and Professor of Afro-American Studies at Harvard University, and Research Associate, Department of Afro-American Studies at Harvard University, respectively. *The research reported in this paper was assisted by a grant from The Spencer Foundation. The data presented, the statements made, and the views expressed are solely the responsiblility of the authors.*

The title of this paper refers to *Equality of Educational Opportunity*, a pathbreaking study of the nation's public schools prepared for the U. S. Office of Education nearly 30 years ago (Coleman et al. 1966). The most obvious similarity between the study described in this paper and the Coleman Report, as the earlier study is popularly known, is the extent of their data collection efforts.

Mosteller and Moynihan (1972, p. 5) describe the Coleman Report as the "second largest social science research project in history," noting that the survey (EEOS) it relied upon tested "Some 570,000 school pupils" and "some 60,000 teachers" and gathered elaborate "information on the facilities available in some 4,000 schools." In comparison, the research on Texas elementary schools described in this paper is based on five years of micro panel data for more than 1.8 million children in five student cohorts attending more than 4,500 elementary schools during the years 1990 to 1994. We have obtained results of five statewide achievement tests for two cohorts and two tests for a third, as well as extensive micro data for more than 235,000 individuals teaching in grades pre-K through 8 during the 1990–94 period. The measures of school inputs used in this paper are constructed from individual data for 230,697 individuals employed by Texas public schools in grades pre-K through 8 at any time during the years 1990 to 1994.

In the manner of the Coleman Report, this paper examines (1) the extent of racial segregation both among and within districts; (2) differences in achievement on standardized tests among five racial/ethnic groups (African-Americans, Anglos (non-Hispanic Anglos), Asian-Americans, Hispanics, and Native Americans); and (3) the extent and nature of the variation in several school quality measures within individual school districts. The Coleman Report also estimated educational production functions, in an effort to quantify the relationship between student achievement and the quantity and quality of school inputs and other factors. This paper does not, although their estimation is a major goal of

the larger study of which the research described here is a part.

Most of the analyses included in the Coleman Report were for the 6th grade and above. In contrast, our study is limited to grades pre-K through 6. This was a deliberate decision that reflects our beliefs that the educational disadvantage of minority children has its origins, and must be corrected, in the early grades, when schools all too often fail to provide them with the basic skills they need to succeed in school and subsequently in the workplace (Farkas et al. 1995). In addition, we anticipated that the greater homogeneity of elementary schools would make it more likely that we would be successful in our efforts to distinguish the effects of school inputs, peers, family background, and other factors on achievement.

Principal Findings of the Coleman Report

Coleman et al. (1966) found that children attending the nation's schools were highly segregated by race. They also expected to find large quality differences between predominantly minority and predominantly majority schools. In an interview published in the *Southern Education Report* (November–December 1965), Coleman, anticipating the results of the Coleman Report, stated:

> [T]he study will show the difference in the quality of schools that the average Negro child and the average white child are exposed to. You know yourself that the difference is going to be striking. And even though everybody knows there is a lot of difference between suburban and inner city schools, once the statistics are there in black and white, they will have a lot more impact (cited in Mosteller and Moynihan 1972, p. 8).

The expectations of Coleman and others were not realized. Mosteller and Moynihan (1972, p. 8), summarize Coleman et al.'s (1966) findings on differences in school inputs as follows: "[W]hile there are reported differences in those available to the majority as against the minority groups, they are surprisingly small differences. And while on balance the differences favor the majority, it is by no means the case that they consistently do so."

Coleman et al. (1966) did not stop with quantifying the variation in school inputs among schools with different racial and ethnic compositions. They included school input measures and other explanatory variables in educational production functions designed to explain variations in individual student achievement. Setting forth a view that was novel at the time but has recently become more widely accepted as a result of Hanushek's several survey articles (1981, 1986, and 1989), they found that variations in the school input measures included in their analysis had very little impact on student performance on standardized tests.

A fair amount of confusion arose in subsequent discussions of the Coleman Report because its authors did not classify teachers or peers as school inputs. They did, however, include these variables in their educational production functions. As the following summary of the report's findings by Mosteller and Moynihan (1972, p. 20) reveals, Coleman et al. (1966) also found that teachers had little effect on achievement.

> Teachers appeared to matter, at least for Negroes. A list of variables concerning such matters as teachers' scores on a vocabulary test, their own level of education, their years of experience, showed little relation to achievement of white students, but some for Negroes, and increasingly with higher grade levels. Even so, none of these effects was large; the between-school variance was so little to begin with, dividing it up, parceling it out between this factor and that, produced unimpressive results at best, and demoralizing at worst.

Turning to peer effects, Coleman et al. (p. 302) stated that "*Attributes of other students account for more variation in the achievement of minority group children than do attributes of staff*" [their italics], adding that "a pupil's achievement is strongly related to the educational backgrounds and aspirations of the other students in the school" and that "children from a given family background, when put in schools of different social composition, will achieve at quite different levels."

The Extent of Racial/Ethnic Segregation: Then and Now

Coleman et al. found that the nation's schools were highly segregated by race. Writing in 1966, they found that 65 percent of all Negro students in the 1st grade went to schools that were between 90 and 100 percent Negro. While it may not be true in some other parts of the country, public schools in Texas and in other parts of the South are now much less segregated by race than they were at the time the Coleman Report was completed (Welch et al. 1987). Table 1 shows the percentages of black, black and Hispanic, and Anglo students attending campuses with varying percentages of their enrollments of the same racial/ethnic mix. (Throughout this paper, blacks are defined as

Table 1

Percent of Black, Black plus Hispanic, and Anglo Students[a] by Campus Percent Black, Black plus Hispanic, and Anglo: State of Texas and Large Texas MSAs

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Percent Black Students		Percent Black + Hispanic Students		Percent Anglo Students	
Campus Percentage	1990	1994	1990	1994	1990	1994
Entire State						
0–10	12.5	14.2	1.7	1.6	1.5	1.3
11–20	15.4	17.2	5.1	5.7	1.9	2.2
21–30	13.8	13.4	8.1	8.4	3.3	3.1
31–40	10.2	10.6	9.3	10.6	5.2	5.0
41–50	7.3	10.9	9.2	11.3	8.0	7.2
51–60	7.1	6.5	10.0	10.1	9.5	10.5
61–70	5.3	4.9	8.4	8.5	12.6	14.1
71–80	5.3	5.2	7.9	8.2	17.1	16.8
81–90	6.7	6.0	7.0	8.2	23.0	24.5
>90	16.5	11.1	33.4	27.4	17.0	15.3
All	100.0	100.0	100.0	100.0	100.0	100.0
>50	40.8	33.6	66.7	62.4	79.2	81.2
Large MSAs						
0–10	12.3	13.9	1.4	1.5	1.8	1.6
11–20	15.2	15.5	4.6	4.4	2.2	2.7
21–30	11.7	11.6	5.9	6.2	3.9	3.8
31–40	6.8	7.4	6.4	7.8	5.0	5.3
41–50	5.3	9.3	6.6	7.4	8.0	6.8
51–60	7.1	6.5	8.2	7.7	8.6	9.4
61–70	3.7	5.3	6.5	6.3	12.5	13.8
71–80	5.6	6.6	6.9	9.6	17.3	16.1
81–90	8.5	8.0	7.5	10.0	23.7	26.3
>90	23.7	16.0	46.0	39.1	17.0	14.2
All	100.0	100.0	100.0	100.0	100.0	100.0
>50	48.7	42.4	75.1	72.7	70.4	70.4

[a]Data for 1990 cover pre-K to grade 3 enrollments, 1994 data grades 3 to 7.

non-Hispanic blacks, Anglos as non-Hispanic whites, and all Hispanics as Hispanics.) As the data in the second column of Table 1 indicate, only 16.5 percent of black children enrolled in grades pre-K through 3 in 1990 attended schools that were 90 percent or more black. The same statistic for black students enrolled in grades 3 to 7 in 1994 was only 11.1 percent.

Some care should be taken in reading Table 1 because its interpretation depends on which column is being considered. Campus percentage (column (1)) refers to campus percent black for columns (2) and (3), to campus percent black plus Hispanic for columns (4) and (5), and to campus percent Anglo for columns (6) and (7). Coleman and his coauthors found that 80 percent of all Anglo 1st-grade students went to schools that were between 90 and 100 percent Anglo in 1967. The situation is very different in Texas today; only 17.0 percent of Anglo students in 1990 and 15.3 percent in 1994 attended schools that were more than 90 percent Anglo.

The bottom panel of Table 1 reveals that racial concentration is much greater in the seven largest Texas MSAs. For these areas, the percentage of black students in the respective grades who attended public schools that were more than 90 percent black was 23.7 in 1990 and 16.0 in 1994. While these shares are significantly higher than the statewide figures, they are much lower than they were nationwide in 1967.

With the rapid growth of Texas's low-income Hispanic population, the use of campus percent black as the sole indicator of school racial composition increasingly is seen as incomplete and possibly misleading. The two columns labeled "Percent Black + Hispanic Students" in Table 1 show the impact of including both blacks and Hispanics in the definition of the campus minority share. When this is done, the 1994 percent of black and Hispanic students (grades 3 to 7) who are enrolled at campuses in large MSAs that are greater than 90 percent black plus Hispanic is seen to be to 39.1 percent; the same statistic using a greater than 50 percent cut-off is 72.7 percent.

Texas is a large and heterogeneous state with great racial and ethnic diversity by region and metropolitan area. The racial/ethnic composition of its public schools cannot be meaningfully assessed without an understanding and appreciation of this diversity. Table 2 gives 1994 enrollment shares (grades 3 to 7) for the state's four largest racial/ethnic groups for the entire state, for large and small metropolitan areas, for non-metropolitan and rural areas, and for the central cities and suburbs of each of the state's seven largest metropolitan areas. Dallas appears twice in the MSA list. Greater Dallas combines districts in the Dallas MSA plus 13 districts (164 campuses) in the eastern part of the Ft. Worth MSA that many individuals employed in Dallas view as reasonable residential and school choices.

As these data reveal, in 1994 less than half of the state's grades 3 to 7 enrollment was Anglo. Hispanics, with 35.1 percent of total enrollment, were the largest minority, and Hispanics and African-Americans combined slightly outnumbered Anglos. Asian-Americans were only 2.1 percent of total state enrollment in 1994, but their numbers are growing rapidly. Native Amer-

Table 2
Shares of Total Grades 3 to 7 School Enrollments in Texas, by Race and Ethnicity, in 1994

Area	Black	Hispanic	Black + Hispanic	Anglo	Asian
Entire State	14.1	35.1	49.3	48.4	2.1
Large MSAs	16.3	34.4	50.7	46.1	3.0
Small MSAs	12.4	39.8	52.3	46.2	1.3
Non MSAs	9.6	31.6	41.2	58.2	.4
Rural	7.1	21.2	28.4	70.2	1.1
Individual Metropolitan Areas					
Austin	11.8	29.0	40.8	56.9	2.1
Corpus Christi	4.4	60.9	65.3	33.7	.7
Dallas	20.8	20.9	41.6	54.6	3.3
Greater Dallas	18.1	18.4	36.5	59.6	3.5
El Paso	3.3	80.4	83.7	15.5	.7
Fort Worth	14.5	16.1	30.7	66.0	3.0
Houston	21.9	30.2	52.0	43.4	4.5
San Antonio	8.0	59.9	67.8	30.9	1.1
Central City Districts					
Austin	18.7	37.9	56.6	41.3	1.9
Corpus Christi	6.0	66.7	72.7	26.3	.7
Dallas	43.6	40.1	83.6	14.2	1.7
El Paso	5.0	73.3	78.3	20.6	1.0
Fort Worth	33.8	33.7	67.5	30.2	2.2
Houston	35.6	49.6	85.2	12.2	2.6
San Antonio	11.3	82.6	93.8	5.7	.4
Suburban Districts					
Austin	5.8	21.3	27.1	70.5	2.2
Corpus Christi	2.7	54.3	57.0	42.0	.8
Dallas	11.8	13.3	25.2	70.5	3.9
Greater Dallas	10.9	12.2	23.1	72.5	4.0
El Paso	2.0	85.8	87.8	11.6	.4
Fort Worth	7.2	9.5	16.7	79.6	3.4
Houston	16.3	22.4	38.8	55.8	5.2
San Antonio	7.0	52.8	59.7	38.8	1.3

icans, who are not included in the table, made up only 0.2 percent of the state's population. These data also indicate that Anglos are disproportionately found outside of metropolitan areas and in rural areas, where they make up 58.2 and 70.2 percent respectively of the school population in grades 3 to 7.

African-Americans disproportionately live in large metropolitan areas, where they accounted for 16.3 percent of total enrollments in grades 3 to 7 in 1994. Similarly, Hispanics accounted for 34.4 percent, and in combination with African-Americans made up 50.7 percent of the enrollment in grades 3 to 7 in these areas. Central city districts differ greatly in terms of the racial composition of their public schools. The Dallas Independent School District (ISD) has the highest concentration of blacks, 43.6 percent of total grades 3 to 7 enrollments, whereas El Paso, with only 5.0 percent black, has the smallest.

Anglo shares of central city enrollments in these grades in 1994 varied from a low of 5.7 percent for the San Antonio ISD to a high of 41.3 percent for the Austin ISD. Hispanics, the fastest-growing racial/ethnic group in Texas, comprised 33.7 percent of these students in the Ft. Worth ISD and 73.3 percent in the El Paso ISD in 1994. When the black and Hispanic populations are combined, the combined shares vary from 56.6 percent for the Austin ISD to 93.8 percent for the San Antonio ISD.

The data in Table 3 provide another way of looking at the racial composition of Texas elementary schools. In contrast to the previous discussion, which focused on the fractions of black, Hispanic, and Anglo students attending schools of varying racial compositions, these data show the distribution of schools according to racial composition. They are arguably more relevant to analyses of variations in school inputs among districts and campuses, the central research question considered in this paper.

Statistics on the fractions of schools with student bodies of varying racial composition reveal that about 7 percent of all Texas campuses have enrollments that are 50 percent or more black. For large MSAs, this fraction increases to nearly 10 percent, while the fraction for small MSAs (3.9 percent) is considerably below the statewide average. Nearly one-fourth of campuses in the seven largest central city districts, however, have enrollments that are more than 50 percent black. High levels of Hispanic concentration are much more common than high levels of black concentration. Using the same 50 percent cut-off, 26.4 percent of statewide campuses were more than 50 percent Hispanic in 1994, more than three times the rate for blacks. The figure is not much different for campuses located in large metropolitan areas. Nearly half (46.8 percent) of large central city campuses are more than 50 percent Hispanic and more than one-fourth are over 80 percent Hispanic.

The third panel in Table 3 shows the fraction of campuses in each area that have specified shares of black plus Hispanic students. These data reveal that 42 percent of campuses statewide, 48 percent of campuses in large metropolitan areas, and nearly 87 percent of campuses in the seven largest central city school districts have enrollments more than 50 percent black plus Hispanic. In the suburban rings of the

Table 3
Racial Composition of Texas Elementary School Campuses in 1994

	Entire State	Large MSAs	Large MSAs: Central Cities	Large MSAs: Suburbs	Small MSAs
Percent Black					
0	18.2	8.2	4.8	9.9	27.9
0–10	44.9	50.4	36.6	57.2	39.6
11–20	15.3	16.5	13.9	17.7	14.1
21–30	7.3	7.7	8.7	7.2	7.0
31–40	4.0	3.4	4.1	3.1	4.6
41–50	3.4	3.9	7.2	2.2	2.9
51–60	1.6	1.8	3.5	1.0	1.3
61–70	1.2	1.5	3.8	.4	1.0
71–80	1.1	1.5	4.0	.4	.6
81–90	1.2	1.8	5.2	.2	.5
91–100	1.9	3.2	8.3	.8	.5
All	100.0	100.0	100.0	100.0	100.0
>50	6.9	9.9	24.8	2.7	3.9
Percent Hispanic					
0	3.9	2.7	2.5	2.8	5.1
0–10	28.5	26.8	11.3	34.4	30.2
11–20	16.7	18.1	11.5	21.3	15.2
21–30	10.6	11.2	10.7	11.5	10.1
31–40	7.9	7.6	8.7	7.1	8.2
41–50	5.9	5.5	8.6	4.0	6.4
51–60	4.5	4.9	7.3	3.7	4.2
61–70	4.0	4.2	6.6	3.1	3.8
71–80	3.3	4.3	7.2	2.8	2.4
81–90	4.2	5.4	10.4	2.9	3.1
91–100	10.3	9.3	15.4	6.4	11.3
All	100.0	100.0	100.0	100.0	100.0
>50	26.4	28.0	46.8	18.9	24.9
Percent Black + Hispanic					
0	1.9	1.5	.5	2.0	2.3
0–10	12.4	12.0	.6	17.6	12.7
11–20	13.8	12.8	2.2	18.0	14.8
21–30	11.0	10.0	2.7	13.6	12.0
31–40	9.9	8.4	3.5	10.9	11.4
41–50	8.9	7.1	3.8	8.7	10.5
51–60	7.2	6.5	7.1	6.2	7.8
61–70	6.0	5.4	6.6	4.8	6.6
71–80	5.4	6.5	9.3	5.1	4.3
81–90	6.1	7.5	14.5	4.1	4.8
91–100	17.4	22.2	49.2	9.1	12.7
All	100.0	100.0	100.0	100.0	100.0
>50	42.1	48.1	86.6	29.3	36.2

seven largest metropolitan areas, enrollments in 29 percent of campuses are more than 50 percent black plus Hispanic.

Clearly, the levels of racial concentration in Texas elementary schools have declined by substantial amounts since Coleman and his coauthors completed their research. In addition, growing numbers of minority households residing in Texas metropolitan areas have moved to communities served by suburban school districts, particularly in the past decade. But even though increasing numbers of African-Americans have been moving to suburban communities in Texas, elementary school indexes of dissimilarity for Texas metropolitan areas are still quite high. (The index of dissimilarity compares the distributions of particular racial or income groups.) The black versus Anglo indexes vary from a high of 79 for Laredo to a low of 30 for Odessa, with mean values of 48 for the 21 small MSAs and 56 for the seven large MSAs. Black versus non-black and Hispanic versus non-Hispanic indexes of dissimilarity are somewhat lower.

Rivkin (1994) has shown that, as in other parts of the country, the continuing high levels of school segregation in Texas are largely due to even higher levels of residential racial segregation. It is therefore not particularly surprising to discover that the segregation indexes for Hispanic and Asian-American residents of Texas metropolitan areas, who are less highly segregated residentially than African-Americans, are lower as well (Farley 1993). San Antonio and El Paso, where Hispanic-Anglo segregation exceeds black-Anglo segregation by significant amounts, are exceptions. The explanation presumably is related to the small black and very large Hispanic population shares that characterize these areas.

Differences in Achievement by Race/Ethnicity and Income

As noted previously, the analyses presented in this paper are based in part on enrollment data for 1.8 million students who attended Texas elementary schools during the five-year period 1990 to 1994. Enrollments by year and grade for five student cohorts are shown in Table 4. We have obtained standardized test results for 12 tests/years/grades for students in cohorts 2, 3, and 4. While we did not acquire standardized test data for cohorts 1 and 5, the enrollment and attendance data for these cohorts will enable us to keep track of students who were retained in grade or double-promoted and who thus moved from one of the three central cohorts. When longitudinal samples are created by linking individual student records for two or more tests/years, as in Kain (1995) and Fergu-

Table 4
Snapshot Data for Enrollments by Year, Grade, and Cohort: Texas Elementary Schools, 1990 to 1994

	Cohort 5	Cohort 4	Cohort 3	Cohort 2	Cohort 1					
Year	Pre-K	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Total
1990	71,185	250,887	297,318	272,845	269,123					1,161,358
1991		288,551	326,127	301,383	295,408	294,082				1,505,551
1992			303,173	282,566	279,476	278,636	276,444			1,420,295
1993				288,937	281,754	282,376	280,697	281,829		1,415,593
1994					289,073	284,179	284,120	285,186	286,350	1,428,908
Total	71,185	539,438	926,618	1,145,731	1,414,834	1,139,273	841,261	567,015	286,350	6,931,705

son and Ladd (1995), such students simply disappear from the analysis. This selective attrition may result in seriously misleading findings about student progress. In addition, in the absence of a student data base that is independent of the testing program, it is difficult to assess the apparently widespread practice of not testing some children who are expected to perform poorly on the tests (Orfield and Ashkinaze 1991).

The educational histories with multiple standardized test data that we are constructing for each student should be of great value to our efforts to determine the connections between school inputs (including teachers and peers) and individual student achievement. The mean reading scores by race/ethnicity and family income/poverty for the five statewide tests taken by cohort 2 students, shown in Table 5, provide a glimpse of the promise of these data. Cohort 2 students took five statewide achievement tests, including three different types of tests, between 1989 and 1994; the three tests were TEAMS (Texas Educational Assessment of Minimum Skills), TAAS (Texas Assessment of Academic Skills), and NAPT (Norm-referenced Assessment Program for Texas). NAPT is a norm-referenced test, while TEAMS and TAAS are criterion-referenced.

The achievement test data for cohort 2 students in Table 5 are mean scores for students taking each test in a particular year, rather than mean scores for a true panel of individual students.[1] Because significant numbers of students enter and leave the state, transfer to or from private schools, or are excused from taking these tests in one or more years, the composition of the samples used in calculating the mean scores may vary from one year to the next.

The top panel in Table 5 presents indexes of mean reading scores for each of the five race/ethnicity groups by grade/year, indexed to the statewide mean reading score for that year. Children participating in special education programs are omitted from these calculations, as are significant numbers of children who were excused from taking the examination for other reasons in each year. The first and third grade data also exclude the reading scores of Hispanic children who took a Spanish language version of these tests.

The indexes of mean reading scores in Table 5 reveal that Asian-Americans and Anglos have the highest reading scores, followed by the relatively small sample of Native Americans, who consistently score at about the statewide average. Blacks and Hispanics have the lowest scores, their relative scores are very similar in each year, and some evidence suggests that the achievement gaps between Asian-Americans/Anglos and African-Americans/Hispanics increase with years of school completed. While an increasing achievement gap of this kind between disadvantaged and advantaged groups is a widely reported finding, it is impossible in this instance, and very likely in many other studies that have reported this result, to be confident about the apparent deterioration of Hispanic scores, because of the widespread

[1] We are still completing the difficult, time-consuming, and frequently frustrating task of creating a multi-year linked student data base and adding the scores and other data from the tests to individual student records. At the time we prepared this paper, we had matched more than 97 percent of the 1994 test records and between 94.1 percent and 96.7 percent of the 1993 test records to the Public Education Information Management System enrollment/attendance records. We had less success with the five 1991 and 1992 tests; the rates of successful matches for them varied between 88.8 and 94.1 percent. A large fraction of the remaining non-matches, particularly for 1991 and 1992, are concentrated in a small number of districts. We are working with the Texas Education Agency in an effort to improve the match rates for these districts.

Table 5
Indexes of Student Mean Reading Scores, by Race/Ethnicity and Family Income/Poverty Level[a]: Cohort 2, Grades 1 and 3 through 6

Statewide Mean = 100	TEAMS Grade 1	TAAS Grade 3	NAPT Grade 4	NAPT Grade 5	TAAS Grade 6
By Race/Ethnicity					
Asian-American	107	105	111	108	110
Anglo	105	106	109	112	108
Black	94	93	87	88	89
Hispanic	94	93	88	86	91
Native American	99	101	99	100	100
All Race/Ethnicity	100	100	100	100	100
By Percent of Poverty Level					
More than 185 Percent	105	105	110	110	107
135–185 Percent	n.a.	n.a.	n.a.	97	98
Less than 135 Percent	n.a.	n.a.	n.a.	90	94
AFDC and like programs	n.a.	n.a.	n.a.	85	89
Less than 185 Percent	93	92	88	n.a.	n.a.
By Race/Ethnicity and Poverty Level					
Greater than 185% of Poverty Level					
Asian-American	109	108	114	115	114
Anglo	107	107	114	115	110
African-American	98	98	94	95	94
Hispanic	100	100	99	98	99
Native American	103	105	104	109	105
Less than 185% of Poverty Level					
Asian-American	100	98	95	92	101
Anglo	97	98	99	99	99
African-American	91	90	83	84	85
Hispanic	92	91	84	82	88
Native American	93	96	92	90	92

n.a. = not available.
[a]Family income/poverty level derived from eligibility for the school lunch program. See the text.

practice of excusing large numbers of low-achieving students, and particularly Hispanics, from achievement tests in the early grades.[2]

The family income/poverty level variables used in Table 5 are derived from information that indicates whether a particular child received a free or reduced-price lunch under the federal school lunch program. Program eligibility is based on federal definitions of the poverty level and thus depends on both family income and family size. To receive a free lunch, a child must belong to a family whose annual income is less than 135 percent of the poverty level for its size. Similarly, to receive a reduced-price lunch, family income must be between 135 and 185 percent of the poverty level. Students whose families receive AFDC benefits or who participate in a number of other poverty programs are also eligible for a free lunch. In subsequent discussions, we refer to students belonging to high-income families (greater than 185 percent of the poverty level), middle-income families (135 to 185 percent of the poverty level), and low-income families (less than 135 percent of the poverty level).

The estimates in Table 5 are obtained from individual test records, and the definition of the school lunch variable differs somewhat among the several tests. Only two poverty/lunch categories are available for grades 1, 3 and 4, while three are available for grades 5 and 6. In the second panel, we use four family income/poverty categories for grades 5 and 6, but only two categories for grades 1, 3 and 4. Both 5th and 6th grade reading scores exhibit a consistent relationship with family income levels; the differences are especially large for the 5th grade scores. The reading scores of 5th grade students in the high-income category are 110 percent of the statewide average, while the reading scores of 5th grade students in the middle- and low-income categories are 97 and 90 percent of the statewide average, respectively. Fifth-grade students who qualified for a free lunch through their participation in AFDC or other welfare programs have a mean reading score of only 85 percent of the statewide average.

The bottom panel of Table 5 shows mean reading scores by race/ethnicity and two family-income categories, greater than and less than 185 percent of the poverty level. Stratification by family income level

[2] Of the 233,883 3rd-grade students with a reading score, 4.7 percent took a Spanish language test. A large fraction of these students are subsequently excused from taking the 4th grade test because of limited English proficiency; they are classified as LEP (Limited English Proficiency) in the 4th grade and thereby are excused. Including the raw reading score for these students in the calculations of mean reading scores changes only one number in Table 5, the mean reading score index for Hispanic 3rd graders from families whose incomes were less than 185 percent of the poverty level.

narrows the differences between Anglo reading scores and those of African-American and Hispanic students, but by no means eliminates them. Not too much should be made of this result; the two-category family income/poverty variable is only a crude index of socioeconomic differences.

Within- and Between-School Variations in Grade 6 Reading Scores

Mosteller and Moynihan (1972, p. 19) in their discussion of Coleman et al.'s findings place great emphasis on the fact that "90 percent of the variance in student achievement was found to lie *within*—not between—schools." Commenting further on this theme, they observe:

> EEO found that schools receive children who already differ widely in their levels of educational achievement. The schools therefore do not close the gaps between students aggregated into ethnic/racial groups. Things end much as they begin. . . . such findings might be interpreted to mean that "schools don't make any difference." This is absurd. Schools make a very great difference to children. . . . But given that schools have reached their present level of quality, the observed variation in schools was reported by EEO to have little effect upon school achievement. This actually means a large joint effect owing to both schools and home background (including region, degree of urbanization, socioeconomic status, and ethnic group), little that is unique to schools or home. They vary together.

Equation 1 in Table 6 presents the results of regressing individual TAAS reading scores for 228,051 sixth graders in this study on 16 explanatory variables that are measures of individual and family background characteristics of these students. These variables explain 18 percent of the variance in reading scores; they include 14 dummy variables for race/ethnicity by family income (Anglos eligible for free lunch is the omitted category in all three equations) plus the sex and age of each student. In Equation 2, we have augmented the individual student variables included in Equation 1 by three campus-level variables that measure parents' education and median household income. In contrast to the individual student variables, the percentages of each racial/ethnic group who were college graduates or did not complete high school and median family income for all groups are averages for the school campus zip code. While we plan to create more precise estimates of these family background and community variables by aggregating 1990 census block group data to individual attendance areas, these campus-level variables, following Ferguson and Ladd (1995), are based on 1990 Census tabulations for the zip code of each campus. Adding the three campus-level variables increases the R^2 to 0.19. In Equation 3, we replace the three campus/zip code variables with 1,986 campus dummies; the resulting campus fixed-effects specification increases the explained variance from 19 percent to 23 percent. When only campus dummies are included, the resulting equation explains 16 percent of the total variance in reading scores. In interpreting this result, it should be understood that "campus" measures both the effects of school inputs (facilities, teachers, and peers) and the effects of grouping children with similar racial/ethnic and other individual and family background characteristics.

The results for the fixed-effect equations indicate that holding the effects of campus, age, and sex constant, the representative low-income African-American student had 3.4 fewer right answers on the 6th grade reading test than a low-income Anglo student. This difference falls to 1.5 points for middle-income black students and to 1.2 points for high-income black students. High-income Anglo students have 2.7 more right answers than low-income Anglo students and 3.8 more right answers than high-income black students.

In considering the 6th-grade reading regressions, it should be understood that nearly 20 percent of all 6th-graders are not included in the analysis. Of this number 11.9 percent were excluded from our calculations because they were special education students and an additional 6.9 percent were excused from the test for a variety of other reasons, including absences on the day the test was given, LEP (Limited English Proficiency) exemption, ARD exception (for students with disabilities who were not already excluded from the sample because of their participation in special education classes), cheating, or illness. The fractions differ among ethnic/racial categories. More than 13 percent of Hispanics and 10.5 percent of Asian-American students were excused from taking the test, mostly because they were classified as LEP. African-Americans were somewhat more likely to be in special education classes (14.4 percent versus 11.9 percent for all students), but were less likely to be excused from taking the exam (4.3 percent versus 6.9 percent for all students). These issues, which deserve careful attention, will be examined after we have completed linking the data.

The most obvious missing variable from the 6th-

Table 6
Grade Six TAAS Reading Score Regressions

	Equation 1 Individual Characteristics		Equation 2 Individual plus Zip Code: Education & Income		Equation 3 Individual plus Campus Fixed-Effects	
Explanatory Variables	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
High Income						
Anglo	3.35	59.19	2.91	49.60	2.70	47.60
Asian-American	4.25	35.61	2.63	19.62	3.17	26.48
Native American	2.06	5.38	1.85	4.62	1.39	3.73
Black	−1.28	−16.43	−1.39	−17.21	−1.15	−14.07
Hispanic	.17	2.40	.27	3.34	.15	2.16
Middle Income						
Anglo	1.24	11.97	1.23	11.57	1.09	10.79
Asian-American	1.35	3.53	.48	1.23	.90	2.42
Black	−1.69	−11.10	−1.62	−10.37	−1.54	−10.25
Hispanic	−1.01	−10.06	−.72	−6.51	−.89	−8.80
Native American	−.36	−.35	−1.21	−1.09	−.10	−.10
Low Income						
Asian-American	.54	2.80	−.23	−1.13	.57	2.96
Black	−3.95	−54.76	−3.75	−50.74	−3.40	−44.53
Hispanic	−3.00	−49.55	−2.58	−33.26	−2.53	−38.50
Native American	−2.05	−3.91	−1.27	−2.30	−1.55	−3.03
Other Individual Characteristics						
Male	−.62	−22.70	−.63	−22.11	−.61	−22.93
Age	−1.38	−60.18	−1.37	−57.81	−1.28	−56.80
Campus Mean by Race/Ethnicity						
Percent College Grad			7.80	22.10		
Percent Less than High School			.18	1.05		
Campus Mean, All Households						
Median Income			.04	22.61		
Campus					F-stat. (1,986 225,914) =	9.07
Constant	45.73	164.11	44.08	150.92	44.63	163.57
Observations	228,051		212,601		227,917	
Variables	16		19		2,002	
R^2	.18		.19		.23	

Note: Anglos with low-income families is the omitted category for the race/ethnicity by family income/poverty level variables in the first three panels.

grade reading score regressions is any measure of each student's cognitive abilities or earlier educational experiences. Because we have not finished linking the test and enrollment data, we were unable to include these critical control variables. In an earlier exploratory analysis of TAAS reading scores for individual 4th-graders, however, Kain (1995, p. 44) found that the same student's 3rd-grade reading score by itself explained 44 percent of the variation in 4th-grade reading scores. Adding a large number of individual student and school input measures increased the explained variance by only an additional 5 percentage points to 50 percent, and these same variables without the lagged reading score explained about 28 percent of the total variance in individual 4th-grade reading scores.

Variations in School Quality Measures

Educational production function studies, including the Coleman Report, have had modest success at best in their efforts to quantify the relationship between school inputs and student achievement. At least

two explanations are possible. First, in the spirit of the Coleman findings, public schools may not vary much in terms of those variables that affect student achievement on standardized tests. Or second, as Hanushek and Kain (1972, p. 117) argued in their critique of the Coleman Report, there may be important differences, but the crude measures that Coleman and his colleagues used in their analyses (and have been used in most subsequent educational production function studies) may not adequately account for these differences. This second possibility, which seems to us to be a very real one, was one of the reasons we decided to undertake this study.

Educational production function studies have had modest success at best in their efforts to quantify the relationship between school inputs and student achievement. This failure may be due to inadequate school-input quality measures.

The view that the failure of most studies of educational production functions to find significant school input effects may be due to inadequate school quality measures finds support in Hanushek's survey of 147 published "separately estimated educational production functions," which begins by observing that "*Teachers and schools differ dramatically in their effectiveness*" [his italics]. Hanushek (1986, p. 1159) then argues that the "very different impressions . . . left by the Coleman Report and indeed by a number of subsequent studies . . . have primarily resulted from . . . the difficulty in explicitly measuring components of effectiveness," adding that "existing measures of characteristics of teachers and schools are seriously flawed and thus they are poor indicators of the true effects of schools." Finally, he suggests that "when these measurement errors are corrected, schools are seen to have important effects on student performance."

When it comes to assessing the evidence concerning the relationship between particular school input measures and student achievement, however, Hanushek becomes much more negative. Commenting on the findings of his most recent survey of educational production function estimates, Hanushek concludes, based on his examination of 187 studies, that "the results are startlingly consistent in finding no strong evidence that teacher-student ratios, teacher education, or teacher experience have the expected positive effect on student achievement" (1989, p. 46).

Hanushek's negative conclusions about the effect of various school input variables on achievement have been strongly disputed by Ferguson (1991) in an influential paper that presents educational production function estimates obtained using aggregate (district-level) data for nearly 900 Texas school districts.[3] In both his Texas analysis and a more recent paper with Ladd based on both micro and aggregate campus-level data for Alabama, Ferguson suggests that differences in mean teacher test scores, average class size, the fraction of teachers with master's degrees, and per pupil expenditures account for a large part of the variation among districts and campuses in student achievement levels (Ferguson 1991; Ferguson and Ladd 1995). Ferguson's (1991) educational production function estimates for Texas schools obviously are highly relevant to our research.

Our review of earlier educational production function studies has made it clear to us that we should begin by making every effort to develop better school input measures than have been used in most earlier studies. Part of this effort entails a careful assessment of the extent of the variation among districts and campuses and, in particular, among campuses with different racial/ethnic and socioeconomic makeups. The selection of school input measures to be considered in this paper was determined by data processing considerations and by the findings of earlier educational production function studies. In the following sections, we examine the within-district variation of four types of school inputs by campuses of varying race/ethnic and income composition: (1) teacher scores on standardized tests, (2) the percentage of teachers with advanced degrees, (3) teacher experience, and (4) class size. We begin this analysis with composite reading and writing scores for Texas teachers, obtained by combining individual test results from seven different teacher certification exams.

[3] Ferguson's study used district-level aggregate data for all Texas school districts with complete data except the Dallas and Houston Independent School Districts, which he excluded because "the weighting scheme in the estimating procedure would have given these two cities too much influence over the results" (Ferguson 1991, p. 470).

Teacher Test Scores

Several educational production function studies have found that teacher verbal ability and high scores on other standardized tests had a significant effect on student achievement (Hanushek 1971 and 1972; Ferguson 1991; Ferguson and Ladd 1995; and Murnane 1975). Moreover, Hanushek (1986, p. 1164) has observed that "The closest thing to a consistent finding among the studies is that 'smarter' teachers, ones who perform well on verbal ability tests, do better in the classroom"; he adds, however, that "even for that, the evidence is not very strong."

Teacher verbal ability and high scores on other standardized tests have been found to have a significant effect on student achievement.

Ferguson (1991, p. 475) in his study of Texas school districts similarly found that "Teachers' language skills as measured by the TECAT score is the most important school input for both math and reading," and that "After the first grade, teacher scores on TECAT account for about one-fifth to one-quarter of all variation across districts in students' average scores on the TEAMS exam."[4] In addition, Ferguson and Ladd (1995, p. 35), in their study of Alabama schools, found that "The skills of teachers as measured by their test scores exert consistently strong and positive effects on student learning despite the fact that the data are limited and test scores are an imperfect measure of teacher skills."[5]

The educational production function estimates published by Ferguson in his 1991 paper were for the 1985–86 school year. By using TEAMS data for that year, Ferguson was able to take advantage of a feature of reform legislation implemented two years earlier that required all Texas public school teachers to pass the Texas Examination of Current Administrators and Teachers (TECAT), which the Texas Education Agency began using in 1986 to recertify existing teachers. Since nearly 97 percent of those who took the exam in March 1986 passed, TECAT was obviously not a very difficult hurdle. Furthermore, those who failed were allowed to retake the exam as many times as they wished and nearly all passed eventually. Given TECAT's low level of difficulty, the small variance of district averages, and the fact that Ferguson used average scores for all teachers in each district, it is quite surprising that TECAT scores were such a powerful predictor of student achievement in his regressions.

The Texas Education Agency was never happy with TECAT, and at the first opportunity it implemented a new and more demanding teacher certification system. With few exceptions, the Agency now requires new teachers, or teachers seeking certificates to teach in various special areas, to take one or more ExCET (Examination for the Certification of Educators in Texas) exams. In addition, all persons applying to teacher preparation programs in Texas are required to take and pass TASP, a general skills test, before they are admitted to these programs. TASP replaced an earlier skills test, PPST (Pre-Professional Skills Test) that served a similar purpose.

While the Texas Education Agency's decision to replace TECAT with a more complex system may have been good policy, it greatly complicated our research task. When we first began this research, we thought we might be able to use the TECAT data Ferguson had obtained from National Computer System (NCS). We found, however, that the individual teachers on Ferguson's tape could not be assigned to individual campuses and that only 59 percent of the 206,780 individuals who taught in Texas schools (grades pre-K to 8) during the 1990–94 period had taken TECAT.

In order to develop comparable ability measures for the 41 percent of teachers in our teacher data base who did not take TECAT, we obtained individual scores from the Texas Education Agency for TECAT and nearly 70 other teacher certification tests. Using

[4] Ferguson notes that "Primary school teachers appear to be particularly important for establishing the reading foundation upon which students depend in later years," adding that their "passing rates on the TECAT have three times the impact of secondary school teachers' passing rates for predicting eleventh graders' passing rates on the TEAMS reading exam" (Ferguson 1991, p. 476). Ferguson used *district-wide passing rates* rather than *average scores* for this part of the analysis because the mean district TECAT scores he used in his analysis were for elementary and secondary school teachers combined. His analyses of TECAT's impact on student achievement for primary and secondary school teachers separately relied on district-wide TECAT *passing rates*.

[5] Summers and Wolfe (1977, p. 644–45) in their careful study of 627 6th-grade students attending 103 Philadelphia elementary schools found a "perverse (negative) relationship between the National Teacher Exam score and learning," but also found that "Teachers who received BAs from higher-rated colleges were associated with students whose learning rate was greater."

Table 7
Linear Specifications of Fixed-Effects Regressions of Campus Mean Teacher TECAT Reading Scores

	All Districts		All MSAs		Large MSAs		Greater Dallas		Houston		San Antonio	
Variable	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Campus Percent[a]												
Black	−2.44	−15.6	−2.37	−14.6	−2.54	−13.5	−2.03	−8.2	−3.43	−7.9	−2.17	−2.7
Hispanic	−1.41	−9.4	−1.30	−8.3	−1.30	−7.1	−1.04	−3.7	−1.80	−4.5	−.91	−1.3
High-Income	−.13	−.9	.00	.0	.00	.0	.18	.8	−.18	−.5	.37	.6
Black*High-Income	1.15	4.2	1.12	4.1	1.38	4.4	.77	1.8	2.00	3.3	4.58	2.2
Hispanic*High-Income	1.30	6.4	1.29	6.2	1.14	4.6	2.16	4.6	1.05	1.8	.00	.0
District Fixed Effect (F-stat.)		3.4		5.5		5.9		4.5		8.3		1.0
Constant	52.68	458.3	52.56	410.4	52.63	348.5	52.53	276.6	52.80	148.8	52.42	87.3
R^2	.73		.73		.71		.74		.77		.49	
No. Observations	4,839		3,449		2,354		763		706		290	
No. Districts	1,046		382		203		72		41		19	
Mean	52.0		51.9		52.0		52.3		51.7		51.9	
Standard Deviation	1.1		1.1		1.1		.9		1.4		.9	

[a]Percent of students enrolled in grades 3 to 7.

data for seven subsamples of teachers who took both TECAT and one or more of the other tests, we estimated explanatory models that explained TECAT reading and writing scores.[6] These equations, which we used to predict TECAT reading and writing scores for all teachers who had not taken TECAT, included as explanatory variables teacher race, sex, scores on the "other" exam, and several dummy variables that served as controls for different test administration dates.

Table 7 contains six fixed-effects regressions of mean TECAT reading scores of teachers of grades 3 to 7 on several explanatory variables that describe the campus percentages of students enrolled in grades 3 to 7 who are African-American, Hispanic, or from high-income families. These equations are for six geographic areas: the entire state, all metropolitan areas, large metropolitan areas, and, individually, the Greater Dallas, Houston, and San Antonio metropolitan areas.[7] The means and standard deviations of all six dependent variables and six independent variables used in the analyses of within-district, campus variations in school inputs are shown in Table 8 for the six areas. Since sample membership differs slightly depending on which dependent variable is being considered, the means of the independent variables also differ slightly by the dependent variable being used. The means and standard deviations of the five explanatory variables in Table 8 are for the sample used in estimating the TECAT reading score regressions.

Not surprisingly, the 1,046 district dummy variables have a large impact on the explanatory power of the TECAT reading equations shown in Table 7. The R^2 for the Large MSA equation, for example, increased from 0.55 to 0.71 when the district dummies were added to the equation. The inclusion of dummy variables in these fixed-effect equations holds constant the influence of school district policies and other factors that produce differences in mean TECAT scores among districts. Campus-level variables in turn quantify the average effect of differences in race/ethnicity and family income on TECAT reading scores and

[6] Of the 217,481 persons teaching in 1994 at the campuses included in this analysis, 79,425 had not taken TECAT. All but 166 of them, however, had taken at least one of the seven other teacher certification tests with sufficiently large samples of persons taking both it and TECAT to permit estimation of TECAT prediction equations. These tests and the number of TECAT reading and writing scores that were predicted with each equation are: Excet2 (Professional Development—Elementary) 46,691; Excet3 (Professional Development—Secondary) 17,579; Excet1 (Professional Development—All Level) 7,073; TASP 3,753; Excet4 (Elementary Comprehensive) 3,753; PPST 648; and TOPT81 387. Mean TECAT scores by race/ethnicity and highest degree earned were used to predict TECAT scores for the 166 persons who took none of the above tests.

[7] We also prepared estimates of the six equations in Tables 9 to 13 with squared terms for percent black, percent Hispanic, and percent high-income. The squared terms were added to test for nonlinearities in the campus race/ethnicity composition and income variables. Interested readers may obtain copies of these tables from the authors.

Table 8
Means and Standard Deviations of Dependent and Independent Variables

	All Districts	All MSAs	Large MSAs	Greater Dallas	Houston	San Antonio
Dependent Variables						
TECAT Reading Score	52.0	51.9	52.0	52.3	51.7	51.9
	(1.1)	(1.1)	(1.1)	(.9)	(1.4)	(.9)
TECAT Writing Score	27.0	27.0	27.0	27.3	26.7	26.9
	(.9)	(.9)	(1.0)	(.8)	(1.2)	(.8)
% Advanced Degrees	24.5	25.6	27.8	32.4	27.5	27.4
	(15.1)	(14.8)	(14.8)	(15.4)	(13.2)	(15.3)
% 0–3 Years Experience	24.8	25.0	24.9	24.3	26.5	22.5
	(14.0)	(8.2)	(13.4)	(13.4)	(13.4)	(12.5)
% 20+ Years Experience	15.9	15.6	15.8	16.5	14.5	17.5
	(10.4)	(9.8)	(9.9)	(10.1)	(9.0)	(10.5)
Class Size		19.1	19.5			
		(4.2)	(4.1)			
Independent Variables						
Campus % Black	13.7	15.9	17.0	18.9	23.1	8.4
	(.2)	(.2)	(.2)	(.2)	(.3)	(.1)
Campus % Hispanic	33.3	35.3	34.4	17.8	30.8	63.4
	(.3)	(.3)	(.3)	(.2)	(.3)	(.3)
Campus % High-Income	50.0	50.4	52.0	61.5	53.9	33.9
	(.3)	(.3)	(.3)	(.3)	(.3)	(.3)
% Black*% High-Income	5.6	6.3	6.6	7.5	9.4	2.6
	(.1)	(.1)	(.1)	(.1)	(.1)	(.0)
% Hispanic*% High-Income	11.0	11.0	11.4	7.3	11.6	14.6
	(.1)	(.1)	(.1)	(.1)	(.1)	(.1)

document the within-district allocation of teachers with different levels of verbal ability among campuses according to the fractions of students at each campus who are black, Hispanic, and from high-income families. The estimates in Table 7 document a clear sorting of teacher ability by schools of differing racial/ethnic and income composition. There is also a sorting of teachers among districts, but the nature of this sorting is not quantified in this analysis.[8]

The tendency of teachers' mean TECAT reading scores to decrease as the campus shares of black and Hispanic students increase is clearly evident in Table 7. All 12 coefficients (campus percent black and campus percent Hispanic times six areas) are negative. The coefficient for campus percentage black in the Large MSA equation, which is −2.54, is highly significant statistically and quantitatively important (as it is for all districts and all MSAs). Since the standard deviation of the mean TECAT reading score is only 1.1, this result implies that the mean TECAT reading score for a 100 percent black school would, holding the effect of all other variables constant, be roughly 2.5 standard deviations less than the same score for a school that is zero percent black. The coefficient for campus percent Hispanic is also highly significant statistically, but it is only about half as large as the coefficient for campus percent black. The coefficient for campus percent high-income is essentially zero, but the coefficients for the two interaction variables are positive and highly significant statistically. The impacts of these interaction effects will be examined further in the concluding section.

The results obtained for the TECAT writing regressions, shown in Table 9, are very similar to those obtained for the TECAT reading scores. They also indicate that persons teaching at schools with higher fractions of black and Hispanic students and fewer students from high-income families tend to have lower TECAT scores, in this case on the writing portion.

While the analyses of variations in mean TECAT reading and writing scores presented in this section are based on estimated campus means for all grades (3 to 7) in 1994, we also estimated these equations for grades 3 and 6. The two most obvious changes, relative to the results discussed above, are a significant reduction in overall explanatory power and a decrease in sample size. Using the Large MSA equation as an example, the

[8] In an earlier version of this paper, given at Harvard's Urban Economics seminar, we presented equations that included both campus and district shares of total enrollment by race/ethnicity and family income in an effort to quantify the variations of school inputs among both districts and campuses with varying percentages of black, Hispanic, and high-income students. High correlations between the district and campus-level variables defeated this effort. The specifications used in this paper finesse this problem by limiting the assessment to the effects of within-district variations in campus racial/ethnic and income composition. We would like to acknowledge the very helpful suggestions on this issue by several seminar participants.

Table 9
Linear Specifications of Fixed-Effects Regressions of Campus Mean Teacher TECAT Writing Scores

	All Districts		All MSAs		Large MSAs		Greater Dallas		Houston		San Antonio	
Variable	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Campus Percent[a]												
Black	−2.30	−16.3	−2.15	−14.9	−2.20	−13.3	−2.02	−8.7	−2.33	−6.2	−2.28	−3.5
Hispanic	−1.64	−12.1	−1.46	−10.4	−1.35	−8.4	−1.25	−4.8	−1.39	−4.0	−1.81	−3.2
High-Income	−.40	−3.2	−.19	−1.4	−.06	−.4	−.01	.0	.09	.3	−.54	−1.0
Black*High-Income	.66	2.7	.67	2.7	.87	3.1	1.10	2.7	.54	1.0	2.65	1.6
Hispanic*High-Income	1.03	5.6	1.03	5.6	.77	3.6	1.47	3.4	.68	1.3	.68	1.0
District Fixed Effect (F-stat.)		2.9		4.6		5.4		3.79		7.88		1.41
Constant	27.95	268.9	27.77	243.3	27.69	208.7	27.70	156.2	27.46	89.3	28.29	57.3
R^2	.68		.69		.69		.69		.75		.51	
No. Observations	4,839		3,449		2,354		763		706		290	
No. Districts	1,046		382		203		72		41		19	
Mean	27.04		26.98		26.97		27.30		26.70		26.90	
Standard Deviation	.91		.94		.96		.82		1.18		.78	

[a]Percent of students enrolled in grades 3 to 7.

percent of variance explained is 43 percent for grade 3 and 46 percent for grade 6, as contrasted with 69 percent for all grades. The 6th grade Large MSA sample has 891 observations, the 3rd grade one has 1,612, and the all-grades sample has 2,354 observations. These differences in sample size result from the fact that many campuses do not have both 3rd and 6th grades and schools serving only the lower grades tend to be smaller (fewer students per grade).

Percent of Teachers with Advanced Degrees

In contrast to most other educational production function studies that have found no relationship between teachers' years of education and the performance of their students on standardized tests, Ferguson (1991, p. 477) in his study of Texas schools found that *"Master's degrees produce moderately higher scores in grades one through seven"* [his italics] and that "The percentage of teachers who have master's degrees accounts for about five percent of the variation in student scores across districts for grades one through seven." This finding also finds support in Ferguson and Ladd (1995, p. 35) who found that "additional education for teachers, as measured by the proportion of teachers with master's degrees, also appears to increase student learning, but by a lesser amount" (relative to teachers' test scores).

Table 10 contains fixed-effects estimates for the campus percentage of teachers with advanced degrees for the same six geographic areas used in the analysis of mean TECAT scores.[9] The sign patterns for the All Districts, All MSAs, Large MSAs, and Greater Dallas equations are identical. In all four equations, the percentage of teachers with advanced degrees declines as the campus percentages of black, Hispanic, and high-income students increases; it rises with increases in both the race/ethnicity-income interaction variables. At first glance the results for Houston and San Antonio appear to be very different, but the individual coefficient estimates have very low levels of statistical significance, a result that appears to be due to high levels of multicollinearity among a number of the explanatory variables.

In contrast to the TECAT regressions, where the campus percent black coefficient was much larger (in absolute value) than the campus percent Hispanic coefficient, these two coefficients are very similar in the first four equations (those with statistically signif-

[9] Including district dummies has a much larger impact on the overall explanatory power of these equations than was true for the TECAT reading or writing regressions. For the six equations without district dummies, the highest fraction of explained variance is only 16 percent (the San Antonio equation). Adding the district dummy variables to the San Antonio equation increases the explained variance to 26 percent. The largest increase in overall explanatory power from adding the district dummies is obtained for the All-District equation; the fixed-effects equation boosts the total explained variance from 6 percent to 50 percent.

Table 10
Linear Specifications of Fixed-Effects Regressions of Campus Fraction of Teachers with Advanced Degrees

	All Districts		All MSAs		Large MSAs		Greater Dallas		Houston		San Antonio	
Variable	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Campus Percent[a]												
Black	−.14	−5.2	−.12	−4.4	−.12	−3.5	−.16	−3.0	.13	2.1	−.09	−.7
Hispanic	−.15	−5.9	−.13	−5.1	−.12	−3.8	−.17	−2.8	−.03	−.5	.13	1.1
High-Income	−.13	−5.7	−.11	−4.5	−.12	−3.9	−.10	−2.2	.04	.7	−.01	−.1
Black*High-Income	.20	4.5	.19	4.3	.19	3.6	.28	2.9	−.06	−.7	−.21	−.9
Hispanic*High-Income	.04	1.2	.01	.3	−.02	−.5	.17	1.6	.01	.1	−.22	−1.7
District Fixed Effect (F-stat.)		3.4		5.7		5.6		7.3		4.1		4.2
Constant	.36	19.6	.36	17.4	.39	15.3	.41	10.4	.24	5.0	.25	2.4
R^2	.50		.44		.35		.44		.26		.26	
No. Observations	5,015		3,592		2,464		791		720		318	
No. Districts	1,046		382		203		72		41		19	
Mean	.25		.26		.28		.32		.28		.27	
Standard Deviation	.15		.15		.15		.15		.13		.15	

[a]Percent of students enrolled in grades 3 to 7.

icant coefficients). Somewhat more surprising, the campus percent of teachers with advanced degrees declines as the fraction of high-income students increases, in all four equations. At the same time, the coefficient of the percent black and percent high-income interaction term is positive, indicating that increases in the high-income share reduce the negative impact of higher fractions of black students on the percentage of teachers with advanced degrees. Of the three individual metropolitan area equations, only the Greater Dallas estimates closely conform to the estimates obtained for the more comprehensive samples; the overall explanatory power of this equation is also considerably larger than those of the other two metropolitan areas. The within-district sorting of teachers with advanced degrees, moreover, appears to be more pronounced in Greater Dallas than in the other two individual metropolitan areas or in either All MSAs or Large MSAs.

Overall, the results in Table 10 provide strong evidence that, in Texas at least, teachers employed in schools with large fractions of Hispanic and African-American children, and particularly the latter, and also in schools with high fractions of children from low-income families, have fewer years of education. This evidence relating to systematic within-district variations in teachers' years of schooling by campus racial and income composition may not matter much, if Hanushek and others are right about the unimportance of years of teacher education as a determinant of student achievement. However, if Ferguson (1991) and Ferguson and Ladd (1995) are correct in their opposing view, this evidence could be quite important.

Teacher Experience

Ferguson (1991, p. 475–76) found that after teachers' language skill, as measured by the TECAT score, "the next most important school characteristic is teacher experience," and that teacher "experience accounts for a bit more than ten percent of the inter-district variation in student test scores." Even Hanushek relents a bit when it comes to teacher experience. Referring to his 1989 survey of educational production function estimates, Hanushek (1989, p. 47) observes that "Teacher experience is possibly different," since "At least a clear majority of estimated coefficients point in the expected direction, and almost 30% of the estimated coefficients are statistically significant by conventional standards." He then returns to form by adding the following qualifications:

> But these results are hardly overwhelming; they appear strong only relative to the other school inputs. Moreover, because of possible selection effects, they are subject to additional interpretive questions. In particular, these positive correlations may result from senior teachers being permitted to select schools and classrooms with better students. In other words, causation may run

from achievement to experience and not the other way around.

A few educational production function studies have suggested that an inverted U-shaped relationship may be present between teacher experience and student achievement. In this regard, the evidence that "inexperienced" teachers are less effective and that students taught by them do less well on standardized tests is more extensive than the evidence suggesting that teacher performance deteriorates beyond a certain point. Nonetheless, some basis exists for believing that there may be too much of a good thing when it comes to teacher experience, or perhaps age, and that the teachers with the most experience, generally older ones, are less effective than younger teachers with somewhat less experience. Some support for this proposition is provided by exploratory educational production functions for Texas elementary schools completed by Kain (1995).

Some basis exists for believing that there may be too much of a good thing when it comes to teacher experience, or perhaps age, and that the teachers with the most experience, generally older ones, are less effective than younger teachers with somewhat less experience.

Because the relationship between teacher experience and student achievement may be an inverted U shape, we have used two dependent variables to quantify experience, the campus proportions of teachers with zero to three years of experience and those with 20 or more. Like the analyses of TECAT scores and advanced degrees, the dependent variables in these equations are for the entire campus, although, as was true of the TECAT analysis, we estimated experience equations for 3rd and 6th grade teachers as well. The results for the 3rd and 6th grade are very similar to those for the entire campus except that the equations generally explained a smaller fraction of the variance in the several dependent variables.

The teacher experience regressions, shown in Tables 11 and 12, include the same explanatory variables and have the same structure as those described above for the regressions for TECAT scores and for percent of teachers with higher degrees in Tables 7, 9, and 10. The fractions of inexperienced and very experienced teachers in particular districts presumably are strongly affected by district demographics. Rapidly growing districts are likely to have proportionately more inexperienced teachers, although this tendency may be offset by policies that favor the recruitment and hiring of experienced teachers. Districts with declining enrollments similarly are likely to have large numbers of very experienced teachers and these district-wide tendencies will be felt at the campus level. The district dummy variables included in the fixed-effects equations account for district-to-district differences of this kind.[10]

Three of the five coefficients (excluding the constant term) for the Large MSA fixed-effects equation for inexperienced teachers have t-statistics of 2.8 or greater. The t-statistics for the remaining two are −1.4 for the coefficient for the percent black-percent high-income interaction and a minuscule 0.3 for the campus percent of high-income students. The coefficients for percent black and percent Hispanic are very similar in magnitude and indicate that increases in either are associated with a higher fraction of inexperienced teachers. The coefficient for the campus percent high-income is zero, suggesting that campus income has little effect on the mix of teachers.

The regression equations for the campus percentage of inexperienced teachers (those with 0–3 years of teaching experience) provide strong evidence that schools with higher percentages of black or Hispanic students have disproportionate numbers of inexperienced teachers. According to the estimates in Table 11, differences in the campus percentage of high-income students affect the allocation of inexperienced teachers only through an interaction with either campus percent black or campus percent Hispanic. In addition, these interaction effects are opposite in sign. Holding the campus percent black constant, increases in the campus percentage of high-income students reduces

[10] The large increase in overall explained variance with the addition of the district dummies suggests these district-level effects have major impacts on the campus fractions of inexperienced and very experienced teachers. When district dummies are not included in the six equations shown in Table 11, the fraction of explained variance varies from a low of 3 to a high of 14 percent; when district dummies are included, the R^2s of these equations vary from 28 to 40 percent.

Table 11
Linear Specifications of Fixed-Effects Regressions of Campus Fraction of Teachers with Zero to Three Years of Experience

	All Districts		All MSAs		Large MSAs		Greater Dallas		Houston		San Antonio	
Variable	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Campus Percent[a]												
Black	.20	6.8	.20	6.4	.19	5.4	.27	4.8	.18	2.5	−.28	−2.3
Hispanic	.21	7.4	.20	6.7	.20	5.9	.24	3.7	.32	4.9	−.32	−3.0
High-Income	.02	.7	.01	.3	.01	.3	.05	1.0	.05	.8	−.42	−4.2
Black*High-Income	−.06	−1.1	−.11	−2.0	−.08	−1.4	−.21	−2.1	.00	.0	.65	2.1
Hispanic*High-Income	.05	1.3	.07	1.6	.13	2.8	.37	3.5	−.11	−1.1	.48	4.0
District Fixed Effect (F-stat.)		2.3		3.1		3.8		3.6		3.6		5.2
Constant	.14	6.3	.14	5.7	.13	4.7	.11	2.4	.11	1.9	.51	5.5
R^2	.40		.30		.28		.30		.30		.33	
No. Observations	4,842		3,451		2,355		761		706		291	
No. Districts	1,046		382		203		72		41		19	
Mean	.25		.25		.25		.24		.27		.23	
Standard Deviation	.14		.08		.13		.13		.13		.13	

[a]Percent of students enrolled in grades 3 to 7.

the fraction of inexperienced teachers. In the case of Hispanic students, the opposite result is seen.

The within-district allocation of inexperienced teachers among schools with varying racial, ethnic, and income composition documented by the inexperienced teachers equations is no doubt due to the well-known "MFK" effect.[11] This effect refers to school district policies that permit teachers with more seniority to choose more desirable schools and the absence of any incentives or rewards for teaching in less desirable schools. The campus percentages of black, Hispanic, and high-income students are proxies for a larger number of school characteristics that determine the attractiveness of individual campuses to teachers. Since we know the teaching assignments of all teachers during the five-year period 1990–94, we should in the future be able to explicitly model this process.

The coefficient estimates obtained for the Greater Dallas and Houston inexperienced teachers equations are fairly similar to those obtained for All Districts, All MSAs, and Large MSAs. The results for San Antonio could not be more different. All five coefficients have t-statistics of more than 2.0 and the sign pattern, which is generally the opposite of that obtained for the other fixed-effects equations, indicates that the percentage of inexperienced teachers declines as the percentages of black, Hispanic, and high-income students increase and rises with increases in both black and Hispanic high-income interaction variables.

The results for teachers with 20 or more years of experience, shown in Table 12, exhibit a pattern consistent with the sorting mechanism described above for inexperienced teachers. Teachers with the most tenure tend to be underrepresented in campuses with

[11] This reference to the MFK effect refers to the experience of the senior author's wife, Mary Fan Kain, during the first year of their marriage when she took a job teaching in a overwhelmingly black junior high school in Oakland, California. Mary Fan did not come to teach in this school because of a commitment to teach disadvantaged children and she had no special preparation (she did her practice teaching in a small rural school in Ohio near Denison University, where she was a student). She took the Hoover Junior High School job because when she arrived in late August in Berkeley, where John was to attend graduate school, only two jobs were left in the East Bay in her areas of specialization (junior high school social studies and English). Both were in inner-city, overwhelmingly black schools, and she took the job closest to Berkeley. Hoover Junior High School was not a bad school by today's standards, and she found the kids were, for the most part "good kids." However, she was totally unequipped to deal with the problems she encountered, which included 7th graders who couldn't read and high rates of turnover. There were three kinds of teachers at Hoover Junior High School. About a third were completely unprepared first-year teachers like Mary Fan who came to teach at Hoover Junior High for the same reason she did—jobs in inner-city schools were the only ones available to beginning teachers. Another third were somewhat older, but still fairly young, dedicated black teachers, and the last third were older white teachers, who, with few exceptions, had lost interest in teaching and prided themselves on maintaining order and discipline and quiet classrooms. It is unclear whether any more learning went on in Mary Fan's classroom than in other classrooms, but we do know that her students had more fun and that her classroom was much less quiet.

Table 12
Linear Specifications of Fixed-Effects Regressions of Campus Fraction of Teachers with 20 or More Years of Experience

	All Districts		All MSAs		Large MSAs		Greater Dallas		Houston		San Antonio	
Variable	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Campus Percent[a]												
Black	−.10	−4.8	−.11	−5.0	−.10	−4.1	−.18	−4.3	−.02	−.4	−.15	−1.4
Hispanic	−.14	−6.9	−.14	−6.7	−.15	−6.3	−.24	−5.0	−.17	−3.7	−.13	−1.3
High-Income	−.06	−3.2	−.06	−3.2	−.07	−2.9	−.09	−2.5	−.08	−1.8	−.09	−1.1
Black*High-Income	.11	2.9	.13	3.4	.09	2.1	.21	2.9	−.08	−1.1	−.17	−.6
Hispanic*High-Income	.07	2.3	.06	2.1	.05	1.4	.12	1.5	.15	2.2	.10	.9
District Fixed Effect (F-stat.)		2.5		3.9		4.3		3.5		4.1		3.7
Constant	.24	14.9	.24	14.0	.25	12.4	.27	8.4	.23	5.8	.29	3.5
R^2	.42		.35		.32		.33		.28		.26	
No. Observations	4,842		3,451		2,355		763		706		291	
No. Districts	1,046		382		203		72		41		19	
Mean	.16		.16		.16		.17		.15		.18	
Standard Deviation	.10		.10		.10		.10		.09		.11	

[a]Percent of students enrolled in grades 3 to 7.

large fractions of minorities and overrepresented in campuses with higher fractions of students from more well-to-do families. If the previously mentioned inverted U-shaped function between teacher experience and student achievement exists, the finding that teachers with more than 20 years are underrepresented among the faculties of campuses with large high percentages of disadvantaged minorities would work to these students' advantage. In contrast to the results for the inexperienced teachers equations, the San Antonio sign pattern is generally the same as the pattern obtained for the other five equations. None of the five coefficients in the San Antonio equation are significantly different from zero, however.

Class Size/Student Teacher Ratios

Ferguson (1991, p. 477) found that class size had a measurable impact on reading scores and placed great emphasis on the role of thresholds, indicating that "reducing the number of 'students per teacher' is important only when it exceeds eighteen. . . . Each additional student over eighteen causes the district average score to fall by between one-tenth and one-fifth of a standard deviation in the inter-district distribution of test scores for grades one through seven." Once again, Hanushek's survey articles offer little support for the notion that smaller classes have a significant effect on student achievement. Of the 187 educational production function studies that Hanushek reviewed for his 1989 survey article, 152 included the teacher-student ratio as an explanatory variable. Only 14 of these 152 studies obtained positive and statistically significant coefficients for the teacher-student ratio and nearly as many (13) found a negative and statistically significant relationship with student achievement (Hanushek 1989, p. 47).

The precision and certainty of Ferguson's (1991) conclusions about the effects of class size and threshold effects, particularly given the crudeness of his data, are stunning. Moreover, his findings about the effects of class size on achievement for Texas schools are further supported by his and Ladd's recent study of Alabama schools. In discussing their results, Ferguson and Ladd (1995, p. 35) observe that "the basic conclusion that class size matters for student learning emerges clearly and consistently, especially for math."[12]

Because Ferguson's (1991, p. 472) Texas study

[12] Summers and Wolfe (1977, p. 645) provide some support for the view that students in smaller classes have larger achievement gains, indicating that their analyses provide fairly strong evidence that smaller classes tended to increase the achievement gains for both low-achieving and high-achieving students, but had no effect on average students. In addition, they briefly describe the results of a survey of 85 earlier studies of the effect of class size on achievement, contained in an unpublished Ph. D. dissertation by Blake (1954), who found that 35 studies determined smaller classes were more effective, 18 determined that larger classes were more effective, and 32 were inconclusive.

relied on aggregate (district-level) data, he had to use students-per-teacher for the entire district as his measure of class size "because a direct measure of average class size is unavailable." Elaborating on this point, he observes:

> This study (and most others) lacks a direct measure of average class size. It does, however, have a measure of the number of students per teacher in the district. Average class size will be larger than "students per teacher" because some teachers are specialists who do not teach regular classes and because most teachers get periods off during the day. The results here show that reducing the number of "students per teacher" is important only when it exceeds eighteen. (Tests show that at least in this data set, the threshold is indeed at eighteen and not at seventeen or nineteen.) ... This is among the stronger effects for any variable in the study. However, it is an effect that is clearly restricted to the primary grades.

In contrast to Ferguson's and most other studies, we have been able to use data for individual teachers to construct a "direct measure of average class size" for each campus and grade. The class size data come from what we have termed "teacher time cards." These time cards provide a detailed description of each teacher's workweek by grade and subject taught, days of the week, the fraction of total time spent on each class, and the number and type (regular, special education, gifted and talented, and so on) of students who are enrolled in each of their classes.

Analysis of the teacher time cards revealed that most elementary school teachers offer instruction in only one grade and to one student population (Regular, ESL, Gifted and Talented, Compensatory/Remedial, Bilingual, or Special Education) and that most persons teaching in kindergarten through 5th grade have only one teaching assignment, presumably a stand-alone classroom.[13] This analysis further indicates that the mean number of assignments (time cards) increases from 1.3 cards per teacher in kindergarten to 1.9 cards per teacher in the 5th grade. Starting in 6th grade, the instructional technology clearly changes, as shown by a sharp increase in the number of teaching assignments from 1.9 per teacher in the 5th grade to 4.0 in the 6th; the mean numbers are even higher for those teaching regular 7th- and 8th-grade students (4.8 and 4.6 per teacher). Special-education teachers, who average 6.5 to 9.8 time cards, have the most assignments.

Texas' school reform legislation also required that all public elementary schools have 22 or fewer students per classroom through the 4th grade. Districts were given four years to fully implement the rule. The normalized frequency distributions of mean class size by campus for all grades (3 to 7) and for the 3rd and 6th grades in 1994, shown in Figure 1, make it clear this regulation has had a significant impact on class sizes.[14]

Because mean classroom size varies substantially by grade, we present equations for all grades (3 to 7), grade 3, and grade 6 for all MSAs and for large MSAs in Table 13. In contrast to the results obtained for other school inputs, the class size all-grades equation does not have a higher R^2 than either the 3rd- or 6th-grade equations. Instead, no doubt reflecting the 22-student cap, the 3rd-grade equation has much less variance and a higher R^2 than the all-grades equation. The R^2 for the 6th-grade equation is also larger than that for the all-grades equation.[15]

Only two of the five coefficients in the all-grades, all MSAs regressions are significantly different from zero. The coefficients for campus percent high-income indicate that average classroom size increases with percent high-income, while the sign for the percent black and high-income interaction variable indicates that average classroom size declines as both the campus percent black and the campus percent high-income increase.

The 3rd-grade class size regression has only one coefficient that is significantly different from zero at the 5 percent level, a negative coefficient for the campus percent black, suggesting that average class size decreases as the percent black increases. In the 6th-grade regression, average class size increases as

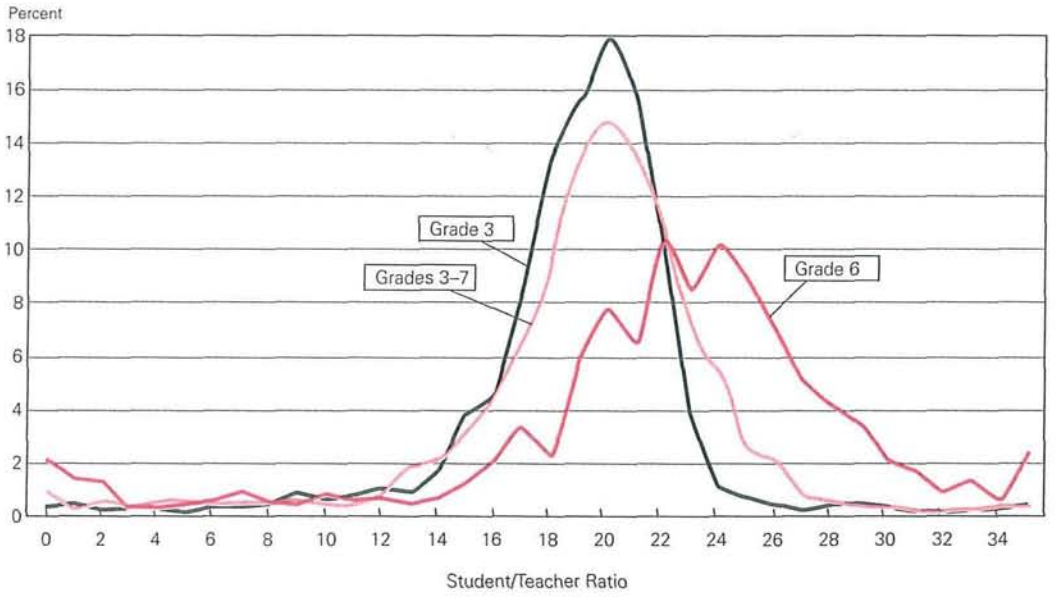
[13] This analysis is based on data for 139,565 classroom teachers in 1994, excluding only those teaching physical education or fine arts. These teachers reported a total of 389,491 different teaching assignments for an average of 2.8 assignments (cards) per teacher.

[14] There are also large differences in class size by population served. Mean class sizes by population served in the 3rd grade are: Bilingual (16.8 students per class), Compensatory/Remedial (13.1 students per class), ESL (16.6 students per class), Gifted and Talented (17.3 students per class), Regular (19.3 students per class), and Special Education (3.8 students per class). If students remained in the same classroom for all of their classes and had the same number of classmates for every class, the use of these data would be straightforward. We know, however, that students can be enrolled in more than one of these programs and it is possible that some, or even most, of these special classes are "pull-outs" from regular classrooms. In those cases, students enrolled in these programs may have taken the larger part of their course work in regular classrooms. Worse yet, these practices presumably differ from one district (or campus) to another.

[15] Using the Large MSA regressions as an example, the fraction of explained variance varies from 2 to 4 percent for the six equations without district dummies. When district dummies are added to the equations, the level increases to between 29 and 47 percent of the total variance.

Figure 1

Distribution of Mean Class Size by Grade, 1994



the campus percent black increases and as the campus percentage of high-income students increases, and decreases as the product of campus percent black and high-income increases.

Predicted Variations in School Inputs by Campus Race/Ethnicity and Income

To make it somewhat easier to understand the way in which each of the six school inputs examined in this paper is affected by differences in campus racial, ethnic, and income composition, we have used the Greater Dallas equations to carry out a parametric analysis of the way in which the several school inputs vary with representative levels of these campus-level variables. We use the Greater Dallas equation rather than the All District or the All MSAs because a single metropolitan area provides a more meaningful indication of the residential and public schooling choices available to households.

The predictions in Table 14 show how the estimated levels of each school input vary with specified changes in the percentages of black and Hispanic and high-income students for hypothetical Greater Dallas campuses.[16] These estimates are obtained using the input coefficients shown in previous tables, an arbitrary value for campus percent Hispanic of 10 percent for all cases, and quintile means of campus percentages black (column 3), and percentages high-income (shown in parentheses at the top of the table).[17]

While the analyses use the actual mean percentages of black and high-income students for each quintile, the quintiles themselves are defined by equal intervals of percent black and percent high-income from zero to one hundred. As column 2 (number of campuses) reveals, Greater Dallas has many more campuses in the interval zero to 20 percent black than in any of the remaining quintiles. Indeed, nearly three-fourths (73.8 percent) of all Greater Dallas campuses belong to this interval; the fourth quintile,

[16] An analogous analysis of the way in which the levels of these school inputs vary with changes in campus percent Hispanic and campus percent high-income is available from the authors.

[17] The actual mean Hispanic shares vary from a low of 6.5 percent for the fifth quintile to a high of 25.8 percent (column four in Table 14). We considered using the actual mean percent Hispanic for each quintile for these simulations, rather than a constant value of 10 percent Hispanic, but ultimately decided that using actual percent Hispanic confuses the respective contributions of campus percent black and campus percent Hispanic.

Table 13
Linear Specifications of Fixed-Effects Regressions of Campus Mean Class Size, All Grades, Grade 3, and Grade 6

	All MSAs						Large MSAs					
	All Grades (3 to 7)		Grade 3		Grade 6		All Grades (3 to 7)		Grade 3		Grade 6	
Variable	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.	Coefficient	t-stat.
Campus Percent[a]												
Black	−.69	−.7	−1.78	−2.0	5.63	2.3	.77	.7	−1.59	−1.7	5.99	2.1
Hispanic	−1.79	−2.0	−1.70	−1.9	3.07	1.3	−.58	−.6	−1.16	−1.2	3.27	1.2
High-Income	2.59	3.1	.26	.3	7.90	3.4	3.95	4.0	1.07	1.2	9.34	3.5
Black*High-Income	−2.89	−1.9	2.21	1.4	−10.65	−2.7	−5.73	−3.2	2.01	1.2	−12.70	−3.0
Hispanic*High-Income	2.17	1.8	1.12	1.0	−2.78	−.9	.42	.3	−.41	−.3	−4.92	−1.3
District Fixed Effect (F-stat.)		3.9		3.7		2.1		3.9		4.1		2.4
Constant	18.48	25.0	19.25	26.6	16.54	8.2	17.88	20.5	19.13	24.1	16.58	7.1
R^2	.36		.43		.47		.29		.38		.43	
No. Observations	3,449		2,350		1,344		2,353		1,621		908	
No. Districts	382		374		379		203		202		203	
Mean	19.10		18.73		21.54		19.53		19.09		22.16	
Standard Deviation	4.15		3.40		6.55		4.08		3.09		6.65	

[a]Percent of students enrolled in grades 3 to 7.

which is 61 to 80 percent black, by contrast includes only 1.9 percent of all campuses and the quintile 81 to 100 percent black includes only 6.6 percent of all Greater Dallas campuses. The bottom two rows of Table 14, which give the number and percentage of campuses in each income quintile, reveal that Greater Dallas campuses tend to be concentrated in the upper end of the income distribution. The 81 to 100 percent high-income quintile contains nearly a third of all Greater Dallas campuses, while the zero to 20 percent category contains only 13 percent.

The hypothetical calculations by campus percentage black and by campus percentage high-income shown in Table 14 raise the question of how well these categories represent the actual distribution of elementary schools in Greater Dallas by racial, ethnic, and income composition. As just noted, most (73.8 percent) Greater Dallas campuses are less than 20 percent black. At same time, the 26 percent of campuses that are more than 20 percent black served 69 percent of Greater Dallas African-American students enrolled in grades 3 to 7 in 1994. It is also the case that very few (five) campuses are more than 50 percent black *and* more than 50 percent high-income. While only 10.6 percent of Greater Dallas campuses are more than 50 percent black, 94 percent of these campuses have low-income percentages in excess of 50 percent. While campuses with very high percentages of black students are disproportionately concentrated in the cells defined by low shares of high-income students, the distribution of campuses by racial composition alone (percent black) is surprisingly uniform. In particular, only 49 (6.2 percent) of the 791 elementary schools in Greater Dallas in 1994 had no African-American students enrolled in grades 3 to 7 in 1994.

The predicted values of TECAT teacher reading and writing scores in Table 14 decline as the campus percentage of black students rises, and they increase as the campus percentage of high-income students increases. To give an example, for campuses with only 9.5 percent high-income students, the predicted difference in TECAT reading scores is 1.6 points between campuses that are 6.9 percent black and 92.2 percent black. Reading the table the other way, for campuses that are 6.9 percent black, predicted TECAT reading scores are 0.4 points less for campuses with only 9.5 percent high-income students than for campuses that are 91.2 percent high-income. Similarly, for campuses that are mostly black (92.2 percent black), the predicted teacher TECAT reading scores are 0.9 points higher for those in the highest income category (91.2 percent high-income) than for those in the lowest (9.5 percent high-income). No Greater Dallas campuses are 90 to 100 percent black *and* 90 to 100 percent

Table 14

Estimated Relationship of School Inputs to Percentages of Black and Hispanic Students and Percentages of High-Income Students, on Greater Dallas Campuses[a]

		Actual Mean			Campus % High-Income				
Campus % Black	Number of Campuses	% Black	% Hispanic	Assumed % Hispanic	0–20% (9.5%)	21–40% (29.9%)	41–60% (50.9%)	61–80% (70.9%)	81–100% (91.2%)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Predicted Teachers' TECAT Reading Score				
0–20	584	6.9	16.9	10.0	52.3	52.4	52.5	52.6	52.7
21–40	101	28.4	22.8	10.0	51.9	52.0	52.2	52.3	52.4
41–60	39	49.0	25.8	10.0	51.5	51.7	51.8	52.0	52.1
61–80	15	70.0	22.1	10.0	51.1	51.3	51.5	51.7	51.9
81–100	52	92.2	6.5	10.0	50.7	50.9	51.1	51.3	51.6
					Predicted Teachers' TECAT Writing Score				
0–20	584	6.9	16.9	10.0	27.5	27.5	27.5	27.6	27.6
21–40	101	28.4	22.8	10.0	27.0	27.1	27.2	27.3	27.4
41–60	39	49.0	25.8	10.0	26.6	26.8	26.9	27.1	27.2
61–80	15	70.0	22.1	10.0	26.2	26.4	26.6	26.8	27.0
81–100	52	92.2	6.5	10.0	25.8	26.1	26.3	26.5	26.8
					Predicted Class Size				
0–20	584	6.9	16.9	10.0	18.5	19.2	19.9	20.5	21.2
21–40	101	28.4	22.8	10.0	18.8	19.1	19.5	19.8	20.1
41–60	39	49.0	25.8	10.0	19.1	19.1	19.1	19.1	19.1
60–80	15	70.0	22.1	10.0	19.3	19.0	18.6	18.3	18.0
81–100	52	92.2	6.5	10.0	19.6	18.9	18.2	17.5	16.9
					Predicted % Teachers with Advanced Degree				
0–20	584	6.9	16.9	10.0	37.7	36.4	35.1	33.9	32.6
21–40	101	28.4	22.8	10.0	34.9	34.8	34.7	34.7	34.6
41–60	39	49.0	25.8	10.0	32.1	33.2	34.4	35.4	36.5
61–80	15	70.0	22.1	10.0	29.3	31.6	34.0	36.2	38.5
81–100	52	92.2	6.5	10.0	26.4	29.9	33.6	37.0	40.6
					Predicted % Teachers with 0 to 3 Years' Experience				
0–20	584	6.9	16.9	10.0	15.7	17.2	18.7	20.2	21.6
21–40	101	28.4	22.8	10.0	21.1	21.7	22.3	22.9	23.5
41–60	39	49.0	25.8	10.0	26.4	26.1	25.8	25.6	25.3
61–80	15	70.0	22.1	10.0	31.7	30.6	29.4	28.3	27.1
81–100	52	92.2	6.5	10.0	37.4	35.3	33.2	31.1	29.0
					Predicted % Teachers with 20 or More Years' Experience				
0–20	584	6.9	16.9	10.0	22.9	21.6	20.3	19.0	17.7
21–40	101	28.4	22.8	10.0	19.5	19.1	18.7	18.4	18.0
41–60	39	49.0	25.8	10.0	16.1	16.7	17.3	17.8	18.4
61–80	15	70.0	22.1	10.0	12.8	14.3	15.8	17.2	18.7
81–100	52	92.2	6.5	10.0	9.2	11.7	14.2	16.6	19.0
Number of Campuses in Income Quintile					103	85	130	213	260
Percent of Campuses in Income Quintile					13.0%	10.7%	16.4%	26.9%	32.9%

[a]Percent of students enrolled in grades 3 to 7.

high-income. The largest predicted difference in teacher reading scores, 2.0 points, is between a campus that is 92.2 percent black and 9.5 percent high-income and a campus that is 6.9 percent black and 91.2 percent high-income. The Greater Dallas area has a fair number of both of these types of campuses. In

assessing the predicted TECAT scores and subsequent predictions of school inputs for campuses of varying percent black and high income, it should be remembered that all of the predictions assume a uniform campus 10 percent Hispanic.

The results obtained for predicted TECAT teacher writing scores are very similar to those obtained for TECAT reading scores. In contrast, the class size results are more complex. For campuses with few high-income students (9.5 percent), class size increases as campus percent black increases, from 18.5 students per teacher (campus percent black 6.9 percent) to 19.6 students per teacher (campus percent black 92.2 percent). For campuses with 91.2 percent high-income students (the top quintile), exactly the opposite result occurs; class size declines from 21.2 students per teacher when the percentage of black students is 6.9 to 18.9 students per teacher when 92.2 percent of the students are black.

The results for Greater Dallas provide strong evidence of systematic and large differences in the fraction of teachers with advanced degrees between low-income, minority and high-income, majority campuses in the same district.

The same kind of twist appears in the predicted fractions of teachers with advanced degrees. For the lowest income category, the percentage of teachers with advanced degrees declines from 37.7 percent for campuses that are 6.9 percent black to 26.4 percent for campuses that are 92.2 percent black. These results provide strong evidence of systematic and large differences in the fraction of teachers with advanced degrees between low-income, minority and high-income, majority campuses in the same district. As noted earlier, the importance of this result depends on whether teachers with advanced degrees are more effective teachers, something about which there is considerable disagreement.

The results for inexperienced (0 to 3 years' experience) teachers indicate very large differences in the fractions of inexperienced teachers between very low-income schools with relatively few black students and very low-income schools that are predominantly black. For campuses with the fewest (9.5 percent) high-income students, the fraction of teachers with limited experience increases from 15.7 percent for schools that are 6.9 percent black to 37.4 percent for schools that are 92.2 percent black. Smaller differences by campus percent black appear for schools with larger fractions of high-income students.

The results for teachers with 20 or more years of experience provide strong evidence that teachers with greater seniority avoid schools with high fractions of low-income black students. This result disappears for campuses in the top income quintile, however, where the predicted fraction of very experienced teachers in schools with 92.2 percent black students, 19 percent, is slightly higher than the percent for schools with only 6.9 percent black students, 17.7 percent.

Summary and Conclusions

Significant changes have taken place in the educational landscape since the Coleman Report was published nearly 30 years ago. As this paper demonstrates, the most obvious change in Texas has been substantial reductions in the extent of racial/ethnic segregation in the public schools. While Coleman and his colleagues (1966) found high levels of school segregation, data for Texas elementary schools presented in this paper show that in 1994 fewer than 16 percent of Anglo students attended schools that were greater than 90 percent Anglo. Additional measures of campus-level concentration for African-American, Hispanic, and Anglo students reveal relatively few campuses throughout the state where students attend schools composed solely of their own ethnic/racial group. Racial concentration continues to be higher in Texas's largest metropolitan areas. Nonetheless, the levels of racial/ethnic concentration today are much lower than the levels found 30 years ago.

In spite of significant declines in racial/ethnic concentrations, the large gaps in mean achievement identified by Coleman persist; analyses of mean reading scores for a synthetic cohort of students attending Texas elementary schools during the period 1989 (grade 1) through 1994 (grade 6) reveal that mean reading scores of African-American and Hispanic children in grade 1 are only 94 percent of the statewide average, while mean reading scores for Asian-American and Anglo 1st graders are 107 and 106 percent of

the statewide average. Moreover, the reading scores for Hispanics exclude significant numbers of children who take the reading exam in Spanish or are excused from taking the exam because of limited English proficiency. Crude adjustments for differences in family income levels narrow, but do not eliminate, differences in the mean reading scores of Texas's major racial/ethnic groups.

Analyses presented in this paper also provide some support for the widely reported finding that racial/ethnic gaps in student achievement tend to increase as years of schooling increase. A final judgment on this finding should be reserved, however, until we have completed the linking of test and student records, repeated the same analyses for true cohorts, and more carefully evaluated the role of the 1st- and 3rd-grade Spanish language tests and non-test-taking by low-achieving students.

While the findings summarized above are important, this paper has been principally concerned with quantifying within-district variations in selected school inputs by campus racial/ethnic and family income composition. In contrast to Coleman et al.'s (1966) finding of no consistent differences in the quantity and quality of school inputs for predominantly majority and minority schools, the analyses presented in this paper reveal substantial within-district variations in four types of school inputs: teacher test scores, years of education, and experience, and class size (student-teacher ratios). The statistical models presented in this paper document a sorting of school inputs based on campus racial/ethnic and socioeconomic composition. In particular, the models suggest that teacher ability, as measured by verbal and written proficiency scores, decreases as the campus percentage of black and Hispanic students increases; measured teacher ability increases with the campus percentage of high-income students. Estimates of the variations in other school input measures provide strong evidence that, in Texas, teachers employed in schools with high fractions of disadvantaged minority students have fewer years of education and less experience; they also have more students in their classes.

While the findings presented in this paper are important in their own right, they also have important implications for the larger study of which this paper is a part, and particularly for the careful estimation of the determinants of educational achievement, a major goal of the larger study. In the past, educational production function studies have had only modest success in quantifying the relationship between school inputs and student achievement. As Hanushek and Kain (1971) argued a quarter of a century ago, the failure of earlier educational production function studies to obtain more consistent results may be attributable to imprecise measurement of school inputs. The results in this paper are a first step toward the goal of obtaining more reliable estimates of the relationship between school inputs and student achievement. The analyses reported in this paper of within-district variation in school input measures reveal that schools differ significantly in the level of inputs they provide and in the instructional technology that they employ. By creating a linked sample of student achievement scores combined with these and other precise measures of school inputs, we hope to determine how the variations in school input measures affect student achievement and the gaps that persist between disadvantaged minorities and more prosperous members of other racial/ethnic groups.

References

Blake, Howard. 1954. "Class Size: A Summary of Selected Studies in Elementary and Secondary Public Schools." Unpublished Ph.D. dissertation, Columbia University.

Campbell, Ernest Q. 1969. "Negroes, Education and the Southern States." *Social Forces*, vol. 47, no. 3 (March).

Coleman, James S., Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederic D. Weinfeld, and Robert L. York. 1966. *Equality of Educational Opportunity.* Washington, D.C.: Government Printing Office.

Farkas, George et al. 1995. "Can All Children Learn to Read at Grade-Level by the End of Third Grade?" Working Paper, The Center for Education and Social Policy, University of Texas at Dallas, September 20.

Farley, Reynolds. 1993. "Changes in the Segregation of Anglos from Blacks during the 1980s: Small Steps Toward a More Integrated Society." Population Studies Center, University of Michigan, July.

Ferguson, Ronald F. 1991. "Paying for Public Education: New Evidence on How and Why Money Matters." *Harvard Journal on Legislation*, vol. 28, no. 2 (Summer), pp. 465–98.

Ferguson, Ronald F. and Helen F. Ladd. 1995. "Additional Evidence on How and Why Money Matters: A Production Function Analysis of Alabama Schools." Harvard and Duke Universities, June 29.

Hanushek, Eric A. 1971. "Teacher Characteristics and Gains in Student Achievement: Estimation Using Micro-Data." *The American Economic Review*, vol. 61, pp. 280–88.

———. 1972. *Education and Race: An Analysis of the Educational Production Process.* Cambridge, MA: Heath-Lexington.

———. 1981. "Throwing Money at Schools." *Journal of Policy Analysis and Management*, vol. 1, pp. 19–41.

———. 1986. "The Economics of Schooling: Production and Efficiency in Public Schools." *Journal of Economic Literature*, vol. XXIV (September), pp. 1141–77.
———. 1989. "Impact of Differential Expenditures on School Performance." *Educational Researcher*, vol. 18, no. 4 (May), pp. 45–51.
———. 1991. "When School Finance 'Reform' May Not Be a Good Policy." *Harvard Journal on Legislation*, vol. 28, pp. 423–56.
Hanushek, Eric A. and John F. Kain. 1972. "On the Value of Equality of Educational Opportunity as a Guide to Public Policy." In *On Equality of Educational Opportunity*. Frederick Mosteller and Daniel P. Moynihan, eds. New York: Random House, Inc.
Hedges, Larry, Richard Lane, and Rob Greenwald. 1994. "Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes." *Educational Researcher*, vol. 23, no. 3, pp. 5–14.
Jencks, Christopher. 1972. "The *Coleman Report* and the Conventional Wisdom." In *On Equality of Educational Opportunity*, Frederick Mosteller and Daniel P. Moynihan, eds. New York: Random House, Inc.
Kain, John F. 1968. "Housing Segregation, Negro Employment, and Metropolitan Decentralization." *Quarterly Journal of Economics*, vol. LXXXII, no. 2 (May), pp. 175–97.
———. 1979. "Failure in Diagnosis: A Critique of the National Urban Policy." *The Urban Lawyer*, vol. II, no. 2 (Spring).
———. 1985. "Black Suburbanization in the Eighties: A New Beginning or a False Hope?" In *American Domestic Priorities: An Economic Appraisal*, John M. Quigley and Daniel L. Rubinfeld, eds. Berkeley, CA: University of California Press.
———. 1992. "The Spatial Mismatch Hypothesis: Three Decades Later." *Housing Policy Debate*, vol. 3, issue 2, pp. 371–460.
———. 1995. "Impact of Minority Suburbanization on the School Attendance and Achievement of Minority Children: Final Report of Work Completed Under Spencer Foundation Small Grant." January 28.
Kain, John F. and Joseph J. Persky. 1969. "Alternatives to the Gilded Ghetto." *The Public Interest*, Winter, pp. 74–87.
Massey, Douglas S. and Nancy A. Denton. 1993. *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, MA: Harvard University Press.
Mosteller, Frederick and Daniel P. Moynihan, eds. 1972. *On Equality of Educational Opportunity*. New York: Random House, Inc.
Murnane, Richard. 1975. *The Impact of School Resources on the Learning of Inner City Children*. Cambridge, MA: Ballinger.
———. 1981. "What Do Effective Teachers of Inner-City Children Have in Common?" *Social Science Research*, vol. 10, pp. 83–100.
Orfield, Gary and Carole Ashkinaze. 1991. *The Closing Door: Conservative Policy and Black Opportunity*. Chicago, IL: University of Chicago Press.
Orfield, Gary and Franklin Monfort. 1992. "Status of School Desegregation: The Next Generation." Report to the National School Boards Association, Metropolitan Opportunity Project.
Owen, John D. 1972. "The Distribution of Educational Resources in Large American Cities." *The Journal of Human Resources*, vol. VII, no. 1 (Winter), pp. 26–38.
Rivkin, Steven G. 1994. "Residential Segregation and School Integration." *Sociology of Education*, vol. 67 (October), pp. 270–92.
Summers, Anita and Barbara Wolfe. 1977. "Do Schools Make a Difference?" *The American Economic Review*, vol. 67, no. 4 (December), pp. 639–52.
Texas Education Agency. 1990. "The Texas State Plan and Guidelines for the Education of the Gifted-and-Talented." Austin, Texas.
U. S. Commission on Civil Rights. 1967a. *Racial Isolation in the Public Schools*. Washington, D. C.: Government Printing Office.
———. 1967b. *Racial Isolation in the Public Schools: Appendices*. Washington, D. C.: Government Printing Office.
Welch, Finis, et al. 1987. *New Evidence on School Desegregation*. Los Angeles, CA: Unicon Research Corp.

Discussion

Eric A. Hanushek, Professor of Economics and of Public Policy at the University of Rochester.

This is the right line of research at the right time. The fortieth anniversary of *Brown v. Board of Education* just passed and the thirtieth anniversary of the Coleman Report (Coleman et al. 1966) is arriving; the time has come for a serious reconsideration of race, segregation, and schooling. Over the past decades, a wide variety of desegregation and compensatory programs have been introduced, so that their effects should now be evident. Additionally, there is a new willingness (perhaps overwillingness) to consider major restructuring and even elimination of programs. Thus, it would be nice to have evidence about what is and is not important in student achievement. Toward this end, John F. Kain and Kraig Singleton are creating a truly unique data set that will permit investigation of some of the key questions that have almost completely eluded educational researchers. And of course Kain, an early interpreter of the Coleman Report and one of the nation's premier researchers into the nexus of race and space, is uniquely prepared to undertake this investigation.

Given the local basis of education and the patterns of local control of educational decisions, a discussion of education is inherently a discussion of the spatial distribution of opportunities. In terms of this conference, the spatial structure of schooling provides clear linkages between today and the future. So it is of some importance to understand how schooling opportunities interact with school attendance patterns and racial disparities in educational quality.

Race and Schooling

The motivation for the Coleman Report, a study mandated in the Civil Rights Act of 1964, was to investigate the "lack of availability of equality of

educational opportunity for individuals by reason of race, color, religion, or national origin." This report and the follow-on by the U.S. Commission on Civil Rights (1967), entitled *Racial Isolation in the Public Schools*, focused attention on one of the most obvious characteristics of the schools of the mid-1960s, their separation by race of the students. While not in their direct charge, these studies also began to provide information that could be used to evaluate the achievement effects of what is one of the largest and most long-running social programs in our nation's history—the effort to desegregate the schools of both

The time has come for a serious reconsideration of race, segregation, and schooling.

the Old Confederacy and the rest of the Union. Given this backdrop, it is useful to begin with a quick summary of what we know about race and schooling from these original studies and intervening studies.

My overall summary is as follows:

1. Large disparities by race exist in school performance (measured, say, by the National Assessment of Educational Progress), although the gaps have closed some over the past 10 to 15 years.

2. The racial composition of schools has changed in fairly complicated ways related to the imposition of desegregation policies (voluntary or otherwise), to the development of housing patterns within cities, and to the general decentralization of the population. Nonetheless, while the patterns vary across regions, the amount of racial contact in the schools has increased over the past decades (Welch and Light 1987).

3. The racial composition of the schools has minimal effects on student test performance, other things being equal.

4. Quality of the schools may be correlated with racial composition, although this is not particularly well documented.

5. Limited progress has been made in addressing the important issues of how school policies interact with racial disparities in performance, largely because the data available for analysis have not been at all adequate.

Kain and Singleton have embarked on a data construction effort in the state of Texas that directly addresses point 5 and holds promise for filling in the details on points 3 and 4. Their data set, which is still under construction, could become the richest data set ever compiled to address central issues of educational policy, particularly as related to race and space. Until now, the largest and most comprehensive data base has been the one for the original Coleman Report, even though it has a number of serious flaws for the investigations of interest here. The Kain and Singleton data set will clearly leapfrog that data base. Without repeating their description, the key features include the extraordinarily large samples, the ability to follow individual students over time, and the ability to link school resources rather closely to individual students.

The Kain-Singleton Analysis

The analysis in this paper largely concentrates on a series of very important descriptive issues. While this analysis considers only a small part of what they can eventually exploit, the authors begin to provide important insights that motivate analyses yet to come.

The basic starting point is a finding that clear and systematic differences exist in student test performance by race and ethnic background. While not surprising in light of other data, this finding sets the scene for the central analysis. An important point, however, is that the differences are larger for low-income blacks and Hispanics. This interaction between income and race is less well known or documented in past work.

Most of the new analytical efforts within this paper are devoted to understanding the distribution of school resources across schools in Texas. Before doing this, however, they present what I believe is the key table for interpreting all of the results—their Table 6. Table 6 presents the only estimates in the paper of the determinants of student performance. These 6th-grade results are clearly preliminary and subject to modification with further refinements. Nonetheless, they are rather remarkable. The first column presents estimates of achievement models that employ just income-race interactions (plus student gender and age). The fifth column presents estimates of this same model with individual school fixed effects, that is, a dummy variable for each of the about 2,000 separate campuses. At least at the visual level, the estimated differences in performance by race appear *independent of school level inputs*. In other words, the racial differences are not affected by differences in school level resources.

This finding does not particularly surprise me, because I have long held that school quality is not closely related to expenditure or conventional school inputs (Hanushek 1986). But it does provide a somewhat different interpretation of much of the Kain-Singleton analysis.

The focus of attention of their study is how school resources vary by race of the school. They examine scores on teachers' tests (TECAT), master's degrees, teaching experience (novice or old), and class size. The analysis is very clever and demonstrates the power that comes from their data set. They investigate how resources differ by race, holding constant overall district factors through the use of district fixed effects. The general form of the regressions calls for regressing each of the school resource measures on percent black, percent Hispanic, and interactions with income along with a district fixed-effect term.

Several aspects of these analyses stand out. First, and most important, these resources consistently are distributed such that more resources go to schools with low minority populations. Schools with high proportions of blacks and Hispanics simply get less of each of these resources.

Second, and somewhat unexpected, the pattern and the magnitude of these race effects are very similar across districts. Large MSAs as a group or individual large districts look quite similar to all districts in the state. (Again, these conclusions are not based on formal statistical tests but instead on qualitative summaries of the estimated models.) The apparent uniformity belies conventional views that such race effects are larger and more intense in the big urban centers.

Third, their careful consideration of the measurement of inputs is admirable. They work hard at constructing solid estimates of teacher test scores. They also provide an interesting supplemental analysis of how class size varies widely by type of instruction and grade level, adding a real caution about inherent conceptual difficulties in measuring class sizes for districts. Average class size for a district, for example, will be a very poor measure of potential performance effects if there are nonlinearities in how class sizes affect performance.[1]

As mentioned, the interpretation by many people of these resource variations is that they indicate disparities in the quality of schooling received by students. My interpretation is different, because the evidence on resources indicates that master's degrees and class size are not closely related to student performance. For example, in 277 separate estimates of the effects of teacher-pupil ratios on student outcomes, 15 percent find statistically significant positive effects while 13 percent find statistically significant negative effects (Hanushek, Rivkin, and Taylor 1995). The remaining 72 percent are statistically insignificant; that is, we are not very confident that student outcomes are affected by teacher-pupil ratios. Teacher experience shows somewhat stronger effects but, as Kain and Singleton point out, causality is not well sorted out. The evidence on test scores tends to be stronger: 26 of the 36 studies with estimated effects on student achievement are positive and 15 of those are statistically significant.[2] Thus, past work might suggest taking the TECAT variations more seriously in terms of potential effects on student outcomes.

Kain and Singleton's data set could become the richest ever constructed to address central issues of educational policy, particularly as related to race and space.

But remember Table 6. That table suggests that school-level differences do not affect racial differences in student performance. By implication this supports a finding of "no effect" of these factors, because we know that these factors are themselves distributed in a systematic manner by race and ethnicity.

The overall patterns of resource variations remain inherently interesting. If these hold up to further refinement of the data and analyses, they suggest

[1] Some people, beginning with Glass and Smith (1979), argue that class sizes above some level have little effect on performance but have significant effects below a cut-off—roughly 15 students per teacher in the Glass and Smith analysis. Ferguson (1991) argues from Texas data that class size effects become more important when pupil-teacher ratios rise above a threshold. Specifically, "the number of 'students per teacher' is important only when it exceeds eighteen" (p. 477). Both of these studies imply nonlinear responses to variations in class size, and suggest that aggregation across grades and schools within districts will lead to significant biases.

[2] This summary omits the five studies that report statistically insignificant effects but do not report the sign of the estimated relationship.

systematic discrimination in the operation of schools. Resources that are conventionally thought to affect student achievement are systematically distributed toward the majority whites in Texas and away from the blacks and Hispanics. We can thus be thankful that these resources in reality do not appear to have much to do with student performance.

Finally, I must conclude with a statement of anticipation. Kain and Singleton have constructed a data base that is likely to become the source of much new knowledge about schooling. Issues ranging from the effects of school desegregation to the impacts of student migration to the effects of special education and other distinct programs all can be brought under the spotlight of their data. They should be encouraged to work faster, so we can have the answers sooner.

References

Coleman, James S., Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederic D. Weinfeld, and Robert L. York. 1966. *Equality of Educational Opportunity*. Washington, D.C.: Government Printing Office.

Ferguson, Ronald F. 1991. "Paying for Public Education: New Evidence on How and Why Money Matters." *Harvard Journal on Legislation*, vol. 28, no. 2 (Summer), pp. 465–98.

Glass, Gene V. and Mary Lee Smith. 1979. "Meta-analysis of Research on Class Size and Achievement." *Educational Evaluation and Policy Analysis*, vol. 1, no. 1, pp. 2–16.

Hanushek, Eric A. 1986. "The Economics of Schooling: Production and Efficiency in Public Schools." *Journal of Economic Literature*, vol. 24, no. 3 (September), pp. 1141–77.

Hanushek, Eric A., Steven G. Rivkin, and Lori L. Taylor. 1995. "Aggregation and the Estimated Effects of School Resources." Working Paper No. 397, Rochester Center for Economic Research, University of Rochester, February.

U.S. Commission on Civil Rights. 1967. *Racial Isolation in the Public Schools*. Washington, D.C.: Government Printing Office.

Welch, Finis, and Audrey Light. 1987. *New Evidence on School Desegregation*. Washington, D.C.: U.S. Commission on Civil Rights.

Is the Market for College Graduates Headed for a Bust? Demand and Supply Responses to Rising College Wage Premiums

John H. Bishop

Associate Professor and Chair of the Human Resource Studies Department, New York State School of Industrial and Labor Relations, Cornell University. *The research reported here was supported by funds from the Federal Reserve Bank of Boston, the Center for Advanced Human Resource Studies, and the Cornell Youth and Work Program. This paper has benefited from conversations with Ron Kutscher and other staff at the U.S. Department of Labor. The opinions and conclusions expressed herein are solely those of the author.*

Demand for college-graduate workers was strong during the 1980s (Blackburn, Bloom, and Freeman 1989; Katz and Murphy 1990; Kosters 1989; Freeman 1991). Their relative wage rose, and the share of 18- to 24-year-olds attending college rose in response. Have the demand and technology shocks that produced this result now run their course? Is the supply response large enough to stop or reverse the 1980s escalation of the relative wages of college graduates?

Read superficially, U.S. Bureau of Labor Statistics (BLS) projections appear to suggest that the answer to these questions is "Yes." In the most recent BLS report, the growing supply of college graduates was projected to outstrip growth in demand by 330,000 annually (Shelley 1994). An even larger gap between supply and demand had been projected in 1992 (Shelley 1992). Looking at earlier projections, some in the press even reported that the college graduate labor market was about to go bust. *New York Times* reporter Louis Uchitelle, for example, led off an article titled "Surplus of College Graduates Dims Job Outlook for Others" with the following:

> Hundreds of thousands of jobs, once performed creditably without a college degree, are today going to college graduates as employers take advantage of an oversupply. . . . At roughly 25 percent of the work force—higher than in any other industrial nation—college graduates outstrip the demand for their skills, the Labor Department reports (June 18, 1990, p. 1).

Most economists, however, do not believe a surplus of college graduates and other skilled workers exists now or is likely to develop anytime soon. The Secretary of Labor and the Chief Economist's office within the U.S. Department of Labor apparently give little credence to the BLS projections of a college graduate surplus. Skills shortages are a common theme of Secretary Robert Reich's speeches and of policy initiatives of the department.

Who is right? Is a bust of the college graduate labor market on the

horizon? In fact, a closer reading of the latest BLS projections suggests that it is not. The future is predicted to be much like the past. Since the recent past has been characterized by low unemployment and rising relative wages for college graduates, the BLS data can also be interpreted as predicting more of the same.

Past BLS projections have not been particularly successful in predicting changes in the market for college graduates. The BLS projected a strong market for college graduates in 1970, just prior to the bust of the 1970s. The BLS projected a weak market in 1980, just prior to the 1980s boom. Moreover, the task of projecting the number of jobs "requiring a college degree" into the future is essentially impossible. The methods used to make the projections are not well adapted to the task. BLS projections published in 1981, 1983, and 1985 underestimated the growth of managerial and professional jobs and overestimated the growth of lower-skill jobs. The methods used to project occupational employment inevitably miss an important portion of the rise in skills that is under way in our economy.

Findings about skill differentials suggest that we should raise high-school standards, increase student financial aid, make tuition tax-deductible, and stop increasing tuition at public colleges.

An alternate methodology for projecting occupational employment is available. Regressions predicting occupational employment shares with a trend, unemployment, the trade deficit, and the share of workers using personal computers did a better job projecting the early 1990s than the BLS. Both methods, however, missed predicting the slowdowns in the growth of clerical, technical, and craft jobs.

The updated model projects that professional, technical, and managerial jobs will account for 60 percent of job growth between 1990 and 2005. Skill differentials between college-level jobs and other jobs continue to expand, even in the most recent data. And because the college-age population cohort is small, the increase in the share of the cohort attending school has not produced a substantial increase in the ratio of new BAs to total employment. Rates of college completion are not high enough to flood the college graduate market, and U.S. youth are not overeducated relative to those of other nations, as has been claimed. In fact, young Europeans and East Asians spend more years in school than young Americans.

These findings have important policy implications. They suggest that we should raise high school standards, increase student financial aid, make tuition tax-deductible, and stop increasing tuition at public colleges.

What Do the 1994 BLS Projections of Supply and Demand for Graduates Really Imply?

Let us begin by examining the projections of supply and demand made by the U.S. Bureau of Labor Statistics in 1992 and 1994. The 1992 report states that "estimates of available entrants to the college graduate labor force (supply) will average . . . 406,000 more than demand" (Shelley 1992, p. 16). The 1994 report predicts that "nearly 25 percent of new entrants are expected to settle for jobs that do not require a college degree" (Shelley 1994, p. 9). Both sound quite negative about the future demand for college graduates. Table 1 presents the numbers. In 1992, BLS projected a significant deterioration of the supply-demand balance during the 1990s. The annual increase in the number of "underemployed" graduates was projected to be equal to 31 percent of the annual flow of BAs into the labor force (both immigrants and new graduates) during the period. The share of underemployed college graduates was projected to increase from 19.9 percent in 1990 to 25.9 percent in 2000.

However, when later projections were made, predictions of employment growth in professional jobs were revised upward, from the 340,500 per year of the 1991 projections to 477,000 per year in the 1993 projections and to 461,000 in the 1995 projections (Silvestri and Lukasiewicz 1991; Silvestri 1993; BLS 1996). This has improved BLS's projected outlook for college graduates. Consequently, in the most recent report, the gap between supply and demand is expected to grow only slightly, from 22 percent of the gross increase in the supply of BAs to 24 percent after 1992. The BLS also projects that the growth of the "underemployment" share will accelerate somewhat after 1992.

Table 1
College Graduates Entering the Labor Force and College-Level Job Openings, Past and Projected to 2005
Annual Averages, in Thousands

	1992 Projections		1994 Projections	
	1984–1990	1990–2005	1984–1992	1992–2005
Supply coming from:				
New graduates (National Center for Educational Statistics projections)	974	1106	1000	1180
Other entrants (immigration)	214	214	200	200
Increase in supply of BAs in labor force	1188	1320	1200	1380
Demand coming from:				
Growth of occupations normally "requiring" a BA	459	311	593	562
Growth due to upgrading	308	291	157	168
Replacement demand—due to retirements	197	312	190	320
Increase in college-level jobs held by BAs	964	914	940	1050
Yearly increase in graduates not in college-level jobs	224	406	260	330
Ratio of this supply-demand gap to growth of BAs in labor force	18.9%	30.8%	21.7%	23.9%
Annual change in the share of BAs underemployed	.16%	.61%	.35%	.50%

These projections can be interpreted in two very different ways. Many reporters have interpreted them as implying that the market for college graduates is about to deteriorate. This interpretation comes from focusing on projected gaps between demand and supply in the future. Focusing instead on how the future is expected to differ from the recent past, one arrives at a different conclusion. The 1994 report projects that the supply-demand balance for college graduate workers for the 1992–2005 period will be rather similar to the conditions that prevailed during the previous eight years. Since unemployment rates of college graduates remained low and relative wage rates grew substantially from 1984 to 1992, the BLS projections really predict a continuation of the strong labor market for college graduates that characterized the 1980s. They also point out, quite correctly, that a strong market for college graduates does not imply that all college graduates will have professional, technical, managerial, or sales representative jobs.

Are the BLS Estimates of Jobs "Requiring" a College Degree and of "Underemployed" College Graduates Credible and Reliable?

The BLS assesses the current demand-supply balance for college graduates by defining a set of jobs that "require" a college degree and then counting up the number of college graduates who do not have one of these jobs. The workers being categorized are not asked whether they believe a college degree is required or useful in their job. The classification is based on the match between reported education and reported occupation. Workers with fewer than 16 years of schooling are automatically counted as having jobs that do not require a college degree. Workers with 16 or more years of schooling are classified as "underemployed" when the reported occupation appears not to "require" a college degree.

This classification of occupations is inherently arbitrary and idiosyncratic to the analyst. When Sargent and Pfleeger (1990) did the analysis, the BLS concluded there were 18.1 million college-level jobs in 1988. When Hecker (1992) reestimated the number two years later, he found 21.8 million college-level jobs (a 20 percent increase). Yet the validity of the whole effort to measure "underemployment" depends on this classification being done correctly in every detail, not only for the present but also for up to 15 years in the future. This is essentially impossible.

First, the occupational coding system used by the Current Population Survey (CPS) and the Census is not reliable and comprehensive enough to allow accurate measurement of a concept like "underemployment." Census Bureau studies have found that between 18.3 and 27.3 percent of the individuals recorded as professionals, technicians, or managers in one interview are recorded in a less skilled occupation in a subsequent interview four to seven months later (U.S. Bureau of the Census 1972).

Substantial errors also occur in measuring educa-

tional attainment. Between 5.5 and 9 percent of respondents recorded as having more than 16 years of schooling in one interview are recorded as having fewer than 16 years of schooling in a later interview. If errors in reporting occupation and schooling are uncorrelated with each other, measurement error raises the estimated "underemployment" share by as much as 12 to 18 percentage points.[1]

Consequently, reporting and coding errors are responsible for many of the apparent mismatches between an individual's occupation and his or her education. How else can one explain the 9.6 percent of college teachers and the 5.4 to 6.5 percent of lawyers, physicians, and secondary school teachers who claim not to have completed 16 years of schooling (BLS 1990, Table F-3)? The unreliability of individual measures of occupation and education means that counts of mismatches between schooling and occupation derived from micro CPS data have little validity. True mismatches between education and occupation are a lot less common than these statistics suggest.

The second problem is the lack of symmetry in the handling of possible mismatches between educational qualifications and occupation. Large numbers of workers without college degrees say they occupy jobs that most people would agree "require" at least a four-year degree. In 1988, 44,000 lawyers, 42,000 social scientists, 46,000 natural scientists, 33,000 physicians, 61,000 college teachers, 143,000 elementary and secondary school teachers, and 363,000 engineers said they had not completed four or more years of college (BLS 1990, Table F-3). The BLS does not classify these individuals as "undereducated." By ruling out the possibility of undereducation, the conceptual framework makes inevitable a conclusion that there are too many college graduates.

The third problem is the great heterogeneity of the college graduate category. Ten percent of college graduates cannot write a brief letter explaining an error made on a credit card bill or determine the discount from an oil bill for early payment (National Center for Education Statistics (NCES) 1995a, pp. 38, 40, 66). As one can see in Table 2, these graduates are less likely to have professional, technical, or managerial jobs and much more likely to have service or laborer jobs (NCES 1995a, p. 95).

Table 2
Occupations of College Graduates by Degree of Prose Literacy

	Prose Literacy Group (5 = highest)					
	1	2	3	4	5	Total
Percent in Service or Laborer Job	11.2	7.3	7.5	4.6	2.3	5.5
Percent in Professional, Technical, or Managerial Job	46	56	64	75	83	71
Percent of College Graduates in Literacy Group	1.6	7.8	30	42	16.8	100

More than 40 percent of young adults with associate or bachelor's degrees cannot calculate change from a menu. Seventeen percent of young college graduates read at a level below the typical eleventh-grader (Kirsch and Jungeblut 1986). How can someone with high-school or lower reading and math levels be considered "underemployed" or "overeducated" in a secretarial, carpentry, or retail sales job? For such individuals, the problem is "undereducation," not "underemployment."[2]

The fourth problem is that for most occupations, the question "Does it require a college degree?" does not have a "yes" or "no" answer. It is a matter of degree. Some employers structure their management jobs in ways that make the skills normally developed in college absolutely essential; at other employers such skills are very helpful, and at still others the skills are of little advantage. The magnitude of the college graduate productivity advantage also depends on the quality of the alternative labor supply. If the competence of those who ended their schooling with high school deteriorates, as it did during the 1970s (Bishop 1991), the demand for college graduates will increase. The correct answer to the question of whether a

[1] Let us make the standard assumption that measurement error is random (that is, uncorrelated over time and uncorrelated across questions). Then, 18.3 to 27.3 percent of respondents reporting a PTM occupation in one interview reporting a non-PTM occupation in another interview implies that 0.8526 to 0.9039 of the individuals who are truly in a PTM occupation report themselves in a PTM occupation $[(1 - .273)^{.5} = .8526]$. The estimated proportion of true college graduates who report having less than a college degree is 0.9539 to 0.9721 $[(1 - .09)^{.5} = .9539]$. Thus, the estimated proportion of true college graduates with PTM jobs who underreport either their occupation or schooling ranges between 0.1213 and 0.1867 $[.1867 = (1 - .8526 * .9539)]$.

[2] Robst's (1995) analysis of PSID data indicates that the prestige ranking of the college one attends also has large effects on the probability of being "underemployed." Those who attended colleges in the bottom fifth of the prestige ranking had twice the likelihood of being counted as "underemployed" of those who attended colleges in the top quartile.

Figure 1

The Job Requirements View

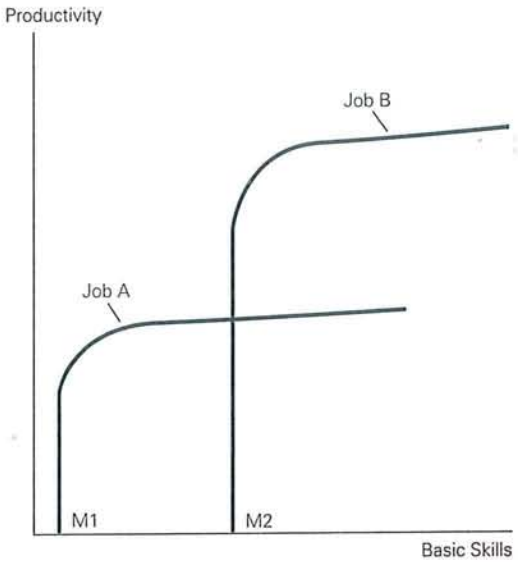
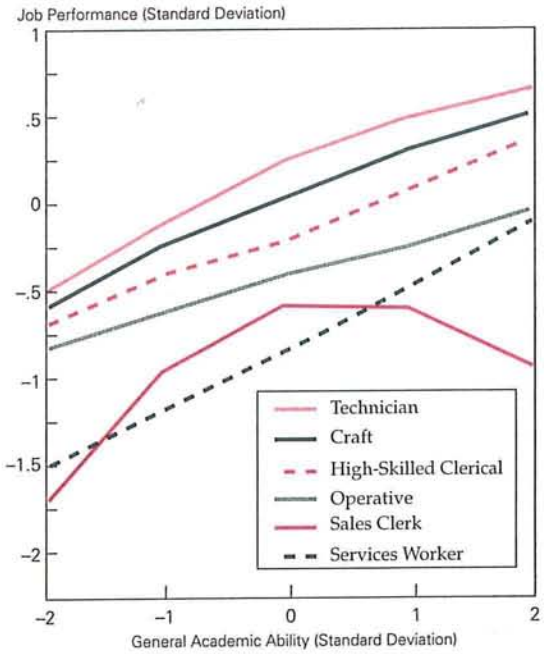


Figure 2

Effect of General Academic Ability on Job Performance



college degree is required is "It depends." It depends on circumstances that analysts and researchers have little knowledge of and no ability to forecast a decade ahead.

The BLS projection exercise apparently assumes that occupations have specific educational or basic skill "requirements." This job requirements view of the world is illustrated in Figure 1. Job A requires a basic skill level of at least M_1 while job B requires basic skills at or above M_2. Exceeding these skill thresholds, however, very quickly yields no further increases in productivity. Once the threshold is reached, diminishing returns set in with a vengeance. People working in job A who have an M_2 skill level are classified as "underemployed." Is this how basic skills influence job performance? Let us test the job requirements hypothesis.

The job requirements view predicts that everyone in job A will have at least the M_1 skill level, and that as a result of diminishing returns, the steep productivity increase near the M_1 skill level quickly becomes a very gentle slope as the individual's skill increases. In other words, the relationship between test scores and job performance should have a convex shape (a large negative second derivative). The job requirements view also implies that the impact of basic skills tests on job performance should diminish as schooling increases.

Data collected by the U.S. Department of Labor's Employment Service to validate the General Aptitude Test Battery were used to test these hypotheses. This data set contains data on job performance, the nine GATB "aptitudes," and background data on 36,614 individuals in 159 different occupations. Professional, managerial, and high-level sales occupations were not studied but the sample is quite representative of the 71.1 million workers in the rest of the occupational distribution. It ranges from drafters and laboratory testers to hotel clerks and knitting-machine operators. A total of 3,052 employers participated. (See Box 1, "Description of the Job Performance Study," below.)

The results are presented in Figure 2 and Table 3.[3]

[3] Selection effects generate a negative bias in coefficients on years of schooling. In a selected sample like accepted job applicants or job incumbents, one cannot argue that these omitted unobservable variables are uncorrelated with the included variables that were used to make initial hiring decisions and, therefore, that

Table 3
A Test of the Job Requirements Model[a]

	General Academic Ability	General Academic Ability Squared	GAA When Schooling over 12 Years	Psychomotor Ability	Psychomotor Ability Squared	Years of Schooling	R^2/ Number of Observations	Mean of General Academic Ability	Mean of Psychomotor Ability
All Workers	.227***	−.0096	.057***	.122***	−.017***	−.017***	.1329	.00	.00
	(.009)	(.007)	(.014)	(.007)	(.005)	(.004)	31,399		
Occupational Groups									
Technicians	.265***	−.033	.030	.116***	−.018	.030*	.1188	.49	.19
	(.043)	(.026)	(.026)	(.026)	(.017)	(.016)	2,384		
High-Skill Clerical	.223***	.012	.033	.112***	.003	.022	.1611	.53	.42
	(.037)	(.028)	(.046)	(.030)	(.017)	(.017)	2,570		
Low-Skill Clerical	.323***	.013	.024	.115***	−.019	−.010	.1354	.21	.18
	(.028)	(.021)	(.039)	(.020)	(.015)	(.012)	4,122		
Plant Operators	.181***	−.030	.062	.135***	−.032	.003	.2063	.30	−.16
	(.066)	(.043)	(.098)	(.048)	(.027)	(.031)	651		
Craft Workers	.236***	−.007	.018	.098***	−.010	−.011	.1481	.12	−.11
	(.016)	(.012)	(.026)	(.013)	(.008)	(.007)	10,061		
Operatives	.177***	−.002	.050	.168***	−.019*	−.032***	.1433	−.38	−.03
	(.017)	(.013)	(.036)	(.014)	(.010)	(.008)	8,167		
Service Workers	.340***	.005	.070	.148***	−.032*	−.021	.1559	−.31	−.24
	(.037)	(.026)	(.063)	(.028)	(.019)	(.017)	1,927		
Sales Clerks	.175*	−.173***	.109	.197***	−.070*	−.015	.1172	.19	.08
	(.090)	(.063)	(.129)	(.066)	(.042)	(.037)	416		

*Probability less than .10 on a two tail test.
**Probability less than .05 on a two tail test.
***Probability less than .01 on a two tail test.
[a]The other variables included in the models but not shown were age, age squared, occupational experience, occupational experience squared, plant experience, plant experience squared, and dummies for female, black and Hispanic. Standard errors are in parentheses under the coefficient.
Source: Analysis of GATB Revalidation Data in the U.S. Employment Service's Individual Data file.

For general academic ability, the hypothesis of diminishing returns was rejected in seven of the eight occupation groups. The exception was sales clerks, where the squared term on general academic ability was significantly negative and general academic ability had a positive effect on performance only when the test scores were no more than one-half a standard deviation above the mean.

For psychomotor skills, however, the hypothesis of diminishing returns was accepted at the 10 percent level for operatives, service workers and sales workers, and for all workers combined. The second derivatives are not so large, however, that the sign of the relationship reverses within the range of actual data. For all workers and for operatives, the derivative of performance with respect to the psychomotor test scores at one standard deviation above the mean of the test is 52 to 57 percent of the derivative when test scores are one standard deviation below the mean. For service workers, the derivative one standard deviation

coefficients on included variables are unbiased. When someone with 10 years of formal schooling is hired for a job that normally requires 12 years of schooling, there is probably a reason for that decision. The employer saw something positive in that job applicant (maybe the applicant received particularly strong recommendations from previous employers) that led to the decision to make an exception to the rule that new hires should have 12 years of schooling. The analyst is unaware of the positive recommendations, does not include them in the job performance model and, as a result, the coefficient on schooling is biased toward zero. This phenomenon also causes the estimated effects of other worker traits used to select workers for the job such as previous relevant work experience to be biased toward zero. Consequently, the results presented should not be viewed as estimates of the structural effect of schooling on worker productivity. The test score results are not similarly biased, however, because firms using aptitude tests similar to the GATB for selecting new hires were excluded from the regression.

Box 1
Description of the Job Performance Study

The workers in the study were given the GATB test battery and asked to supply information on their age, education, plant experience, and total experience. Plant experience was defined as years working in that occupation for the current employer. Total experience was defined as years working in the occupation for all employers. The dependent variable was an average of two ratings (generally two weeks apart) supplied by the worker's immediate supervisor. The Standard Descriptive Rating Scale obtains supervisory ratings of five aspects of job performance (quantity, quality, accuracy, job knowledge, and job versatility) as well as an "all-around" performance rating. Firms with only one employee in the job classification were excluded, as were individuals whose reported work experience was inconsistent with their age.

Because wage rates, average productivity levels, and the standards used to rate employees vary from plant to plant, mean differences in ratings across establishments have no real meaning. Therefore, normalized ratings deviations were predicted by deviations from the job/establishment's mean for gender, race, Hispanic, age, age squared, plant experience, plant experience squared, total occupational experience, total occupational experience squared, schooling, and test composites.

Deviations of rated performance ($R_{ij}^m - R_j^m$) from the mean for the establishment (R_j^m) were analyzed, where the subscript i refers to the individual and j refers to the job and establishment combination. The variance of the job performance distribution was also standardized across establishments by dividing ($R_{ij}^m - R_j^m$) by the standard deviation of rated performance, $SD_j(R_{ij}^m)$, calculated for that firm. Separate models were estimated for each major occupation. They were specified as follows:

$$1) \quad \frac{R_{ij}^m - R_j^m}{SD_j(R_{ij}^m)} = \beta_0 + \beta_1(T_{ij} - T_j) + \beta_2(T_{ij} - T_j)^2 + \beta_3(S_{ij} - S_j) + \beta_4(X_{ij} - X_j) + \beta_5(D_{ij} - D_j) + v_2$$

where R_{ij} = rating standardized to have a zero mean and standard deviation of 1.

T_{ij} = a vector of test score composites—general academic ability and psychomotor ability.
S_{ij} = years of schooling.
X_{ij} = a vector of age and experience variables—age, age squared, total occupational experience, total occupational experience squared, plant experience and plant experience squared.
D_{ij} = a vector of dummy variables for black, Hispanic, and female.
T_j, S_j, X_j and D_j are the means of test composites, schooling, experience variables, and race and gender dummies for the job/establishment combination.

General Academic Ability was constructed by averaging the GATB's G and N composites. Consequently, it is a weighted average of four subtests: a timed arithmetic computation test with a weight of 0.25, an arithmetic reasoning test with a weight of 0.41, a vocabulary test with a weight of 0.17, and a spatial relations test with a weight of 0.17. Squared terms and an interaction with schooling greater than 12 were included in the model to test for ceiling effects and other nonlinearities.

above the mean is 37 percent of the derivative at one standard deviation below the mean.

These results suggest that the job requirements model has some validity for psychomotor skills but not for the basic academic skills that are the primary objective of schooling. Both this analysis and studies conducted by others have found that the underlying relationship between basic academic skills and performance in a specific job is smooth, continuous, and close to linear (Hunter 1983).

The Record of BLS Projections of the Demand and Supply for College Graduates

Despite the difficulties, since 1970 the BLS has published biennial projections of the supply-demand balance. The starting point of its projections are its forecasts of occupational employment growth. It then projects changes in the proportion of particular occupations that "require a college degree," the number of bachelor's degrees to be awarded per year, and the

Table 4

BLS Projections of the Supply/Demand for College Graduates and Subsequent Changes in the College Wage Premium

Date Published (1)	Projected Growth in Underemployed College Graduates: Projection Period (2)	Annual Average (000s) (3)	10-Year % Change in Share Underemployed (4)	Actual 10-Year % Growth of Share Underemployed (5)	Underemployed College Grad % Share—BLS (6)	Implied Predicted Change in CG/HSG Wage Ratio (7)	Actual Change in CG/HSG Wage Ratio (Percentage Points) (8)
1970	1968–80	8	−4.2	6.7	10.6	Rise	−6.7
1972	1970–80	20	−4.3	7.3	11.3	Rise	−7.6
1974	1972–85	62	−3.5	5.3	14.4	Rise	+14.2
1976	1974–85	86	−2.9	3.7	15.4	Rise	+18.9
1978	1976–85	300	5.5	1.7	17.7	Decline	+23.2
1980	1978–90	275	3.5	2.2	17.3	Decline	+26.5
1982	1980–90	300	4.1	1.3	18.6	Decline	+23.6
1984	1982–95	300	4.2	.3	19.7	Decline	
1986	1984–95	200	1.2		19.1	Small Decline	
1988	1986–2000	100	−2.3		19.4	Small Rise	
1990	1988–2000	150	−.5		19.5	Stable	
1992	1990–2005	406	6.1		19.9	Big Decline	
1994	1992–2005	330	5.0		20.0	Decline	

Source: The record of past BLS forecasts of the supply-demand balance is taken from an unpublished BLS memorandum and from Shelley (1992; 1994). Columns 4 and 5 are the projected and actual growth over the succeeding 10-year period of the share of college graduates who are "underemployed." The BLS estimates of the share of college graduates underemployed given in column 6 are taken from Hecker (1992). They are for the year that begins the projection period. For occupations outside the professional, technical, managerial, and sales representative category, worker reports of qualifying training requirements from the 1983 survey of training received were used to estimate the proportion of jobs in the occupation that required a college degree. The data on subsequent changes in the ratio of college and high school wages for workers with one to five years of experience are taken from Katz and Murphy (1990).

annual rates of flow into and out of jobs by workers with a college degree. Comparisons are then made between the projected number of job openings "requiring a college degree" and the projected flow of college graduates seeking work, producing estimates of the number of "underemployed" college graduates. Column 3 of Table 4 presents BLS's projection of the annual increase in the number of "underemployed" college graduates during the projection period. Column 4 presents the projected 10-year change in the share of college graduates who are "underemployed."

Quite clearly the BLS effort to project the supply-demand balance for college graduates has been a failure. Compare the predicted changes in the share of college graduates underemployed (Column 4) to the actual changes (Column 5). At the beginning of the 1970s, BLS projected a decline in the share of college graduates who were underemployed during the subsequent decade. Instead, the share underemployed grew substantially. Changes in the relative wage of young college graduates provide an additional ex post criterion for evaluating the accuracy of BLS's projections of supply-demand balance (Columns 7 and 8). If the projection had been correct, the relative wage of college graduates should have also risen during the period. Instead, the college premium fell 6.7 to 7.6 percentage points by 1980 (Column 8).

At the end of the 1970s, BLS was projecting large surpluses of college graduates during the 1980s. According to the projection made in 1978, the surplus of college graduates was going to grow at a rate equal to 30 percent of the annual flow of bachelor's degrees awarded and the "underemployment" share was going to rise 5.5 percentage points by the end of the decade. The rise in the "underemployment" share was instead only 1.7 percent. If the projections had been correct, relative wages of college graduates should have fallen; instead they rose by 23 to 26 percentage points.

In reality, demand responds to supply and supply responds, with a lag, to demand. An increase in the supply of college graduates with computer science degrees, for example, lowers wages for the group, and this allows some companies to undertake projects not feasible before and it induces other companies to keep development work in the United States rather than

moving it abroad. Wage rates and job-finding difficulties influence enrollment decisions and choice of major, so supply responds to demand. Getting "college-level" jobs also depends on personal qualities—initiative, work habits, and the like—of the graduates. The BLS projection model has oscillated between predicting large decreases and large increases in the share of college graduates who are "underemployed" because it omits feedback loops and other key determinants of employment patterns. If one wants to project shares of college graduates in "non-college" jobs, a better approach is to estimate a historical model (or system of equations) using variables that can be forecasted into the future.

The evidence suggests that the BLS's methods of translating occupational projections into projections of the demand-supply balance for college graduates are seriously flawed. But the problems are not limited to the way in which occupational employment distributions are translated into numbers of college-level jobs. The BLS's occupational projections are also seriously flawed. The BLS systematically under-projects the growth of skilled jobs and over-projects the growth of unskilled jobs.

Biases in BLS Projections of the Growth of Managerial and Professional Jobs

A myth is abroad in the land that job growth is coming (or will come) primarily from low-skill jobs ("McJobs"). In 1987, Levin and Rumberger, for example, stated:

> In summary, the evidence suggests that new technologies are unlikely to have a profound effect in upgrading the education and skill requirements of jobs, and that most new jobs or job openings will be in occupations that require relatively low skills and education (1987, p. 344).

In 1990, Mishel and Teixeira predicted:

> Growth in skill levels from occupational upgrading will actually *slow down* in the 1990s. In fact, future growth rates in skill levels are likely to be only one-fourth to one-third as fast as those in the recent past (1990, p. 1).

In 1995, Basil Whiting, a former deputy assistant secretary in the Department of Labor, wrote:

> Labor Department projections show that most new jobs in the economy at the turn of the century will not be those of technicians but rather in the more prosaic and lower-paid fields of hospitality, retail sales, clerical work, janitoring and other service occupations (Whiting and Sayer 1995, p. 11).

All of these writers based their forecasts on BLS occupational projections. Levin and Rumberger justified their reliance on BLS projections, as follows:

> On the basis of their past record they are still likely to provide a better indication of how the overall job market will look in the future than generalizations from a few casual observations, guesswork, or simple extrapolations of past trends. The point is that none of the latter devices has come close to the accuracy of the BLS forecasts in a world where—by their nature—no forecasts will be perfect (1987, p. 338).

How good is the past record of BLS projections of job growth? BLS projected in 1981 that professional, technical, and managerial jobs, which were 24.9 percent of the nation's jobs in 1978, would account for 28 percent of employment growth between 1978 and 1990 (see Table 5, line 3). Operatives, laborers, farm laborers, and service workers, 37 percent of employment in 1978, had been projected to account for 35.4 percent of employment growth during the period. Columns 4 and 6 of Table 5 tell us what actually happened: Professional, technical, and managerial jobs accounted for 53.6 percent of 1978–90 job growth and operative, laborer, and service jobs accounted for only 8.7 percent of the growth.

The passage of time has produced two additional opportunities to compare projected growth to actual growth: BLS's 1983 and 1985 projections of occupational employment growth through 1995. BLS projected in 1983 that professional, technical, and managerial jobs (PT&M) would account for 30.7 percent of job growth from 1982 to 1995. In fact, PT&M jobs accounted for 53 percent of employment growth. Operative, laborer, and service jobs (OL&S) were projected to account for 30.8 percent of job growth, but in reality accounted for only 15.7 percent of job growth.

For the 1984 to 1995 period, BLS projected that PT&M employment would account for 38.8 percent of employment growth and that OL&S would account for 28.7 percent of growth. Here again, they were far off the mark. For the 1984 to 1995 period, PT&M accounted for 58.3 percent of job growth, and OL&S accounted for 15.9 percent (row 5 of Table 5). Figure 3 presents a comparison of projected and actual growth by broad occupational category (rather than occupational shares of total growth, as in Table 5) for the 1984–95 period. As before, modest growth (22 percent over 11 years) was projected for professional and managerial jobs. Actual growth rates were much larger: 35 percent for professional jobs and 51 percent for managerial jobs. The BLS projection for technical jobs

Table 5
Growth Shares of High-Skill and Low-Skill Jobs: Projections Compared to Subsequent Changes

When Published	Projection Period	Percent Professional-Technical-Managerial		Percent Operative-Laborer-Service	
		Projected	Actual	Projected	Actual
Bureau of Labor Statistics Former Projection Method					
	1950–60	—	31.2	—	27.7
1. 1969	1960–75	34.7	37.3	28.9	23.1
2. 1971	1970–80	33.8	38.1	28.4	20.1
Bureau of Labor Statistics Revised Projection Method					
3. 1981	1978–90	28.0	53.6	35.4	8.7
4. 1983	1982–95	30.7	53.0	30.8	15.7
5. 1985	1984–95	38.8	58.3	28.7	15.9
6. 1987	1986–2000	37.9	63.7*	27.8	15.7*
7. 1989	1988–2000	40.8	70.1*	24.6	11.0*
8. 1991	1990–2005	40.9	74.2*	27.1	10.5*
9. 1993	1992–2005	40.6	58.1*	31.6	16.2*
10. 1995	1994–2005	45.9	—	30.2	—
Bishop/Carter Logit Regressions—1990–2000					
11. Model: Time-Unemp-Trade-PCShare		69.8	74.2*	1.9	10.5*
Bishop Linear Regressions—1990–2005					
12. M1—Time-Unemp-Trade-PCShare		68.1	74.2*	.3	10.5*
13. M2—Time-Unemp-Trade		57.2	74.2*	10.6	10.5*
14. M3—Time-Unemp.		52.5	74.2*	6.1	10.5*
15. Bishop—Table 6 Model—1995–2005		61.4	—	12.1	—

Source: The record of the 1960–75 and 1970–80 BLS projections of occupational shares and actual outcomes is taken from Carey (1980) and Carey and Kasunic (1982). Later projections come from Carey (1981); Silvestri, Lucasiewicz and Einstein (1983); Silvestri and Lucasiewicz (1985, 1987, 1989, 1991); Silvestri (1993) and BLS (1996). They are based on Occupational Employment Survey estimates of occupational shares in the initial year. CPS data on occupational employment from January issues of *Employment and Earnings* and Klein (1984) are used to estimate actual growth shares. Estimates of the level of high-skill employment are higher in CPS data and this accounts for about 5 percentage points of the difference between projected and actual growth shares. For projection periods ending after 1995, an "actual" growth share (indicated by an asterisk) is reported for the shorter period from the baseline year up to August 1995. The logit regression model is from Bishop and Carter 1991b, Table 2. The linear regression predictions of employment growth are from Bishop (1992b). The projection in the bottom row uses the regressions in Table 6 and assumes that in 2005 the unemployment rate is 5.5 percent, the trade deficit equals 1.4 percent of GDP, and PC use is 80 percent above its 1990 value.

matched the actual growth of 29 percent, however. For the operative, laborer, and service categories, each component was overestimated.

Why Have BLS Projections Been So Far Off the Mark?

BLS occupational projections contain many possible sources of error. Projections of final demand shares may be wrong. The input-output matrix is often quite old, and this contributes to errors in projecting value-added shares. For example, unanticipated changes in the federal deficit and exchange rates made export and import shares of industry output particularly difficult to predict in the 1980s. Industry-specific productivity growth may also be in error, resulting in incorrect predictions of industry employment.

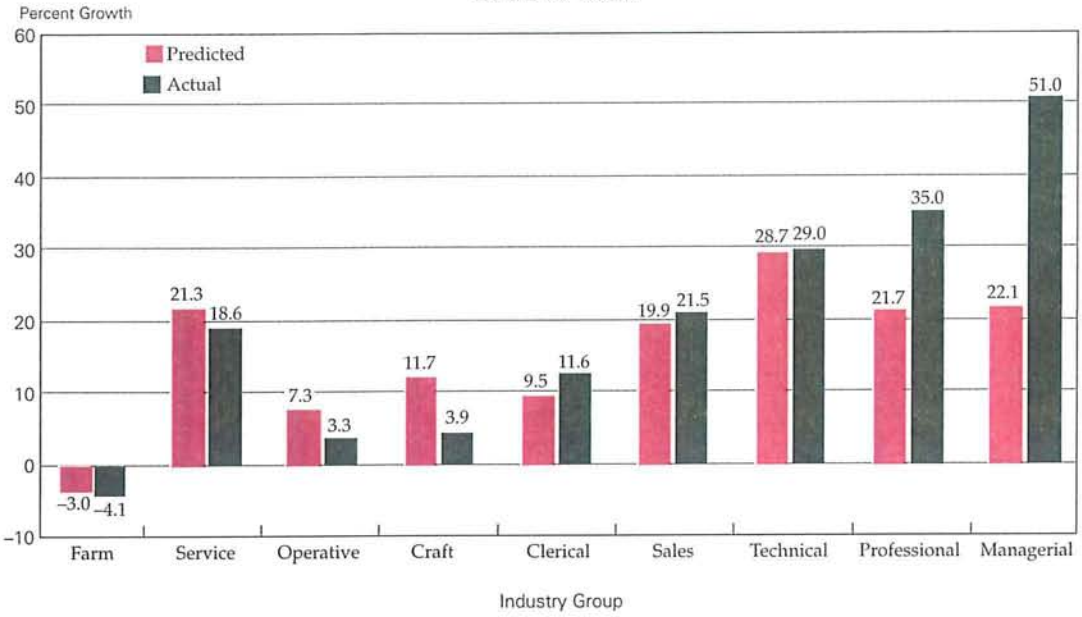
Substantial changes also have occurred in the occupational composition of specific industries, and this has often been a major source of error in occupational projections. BLS derives occupational employment demand by multiplying projected industry employment totals by an assumed, industry-specific, occupational share vector. Adjustments are made to these vectors when BLS studies of the introduction of new technology indicate that changes can be anticipated by the end of the forecast period.[4] Since studies cannot be funded for every industry and for every technological innovation, and the effects of these changes are difficult to foresee 10 years in advance, many of the changes that will occur in the composition of occupational demand within industries are missed by BLS projections.

The BLS obtains its estimates of the occupational composition of employment in specific industries from a survey of establishments, the Occupational Employment Statistics (OES). When the BLS made the projections of 1990 occupational employment in 1981, only one wave of OES survey data was available for most states and industries. The projections for the 1984–95 period were made more difficult by a 1982–83 change in the occupational classification system. Comparability over time is also threatened by the periodic

[4] This characterization of how occupational staffing patterns were projected is based on U.S. Bureau of Labor Statistics, *Handbook of Methods*, Bulletin 2134–1, 1982, p. 143, and conversations with Ron Kutscher, Associate Commissioner responsible for projections.

Figure 3

Evaluation of BLS Projections of Job Growth 1984 to 1995



changes in the industry-specific list of occupations that respondents receive on their questionnaire. The *Handbook of Methods* describes what is done when data are thought to be of doubtful comparability: "When an occupation is added, deleted or changed in definition from one OES survey to the next, extrapolated trends are not developed: the current-year ratios for these occupations are held constant in the preliminary projected matrix" (BLS 1982, p. 143).

Given these data problems and BLS's focus on projecting over 500 different occupations, it is easy to see why BLS chose not to systematically extrapolate past trends in occupational staffing ratios derived from OES or other data into the future, but rather to rely on the judgment of analysts who can take data quality problems into account. Systems that rely on the judgment of analysts are inherently conservative, however. Unfortunately, occupational staffing ratios are seldom stable over periods of 10 years or more, and it is better to start with an assumption that trends are stable than that the ratios themselves are stable.

It does not appear that problems in extrapolating changes in occupational staffing ratios have become less serious as experience with the OES survey has accumulated. The PT&M share of projected job growth has not increased much in later projections, and the 1987 and 1989 projections seem as wide of the mark as the 1985 projection (Table 5). With 64 percent of the projection period already completed, the actual PT&M share of job growth is running 25.8 percentage points above the share projected in 1987. With 58 percent of the projection period already completed, the actual PT&M share is running 29.3 percentage points above the share projected in 1989.

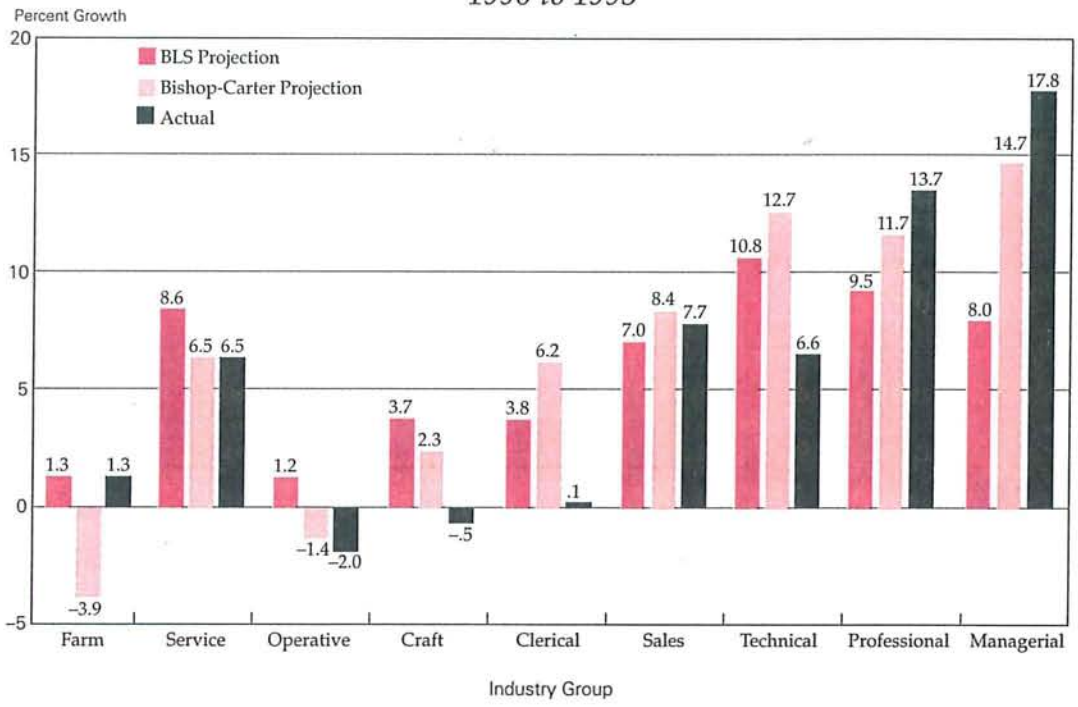
Can Other Projection Methods Succeed Where the BLS Method Has Failed?

Ron Kutscher, the Associate Commissioner at BLS responsible for projections, has said "One could never hope that a projection of the future is entirely accurate" (1991, p. 253). A natural response to the criticisms of BLS methods is to ask, "Can one do better?" Shani Carter and I attempted to do better in a 1991 paper. We showed that both a simple linear extrapolation of occupational share trends for the 1972–80 period and a regression-based projection did a better job of predicting 1990 shares than the BLS (Bishop and Carter 1991b).

Hindsight is always better than foresight, however. A projection constructed by someone with

Figure 4

Comparison of 1991 Projections of Job Growth with Actual Growth 1990 to 1995



knowledge of the actual outcome will generally be better than projections developed without such knowledge. Probably the only really fair test of the validity of alternative forecasting methodologies is to look back at projections published in the past and compare results.

This section of the paper offers such a test. The 1991 regression-based projections of Bishop and Carter are compared to the BLS projections published in the same year.[5] Summary results on the high-skill and low-skill shares of projected and actual job growth are presented in rows 8 and 11 of Table 5. Projected shares of job growth through 2000 will be compared to shares of actual job growth through 1995. Professional, technical, and managerial jobs actually accounted for 74 percent of job growth between 1990 and 1995. Operatives, laborers, and service workers accounted for 10.5 percent. Bishop and Carter's (B&C) projections clearly come closer to the 1990–95 reality than the BLS projections. B&C projected a 70 percent PT&M share of job growth and a OL&S share of 2 percent. BLS by contrast projected a PT&M share of 41 percent (46 percent when translated into CPS data) and an OL&S share of 27 percent.

In a paper published in early 1992, Bishop presented projections based on a variety of linear specifications, rather than a logit specification (Bishop 1992b). Summary results for these projections are shown in rows 12 through 14 of Table 5. These projections also outperform the BLS projections. The best of the projections for the professional, technical, and managerial category have the same four variables on the right-hand side as the preferred model of Bishop and Carter (1991a). In this preferred model, occupational shares are a function of a time trend, the unemployment rate, the merchandise trade balance as a share of GDP, and the share of workers with computers on their desks.

Let us take a more disaggregated look at how the projections are doing, one-third of the way through the 15-year projection period. Which occupations were accurately projected by both methodologies? Which occupations surprised both B&C and BLS? Figure 4

[5] The regression equations used for this exercise are found in Table B2 of Bishop and Carter (1991a).

compares actual growth during the 1990–95 period to projected growth. (The 15-year projections were sized to a five-year period by the simple expedient of dividing percentage growth projections by 3.) Both projections missed three important developments: sharp slowdowns in the growth of craft jobs, clerical jobs, and technical jobs. In areas of disagreement about growth rates—for managers, professionals, operatives and laborers, and service workers—the B&C methodology produced more accurate predictions. For a description of the B&C model and its stability, see Box 2.

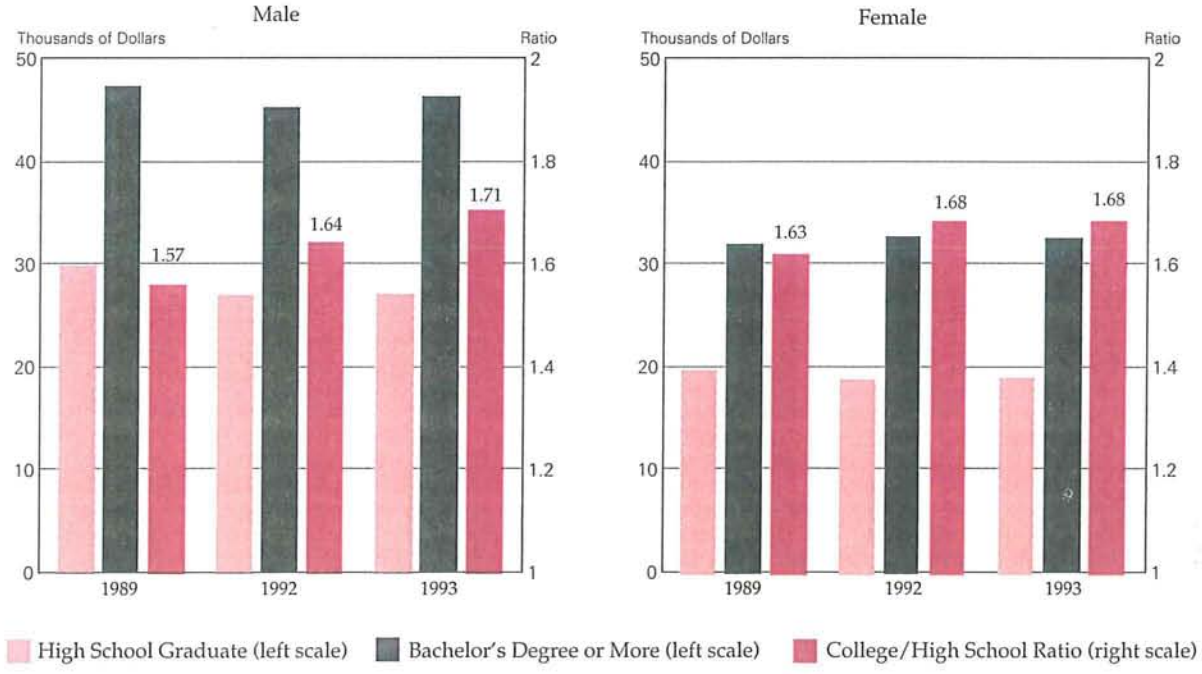
Are the Wage Premiums Paid for Skill Continuing to Rise?

The wage differential between college graduates and high school graduates grew more slowly after the mid to late 1980s than it did in the preceding decade. It still appears to be growing, however. In Katz and Murphy's (1990) data, the weekly wage differential for workers with one to five years of work experience stabilized at a high level beginning around 1985, but the differential for workers of all other experience levels continued to grow through 1990, the latest year of their data series (Murphy and Welch 1993). In Mishel and Bernstein's (1992) data, the differential for workers of all experience levels rose 7.8 percent between 1987 and 1990 and then fell 2.9 percent in 1991. Figure 5 presents the most recent data on the wage premium received by those with four or more years of college. For males, the wage premium rose from 57 percent in 1989 to 64 percent in 1992 and 71 percent in 1993. For females, the premium rose from 63 percent in 1989 to 68 percent in both 1992 and 1993.

The 1991–92 recession caused many companies to cut back their hiring of college graduates. The unemployment rate among managers and professionals, 2.0 percent in the first quarter of 1989, rose to 3.5 percent in September 1992 and then fell to 2.6 percent during

Figure 5

Median Real Earnings, by Education Level
Full-Time, Year-Round Workers Age 25+



Note: 1989 figures use 1980 Census weights.

Box 2: Bishop and Carter's Model of Occupational Employment Growth

It is assumed that the growth of occupational employment shares follows a logistic growth path. B&C assumed that the logistic function had a ceiling of 20 percent. The logit was assumed to have a ceiling in order to build in a slowdown in the rate of growth for three large, fast-growing occupations—managers, professionals, and sales workers. The ceiling was set at 20 percent because that fit the data slightly better than higher ceilings. In the preferred model, the log of the ratio of the j^{th} occupation's share of employment in year t to 0.2 minus that same occupational share, $[S_{jt}/(.2 - S_{jt})]$, is assumed to depend on the year (T_t), the unemployment rate (U_t), and one or more structural variables, (X_t), intended to capture the influence of the economic changes that have occurred in the 1980s. The independent variables have been defined relative to their projected value in the year 2005.

$$2)\quad \log[S_{jt}/(.20 - S_{jt})] = a_0 + a_1(T_t - 2005) + a_2(U_t - .055) + a_3(X_t - X_{2005}) \qquad t = 1972 \ldots 1989$$

For the three smallest occupations, farm workers, protective service workers, and private household workers, X_t is a trend shift variable for the years after 1980. For the other 10 occupations, the X variables were the ratio of the merchandise trade deficit to GNP ($TRADEF_t$) and the ratio of personal computers used in business to civilian employment ($PCUSE_t$).[6] The advantage of deviating all independent variables from their projected level in the year 2005 is that the intercept term, a_0, then provides an estimate of the forecasted logit of 5 times the j^{th} occupation's share of employment in the year 2005.[7]

Bishop and Carter's regression model of employment growth was estimated on data on employment shares from 1972 to 1989 (Bishop and Carter 1991a). Most of the estimated parameters were

1994. This setback was not the beginning of a crash in the market demand for college graduates; it was a temporary effect of the recession. Blue-collar workers were hurt much more by the recession than managers and professionals. The unemployment rate of operatives and laborers, which was 7.7 percent in the first quarter of 1989, rose to 11.4 percent in July 1992 and was still 9.0 percent during 1994. BLS data on median weekly earnings can also be brought to bear on the issue of recent trends in wage premiums for skill. Between the second quarter of 1991 and the second quarter of 1995, the annual rate of increase of nominal wages was 1.4 percent for operatives and laborers, 1.6 percent for service workers, 1.7 percent for craft workers, 1.2 percent for clerical workers, 3.3 percent for technicians, 2.9 percent for managers and 3.7 percent for professionals. In summary, the very latest data on trends in occupational wage differentials suggest that skill differentials continue to widen.

The latest data on employment growth have similar implications. Between October 1994 and October 1995, professional jobs grew by 753,000 and managerial jobs by 837,000, while service jobs rose by only 31,000 and all other jobs declined by 346,000.

[6] The estimates of the number of PCs in use in business were made by Future Computing/Datapro Inc. and can be found in Table 1340 of *The Statistical Abstract*, p. 179. They are derived by cumulating the numbers of machines sold. A very low scrap rate of 3.4 to 6 percent, depending on the year, was assumed. Where possible, vendor reports were used to allocate sales of computers between categories of end user—business, education, and home. Quite often, however, rules of thumb were used to make these allocations. Future Computing is no longer in business so more detailed information on how the series was constructed and data for 1989 are not available. CPS surveys in 1989 and 1993 provide data on the proportion of workers who use computers at work (NCES 1993c, p. 434, and 1994, p. 439). The proportionate growth rate produced by comparing the two surveys was applied to the 1989 value of the PC use variable from Future Computing. Projections of PC use for succeeding years were made by extrapolation. Projections were based on an assumption that the unemployment rate in 2005 would be 5.5 percent and the merchandise trade deficit would be 1.4 percent of GDP.

[7] B&C estimated a number of alternative models in order to test the sensitivity of results to changes in functional form and specification and in the scenario projected for the year 2000. Such tests were needed because only 18 years of data were available on which to estimate the forecasting model, and theory did not yield only one plausible specification. The results of some of these tests are detailed in Bishop and Carter (1990). While specification and scenario did affect projected occupational shares, all of the specifications yielded substantially larger increases in skilled jobs than the BLS projections. Other findings were robust with respect to specification and scenario as well.

remarkably stable when six additional years were added to the analysis.[8] Coefficients on the time trend hardly changed at all. All of the changes in coefficients on unemployment and trade deficit were within the estimated one-standard-error confidence interval. The intercept coefficients changed the most. The right-hand-side variables have been defined in such a way that the intercept term provides an estimate of the projected occupational share in the year 2005 under an assumption of 5.5 percent unemployment, a zero trade deficit, and an 80 percent higher share of workers using PCs than in 1990. By comparing these intercept coefficients, we can get a rough idea about how the new data have changed the forecast for 2005. For some occupations—professionals, craft, transportation operatives, protective service workers—the updated forecast for 2005 is the same as the old forecast. Compared to B&C's 1991 forecast, the revised forecast predicts more rapid growth for farm workers (6.7 percent), factory operatives (9.6 percent), other service workers (2.7 percent), and laborers (5.5 percent). The revised forecast predicts 3.8 percent less growth for managers, 4.9 percent less growth for sales workers, and 3.3 percent less growth for clerical workers.[9]

The updated regressions predict slower growth for managerial and technical employment than the 1991 B&C regressions and faster growth of operatives, laborers, and service workers. This means that instead of predicting that PT&M will account for 70 percent of employment growth to 2005, the updated projections now forecast that PT&M will account for 60 percent of job growth. The updated model projects that the operative, laborer, and service worker share of 1990–2005 job growth will be 12 percent, up from the 2 percent of the 1991 projection. The new estimates imply a slower rise in skills than before, but they still imply a faster rise in skills than BLS projections. Predictions of the growth of professional jobs are now comparable with BLS's 1993 and 1995 projections. For managerial jobs, however, there is a big difference. The updated projections of managerial job growth are about 4.5 million greater than BLS's 1993 projection.

Is the Supply Response Large Enough to Flood the Market with New BAs?

The one event that could invalidate my prediction of continued high wage premiums for college graduates is a massive increase in the number of college graduates trained in well-paid fields like science, engineering, and business. How likely is such a flood?

The high economic payoffs to college during the late 1980s and the 1990s have increased enrollment in college and the proportion of high school graduates who complete at least one year of college (Figure 6). Non-completion rates have remained high, however, so enrollment increases during the 1980s have had only a modest effect on the share of 25- to 29-year-old high school graduates who have completed a four-year degree or more. Many adults have gone back to school and completed their degree, however, and this has resulted in a substantial increase in the ratio of BAs awarded to the number of 22-year-olds—from 22.5 percent in 1980 to 31.0 percent in 1992 (Figure 7). This ratio is projected to increase further to 35.3 percent in the year 2000, a 57 percent increase over 1980 (NCES January 1995b).

The proportionate increase in the total number of BAs awarded, however, is much smaller because the low birth rates of the 1960s and '70s mean that fewer individuals are in the 20- to 30-year-old age cohort that typically receives most of the BAs. As a result, the

[8] The estimates are available from the author upon request.

[9] The addition of 1990–95 data significantly changed the projections of employment in 2005 for three key occupations. *Managerial Workers*: In the 1991 paper the growing use of PCs appeared to be the primary explanation of the accelerating growth of managerial jobs during the 1980s. Despite the continued rise in PC use, the recession of the early 1990s caused a larger than expected slowdown in the growth of managerial jobs. B&C forecasts overpredicted managerial jobs by 2 to 4 percent between 1990 and 1993 but then got back on track when unemployment fell to 5.5 percent in 1994 and 1995. The updated estimate of the model gives unemployment a more important role and PC use a less important role in the determination of managerial jobs. *Clerical Workers*: The 1991 B&C model overpredicted the growth of clerical jobs in the early 1990s, underestimating the negative effect of the PC revolution. The updated regression reflects this by giving PC use a bigger role in the determination of clerical employment. *Factory Operatives*: In the 1991 B&C model PC use had a large, statistically significant, negative effect on operative employment. Operative jobs did not decline nearly as much as the model predicted, so the updated regression model assigns less weight to PC use and the result is an increase in projected employment of factory operatives.

number of BAs awarded as a percentage of total employment fell from 1.09 percent in 1974 to 0.95 percent in 1980 and 0.96 percent in 1992. It is projected to fall even further, to 0.88 percent in 2000 and 0.86 percent in 2005. Relative to the stock of college graduates, the number of new BAs has declined even more precipitously. Thus, despite the technology-driven shift in employer demand in favor of college-educated workers, the ratio of new graduates to total employment has not risen.

To make matters worse, the number of college graduates retiring from the labor force is increasing every year, as the veterans who went to college under the GI bill retire from the work force. As a result, the ratio of workers with a college degree to those with a high school degree or less is projected to grow no more rapidly in the 1990s than it did during the 1980s (Bishop 1992b, Table 4).

Is the Rapid Growth of College-Level Jobs since 1970 an Aberration?

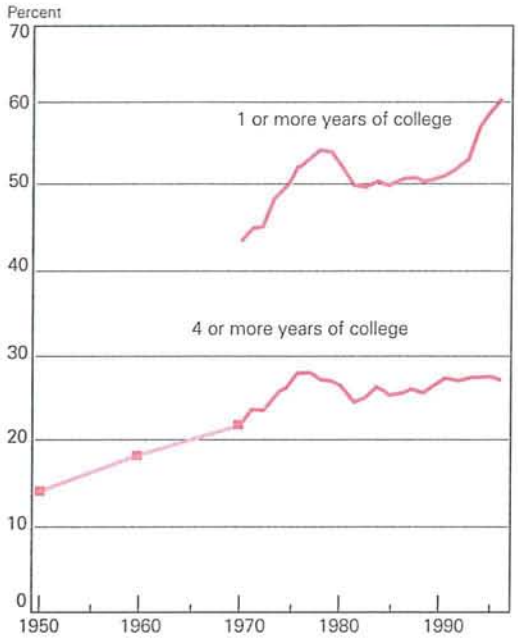
Still another way to test the reasonableness of our projections of continued strong growth of demand for college graduates is to look at trends in managerial and professional jobs abroad and in the supply of well-educated workers in other industrialized nations. Let us define the rate of increase in skills as the difference between the growth rate of professional, technical, and managerial (PT&M) jobs and the growth rate of manual jobs (service, craft, operative, laborer, and farm occupations). For the United States, the rate of skill increase was 1.6 percent per year during the first half of the twentieth century, 1.9 percent per year between 1950 and 1970, 2.8 percent per year between 1970 and 1981 and 2.5 percent per year during the 1980s.

The rise in skills is proceeding even more rapidly in Europe and East Asia (Table 6). The Japanese rate was 4.3 percent per year in the 1970s and 3.3 percent per year in the 1980s, the German rate was 3.7 percent per year in the 1970s and 2.5 percent in the 1980s. Finland's rate was 6.4 percent per year in the 1970s and 5.1 percent per year in the 1980s, Korea's 4.2 percent per year in the 1970s and 6.0 percent per year in the 1980s. Three countries—Canada, Norway, and the United Kingdom—now have proportionately more professional, technical, and managerial workers than the United States, and other countries are close behind.

The supply of college-educated workers has been increasing rapidly all over the world. During the 1970s and 1980s, the share of the population of working age who were university graduates grew at an annual rate of 3.3 percent in the United States, 3.6 percent in Japan, 2.8 percent in Germany, 5.6 to 5.8 percent in Sweden and Norway, 3.1 percent in Belgium and 4.0 percent in Canada (OECD 1989).

Figure 6

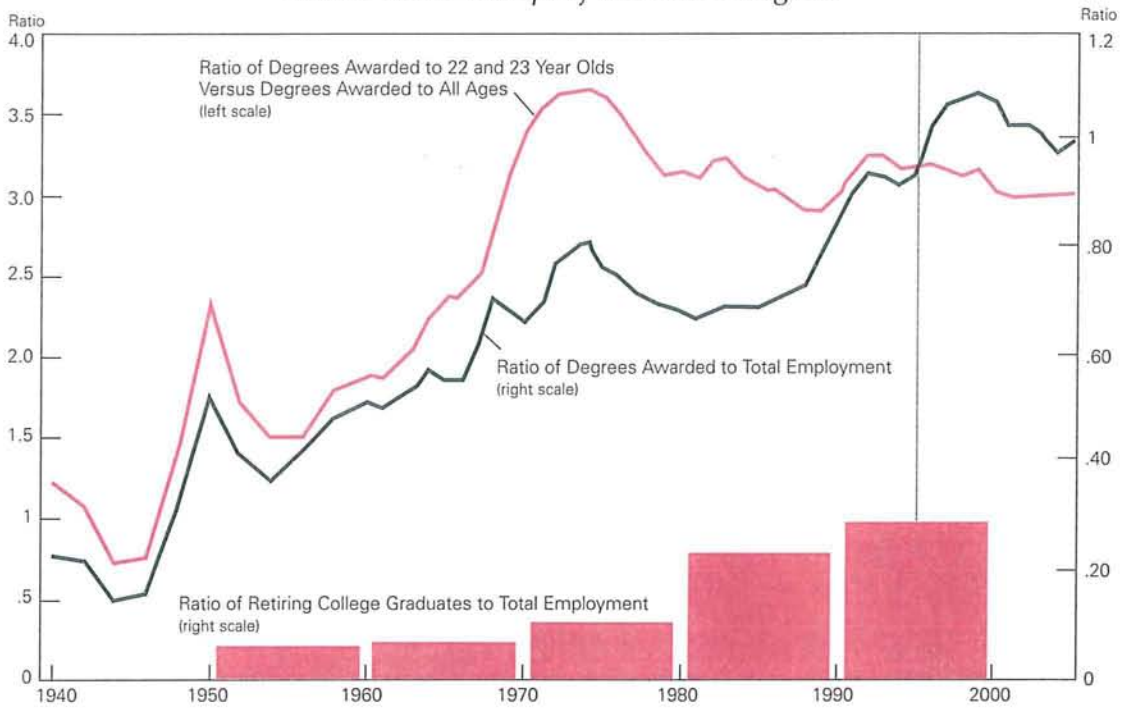
Percent of 25- to 29-Year Old High School Graduates Who Have Completed at Least One, or at Least Four, Years of College



The share of the work force that has graduated from university is higher in the United States than in any other country (columns 4 and 5 of Table 6). But many Europeans would argue that the bachelor's degrees awarded at the second- and third-rank American colleges and universities that educate the vast bulk of students reflect a lower standard than the French *licence* or the Dutch *Doctoraal examen*. High school graduation standards are also higher in Europe and Asia. Completing secondary school requires 14 years rather than 13 years of attendance in some countries. In others, high standards result in many students having to repeat grades. In many cases, the material Americans study in the freshman year of college is taught to Asians and Europeans in secondary school.

Figure 7

Trends in the Receipt of Bachelor's Degrees



Any U.S. lead in the share of the work force with college education is also a legacy of policy initiatives that are 30 to 50 years old. The share of 25- to 29-year-olds who have graduated from college is no higher now than it was 17 years ago. In terms of flows—that is, numbers currently in school—the nations of Northern Europe and East Asia have either caught up or surged ahead. Using age-specific school enrollment rates, the OECD has calculated the expected number of full-time equivalent years of schooling (K to 12 or post-secondary) received between ages five and 29. These estimates are presented in the last column of Table 6. For the United States, the figure is 14.8 years. The comparable figure is 15.9 in West Germany and France, 15.8 in Belgium, 15.4 in Canada and Finland, 15.6 in Norway and Denmark, and 16 in the Netherlands.

In sum, the rapid growth of college-trained workers and of college-level jobs is not uniquely American. American youth are neither more nor better educated than their counterparts in Japan and Northern Europe. Thus, the "America is so well educated, much of it must be unnecessary" argument offered by Louis Uchitelle and others is based on a premise that is no longer valid, if it ever was.

Policy Implications of These Findings

Professional, technical, managerial, and high-level sales workers currently (October 1995) account for 38.4 percent of United States employment, 42.2 percent of hours worked, and about 59 percent of the earnings received by all workers.[10] By comparison, craft workers, operatives, and laborers outside of

[10] *Employment and Earnings* (November 1995, pp. 27, 34). High-skill sales workers include sales representatives outside of retail and services and proprietors and supervisors in the retail and service industry. The median weekly wage for full-time managerial and professional workers is 46 percent above the overall median. High-skill sales workers' wages are 30 percent above and technicians' wages 14 percent above the overall average. These ratios are multiplied by the occupation's share of hours worked to calculate the share of earnings going to these high-skill occupations.

Table 6
Occupational Upskilling in OECD Countries

	Annual Rate by Which Professional-Technical-Managerial Grew More Rapidly than Manual Workers		Professional-Technical-Managerial Share in 1990 (Percent)	Percent 25- to 64-Year Olds[a] in 1992 with		Years of School Expected at age 5[a]
	1970–1981[b]	1981–1990[c]		BA/MA+	NonUniv/ AA Deg	
Austria	2.3	2.0	24.0	12	11	15.1
Belgium	3.9	3.1	25.8	9	11	15.8
Canada	3.5	3.9	30.2	15	26	15.4
Denmark	6.6	2.5	28.0	13	6	15.6
Finland	6.4	5.1	28.6	10	8	15.45.9
France	—	—	—	10	6	15.9
(West) Germany	3.7	2.5	19.9	12	10	15.9
Greece	6.1	3.8	14.3	10	3	13.7
Ireland	6.0	2.1	20.3	8	9	14.6
Japan	4.3	3.3	14.9	19	—	14.6
Korea	4.2	6.0	8.7	—	—	—
Malaysia	—	3.0	9.5	—	—	—
Netherlands	4.5	4.3	28.1	21	0	16.0
Norway	5.5	3.9	30.0	12	13	15.6
Singapore	3.8	4.8	20.3	—	—	—
Spain	3.3	5.9	12.8	8	13	15.2
Sweden	3.0	—	—	12	12	14.7
United Kingdom[d]	3.3	3.9	31.5	11	8	14.0
United States[e]	2.8	2.5	29.3	24	7	14.8

[a]OECD, *Education at a Glance*, 1995, pp. 20, 127. The OECD calculates expected years in school by summing, from age 5 through age 29, age-specific school or college attendance rates (full-time equivalents) taken from national census or household surveys. Since the calculation starts with age 5, kindergarten and nursery school attendance is counted as a year in school.

[b]Manual occupations include farming, fisheries, craft, operatives, laborers and service workers. Source: *Yearbook of Labour Statistics* for 1971, 1976, 1981 and 1991, International Labour Organization, Table 2B and Table 3C. Data availability problems resulted in somewhat different time periods being used for Belgium—1970–83, Canada—1971–81, Denmark 1965–81, Greece—1961–81, Ireland—1966–83, Japan—1970–80, Germany—1970–82, and Netherlands—1971–81.

[c]Source: ILO, *1991 Handbook of Labour Statistics*, Table 3. Absent data meant that shorter time periods were used for some countries: Austria 1984–89, Belgium 1983–89, Federal Republic of Germany 1982–89, Greece 1981–88, Ireland 1983–88, and Malaysia 1981–87.

[d]Growth rates were calculated for 1971 to 1978 and 1978 to 1989. Source: *MSC Manpower Report 1980*, p. 8 and *Labour Force Survey 1988 and 1989*, Office of Population Censuses and Surveys, Table 5.11.

[e]Source: Deborah Klein, "Occupational Employment Statistics for 1972–82," *Employment and Earnings*. Jan. 1984. 13–16; and later January issues of *Employment and Earnings*. Because of a change in occupational coding in 1972, the trend was calculated for the 1972–81 period.

construction receive only about 19 percent of the compensation paid in the economy. The competitiveness of the American work force is in reality more a function of the cost and quality of managerial, professional, and technical workers than it is of the blue-collar factory workers who are normally the focus of discussions of competitiveness.

The short-run consequence of a shortage of highly qualified workers is higher wage premiums for the skilled. The long-run consequence may be loss of comparative advantage in industries that make heavy use of managerial, professional, and technical workers. The high cost of hiring managerial and professional workers in the United States is already inducing firms to look elsewhere for these skills. For example, many software companies now economize on expensive American programmers and systems analysts by contracting with subsidiaries in Bulgaria, Russia, and India to develop code for new programs.

In 1991, Hewlett-Packard picked a Frenchman to head its troubled PC division and moved the division's headquarters to his home town of Grenoble, France. Since then, HP has staged a dramatic comeback in the PC market. Manufacturing time was cut, pricing became more aggressive and, as a result, HP moved from fourteenth to sixth largest PC producer in the world. Production, which had been spread across 12 plants, was concentrated into just two, one of which is in Grenoble (*The Economist* 1993). Hewlett-Packard is not alone. In 1991 and 1992, Du Pont moved the

headquarters of its electronics division to Tokyo and its agricultural products division and part of its fiber and polymer business to Switzerland. IBM moved its networking systems division headquarters to the United Kingdom (Lublin 1992). Is this the start of a trend?

During the 1980s, 18- to 64-year-old college graduates with a business major earned nearly three times what high school graduates of the same gender earned (Kominski and Sutterlin 1992). Since social rates of return to college are now at postwar highs, substantial increases in supply are desirable. This would simultaneously reduce the supply of unskilled workers, so skill premiums should fall and unskilled wages should rise. It would not be a tragedy if a major increase in college completion rates lowered the wage premium paid business B.A.s over high school graduates to only 100 percent rather than 200 percent. Indeed, competitiveness would improve and income inequality would decline.

The competitiveness of the American work force is in reality more a function of the cost and quality of managerial, professional, and technical workers than it is of the blue-collar factory workers who are normally the focus of discussions of competitiveness.

Substantial increases have already occurred in the proportion of young people getting college degrees, but these have not been sufficient to stop the seemingly inexorable rise in the college wage premium. Still bigger increases in college enrollments have been prevented by a rapid escalation of tuition charges at public colleges and the limited availability of need-based financial aid (Bishop 1992a). During the 1980s, tuition charges rose 48 percent more than student ability to pay out of current earnings.

Legislators and college presidents often justify the escalation of college tuition as only fair, given the high wages graduates receive as adults. Setting tuition high is claimed to be a way of helping those who cannot afford college at the expense of rich college graduates. This is a myth. The promised increases in financial aid are never sufficient to hold college students from low-income families harmless. The primary outcomes are fewer students, fewer graduates, and higher wages for those who complete college. College enrollment and graduation rates are highly responsive to tuition levels. Regression models (Bishop 1992a) imply that raising public college tuition by 50 percent ($893 per year) would lower the enrollment of 18- to 19-year-old women by 16 percent, lower the enrollment of 20- to 24-year-old women by 21 percent, and lower the number of B.A.s awarded to women by 11.8 percent.[11]

Elasticities of demand for and supply of college graduates are such that a 12 percent reduction in the supply of college graduates increases their wage relative to that of high school graduates by about 5.8 percent, or $1886 per year in 1992 dollars.[12] In the new long-run equilibrium that results, the present dis-

[11] Average public college tuition charges were $1787 in 1992–93 (NCES 1993c, p. 309). A regression predicting the ratio of BAs awarded to women divided by the mean number of high school diplomas received by women 4 to 10 years previously was used to predict the impact of a 50 percent increase in public college tuition from its 1988 level (Bishop 1991). The ratio of tuition to the forgone earnings of female college students (the wage of female high school graduates with 1 to 5 years of work experience times .75) was assumed to be .1355, its actual level in 1988. The higher tuition policy is assumed to increase this permanently to .20325. The proportionate change in BA awards was calculated by multiplying (.20325 − .1355) × (the coefficient on the tuition variable) × (1 minus the ratio of BAs to high school diplomas in 1989) = (.06775) × (−2.72) × (1 − .362) = 11.75 percent.

[12] The relative supply of college graduates is defined as $ln[(BAs/HSG)/(1 - BAs/HSG)] = ln[BAs/(HSG - BAs)] = E_s$. The effect of the 50 percent increase in tuition on E_s, TP, is $-.1843 = .06775 \times (-2.72)$. Using a logarithmic approximation of the model predicting E_s in Bishop (1991), we have a formula for the relative supply curve: $E_s = .89 \times ln(W_{CG}/W_{HSG})/.75 + TP + S$, where S captures the effect on supply of other exogenous variables. Following Blackburn, Bloom, and Freeman (1989), I assume an elasticity of relative demand of −2, so the relative demand curve is $E_d = -2.0 \times ln(W_{CG}/W_{HSG}) + D$, where D is a variable reflecting other influences on relative demand for college graduates. Setting $E_d = E_s$, and reorganizing terms to get an expression for the relative wage, we have $ln(W_{CG}/W_{HSG}) = (TP + S - D)/(-2.0 - .89/.75) = (TP + S - D)/3.19$. The long-run impact of the tuition increase on relative wages is $(-.18428)/(3.19) = .0578$ or 6 percent. If the elasticity of relative demand had been assumed to be −4, the equilibrium increase in relative wages would have been 3.55 percent. Even with this very high elasticity of substitution, the long-run effect of a high tuition policy is to help college graduates and hurt those who do not go to college. Since a 12 percent change in the flow of new BAs takes many years to have comparable effects on the stock of BAs, short-run effects on relative wages would be small, so when the policy is introduced the first few cohorts of college graduates lose out initially, because the wage increase starts out being small. After eight years or so, however, college graduates benefit from the policy change.

counted value of after-tax earnings over the course of the graduate's career goes up $23,100, much more than the $3574 of additional tuition payments.[13] Those who graduate from college gain from a high-tuition policy. Two groups lose: those who are prevented from attending and graduating from college and those who never planned to go to college in the first place. They suffer a decline in their real wage because the number of high school graduates competing for the limited number of low- and medium-skilled jobs has gone up.

The implication of this discussion is that low tuition levels in public colleges (and tax deductions for college tuition) are both an effective and a fair way of increasing the supply of college graduates. Other ways of increasing the supply of college graduates are expanded financial aid; higher academic standards in high school, to reduce college drop-out rates; expansion of advanced placement programs, so as to shorten the time required to earn a degree; and preference for immigrants with high-level scientific and technical training over immigrants with little education and few skills.

[13] I seek to calculate the long-run impact of the policy of raising public college tuition charges by 50 percent and keeping them high. Mean earnings of college graduates were $32,629 in 1992, so a 5.8 percent increase is $1886 per year. The marginal tax rate (netting out deductions) on these earnings is assumed to be 35 percent, so at a 5 percent real rate of discount, the PDV at age 21 is $1886. $\times$ .65 $\times$ 17.89 = $21,931 where 17.89 = $(1/.05)(1 - e^{45r})$ because the individual is assumed to work continuously until age 66.

References

Adkins, Douglas L. 1975. *The Great American Degree Machine*. The Carnegie Foundation for the Advancement of Teaching.

Alsalam, Nabeel. 1993. "Interpreting conditions in the job market for college graduates." *Monthly Labor Review*, February, pp. 51–53.

Bishop, John H. 1977. "The Effect of Public Policies on the Demand for Higher Education." *Journal of Human Resources*, vol. XII, no. 3, Summer.

———. 1991. "Achievement, Test Scores and Relative Wages." *Workers and Their Wages*, edited by Marvin Kosters, pp. 146–81. Washington, D.C.: American Enterprise Institute.

———. 1992a. "The Growth of Female College Attendance: Causes and Prospects." Center for Advanced Human Resources Studies, Working Paper.

———. 1992b. "Is a Skills Shortage Coming? An Evaluation of the Bureau of Labor Statistics Projections for 2005." *Workforce*, Spring.

Bishop, John H. and Shani Carter. 1990. "The Deskilling vs. Upskilling Debate: The Role of BLS Projections." Cornell University, Center for Advanced Human Resource Studies, Discussion Paper 90-14.

———. 1991a. "The Worsening Shortage of College Graduate Workers." *Educational Evaluation and Policy Analysis*, Fall.

———. 1991b. "How Accurate Are Recent BLS Occupational Projections?" *Monthly Labor Review*, October.

Bishop, John H. and Jane Van Dyk. 1977. "Can Adults Be Hooked on College? Some Determinants of Adult College Attendance." *Journal of Higher Education*, vol. 48, no. 1, January/February, pp. 39–62.

Blackburn, McKinley, David Bloom, and Richard Freeman. 1989. "The Declining Economic Position of Less Skilled American Men." In *A Future of Lousy Jobs?*, Gary Burtless, ed., pp. 31–67. Washington, D.C.: The Brookings Institution.

Carey, Max L. 1980. "Evaluating the 1975 Projections of Occupational Employment." *Monthly Labor Review*, vol. 103, no. 6, June, pp. 10–21.

———. 1981. "Occupational Employment Growth through 1990." *Monthly Labor Review*, vol. 104, no. 8, August, pp. 42–55.

Carey, Max L. and Kevin Kasunic. 1982. "Evaluating the 1980 Projections of Occupational Employment." *Monthly Labor Review*, vol. 105, no. 7, July, pp. 22–30.

College Placement Council. 1985. "Inflation and the College Graduate: 1962–1985." Bethlehem, PA.

———. 1991. "CPC salary survey." September. Bethlehem, PA.

The Economist. 1993. "The Metamorphosis of Hewlett-Packard." June 19, pp. 77–81.

Fiorito, J. and Robert C. Dauffenbach. 1982. "Market and Nonmarket Influences on Curriculum Choice by College Students." *Industrial and Labor Relations Review*, vol. 36, no. 1 (October), pp. 88–101.

Freeman, Richard. 1971. *The Labor Market for College-Trained Manpower*. Cambridge, MA: Harvard University Press.

———. 1976. *The Overeducated American*. New York: Academic Press.

———. 1991. "Labour Market Tightness and the Mismatch between Demand and Supply of Less-Educated Young Men in the United States in the 1980s." *Mismatch and Labor Mobility*, Schioppa Fiorel, ed., pp. 360–85. New York: Cambridge University Press.

Hecker, Daniel. 1992. "Reconciling conflicting data on jobs for college graduates." *Monthly Labor Review*, July, pp. 3–21.

———. 1995. "Further analysis of the labor market for college graduates." *Monthly Labor Review*, February, pp. 39–41.

Hunter, John. 1983. *Test Validation for 12,000 Jobs: An Application of Job Classification and Validity Generalization Analysis to the General Aptitude Test Battery*. Washington, D.C.: U.S. Employment Service, Department of Labor.

Katz, Lawrence and Kevin Murphy. 1990. "Changes in Relative Wages, 1963–1987: Supply and Demand Factors." *Quarterly Journal of Economics*, vol. CVII, pp. 35–78.

Katz, Lawrence, Gary W. Loveman, and David Blanchflower. 1992. "A Comparison of Changes in the Structure of Wages in Four OECD Countries." Cambridge MA: National Bureau of Economic Research, July, pp. 1–47.

Kirsch, I. S. and A. Jungblut. 1986. *Literacy: Profiles of American Adults*. Princeton, NJ: Educational Testing Service.

Klein, Deborah. 1984. "Occupational Employment Statistics for 1972–82." *Employment and Earnings*, January, pp. 13–16.

Kominski, Robert. 1990. *What's It Worth? Educational Background and Economic Status: Spring 1987*. U.S. Bureau of the Census, Current Population Reports, no. 21, p. 70.

Kominski, Robert and Rebecca Sutterlin. 1992. *What's It Worth? Educational Background and Economic Status: Spring 1990*. U.S. Bureau of the Census, Current Population Reports, no. 32, p. 70.

Kosters, Marvin. 1989. "Wages and Demographics." Presented at

"Wages in the 1980s" Conference, November 3, 1989, American Enterprise Institute, Washington, D.C.
Kutscher, Ron. 1991. "Reply to Bishop and Carter on the Worsening Shortage of College Graduates." *Educational Evaluation and Policy Analysis*, Fall, pp. 247–52.
Leslie, Larry and Paul Brinkman. 1985. "Student Price Response in Higher Education: The Student Demand Studies." University of Arizona, Tucson, AZ.
Levin, Henry and Russell Rumberger. 1987. "Educational Requirements for New Technologies: Visions, Possibilities, and Current Realities." *Educational Policy*, vol. 1, no. 3.
Lublin, Joann. 1992. "Firms Ship Unit Headquarters Abroad." *Wall Street Journal*, December 9, pp. B1 & B9.
Mishel, Lawrence and Jared Bernstein. 1992. *Declining Wages for High School and College Graduates*. Washington, D.C.: Economic Policy Institute.
Mishel, Lawrence and Ruy Teixeira. 1990. *The Myth of the Coming Labor Shortage: Jobs Skills and Incomes of America's Workforce 2000*. Washington, DC: Economic Policy Institute.
Murphy, Kevin and Finis Welch. 1993. *Inequality and Relative Wages*, pp. 1–14. Santa Monica, Calif.: Unicon.
National Center for Education Statistics. 1992a. *The Condition of Education: 1992*. Washington, D.C.: U.S. Department of Education.
———. 1992b. *Digest of Education Statistics: 1992*, Table 352. Washington, D.C.: U.S. Department of Education.
———. 1993a. *The Condition of Education: 1993*. Washington, D.C.: Department of Education.
———. 1993b. *Occupational and Educational Outcomes of Recent College Graduates 1 Year after Graduation: 1991*. Washington, D.C.: U.S. Department of Education, April.
———. 1993c. *Digest of Educational Statistics: 1993*. Washington, D.C.: U.S. Department of Education.
———. 1994. *Digest of Educational Statistics: 1994*. Washington, D.C.: U.S. Department of Education.
———. 1995a. *Literacy in the Labor Force*, pp. 1–288. Washington, D.C.: U.S. Department of Education, January.
———. 1995b. *Projections of Education Statistics to 2004*. Table 28. Washington, D.C.: U.S. Department of Education.
Organisation for Economic Co-operation and Development. 1989. *Employment Outlook*. Paris: OECD.
Robst, John. 1995. "College quality and overeducation." *Economics of Education Review*, vol. 14, no. 3 (September), pp. 221–28.
Rumberger, Russell. 1981. "The Changing Skill Requirements of Jobs in the U.S. Economy." *Industrial and Labor Relations Review*, vol. 34, July, pp. 578–90.
Sargent, Jon and Janet Pfleeger. 1990. "1988–2000—Outlook for College Graduates." Excerpts from an unpublished BLS Technical Memorandum.
Saunders, Norman. 1993. "Employment Effects of the Rise and Fall of Defense Spending." *Monthly Labor Review*, April, pp. 3–10.
Shelley, Kristina. 1992. "The Future of Jobs for College Graduates." *Monthly Labor Review*, July, pp. 13–21.
———. 1994. "More Job Openings—Even More Entrants: The Outlook for College Graduates: 1992–2005." *Occupational Outlook Quarterly*, vol. 38, no. 2 (Summer), pp. 4–9.
Silvestri, George. 1993. "Occupational Employment: Wide Variations in Growth." *Monthly Labor Review*, November, pp. 58–86.
Silvestri, George, and John Lukasiewicz. 1985. "Occupational Employment Projections: the 1984–95 Outlook." *Monthly Labor Review*, November, pp. 42–59.
———. 1987. "A Look at Occupational Employment Trends to the Year 2000." *Monthly Labor Review*, September, p. 46.
———. 1989. "Projections of Occupational Employment, 1988–2000." *Monthly Labor Review*, November, pp. 42–65.
———. 1991. "Occupational Employment Projections." *Monthly Labor Review*, November, pp. 64–94.
Silvestri, George, John M. Lukasiewicz, and Marcus E. Einstein. 1983. "Occupational Employment Projections through 1995." *Monthly Labor Review*, vol. 106, no. 11, November, pp. 37–49.
Tsang, Mun, Russell Rumberger, and Henry Levin. 1991. "The Impact of Surplus Schooling on Worker Productivity." *Industrial Relations*, vol. 30, no. 2, pp. 209–28.
U.S. Bureau of the Census. 1970. "Characteristics of Men with College Degrees: 1967." *Current Population Reports, Population Characteristics*, Series P20, No. 201, p. 23. Washington, D.C.: U.S. Government Printing Office.
———. 1972. "Effects of Different Reinterview Techniques on Estimates of Simple Response Variance." *Evaluation and Research Program of the U.S. Census of Population and Housing 1960*, Series ER 60, No. 11, Tables 30 and 46, pp. 1–100.
———. 1982. "Money Income of Households, Families and Persons in the United States: 1980." *Current Population Reports*, Series P-60, No. 132, Table 52. Washington, D.C.: U.S. Government Printing Office.
———. 1987. "What's It Worth? Educational Background and Economic Status: Spring 1984." *Current Population Reports*, Series P-70, No. 11, U.S. Government Printing Office, Washington, D.C.
———. 1991. "Money Income of Households, Families and Persons: 1988 and 1989." *Current Population Reports*, Series P-60, No. 172. Washington, D.C.: U.S. Government Printing Office.
U.S. Bureau of Labor Statistics. 1982. *Handbook of Methods*, Bulletin 2134-1.
———. 1989 and previous years. "Nearly Three-fifths of the High School Graduates of 1988 Enrolled in College." USDL 89–308, June.
———. 1990. Unpublished Table F-3, "1983–1988 trends in the employment of persons who have 4 or more years of college education and the percent they comprise of total occupation employment, by detailed occupation." pp. 26–38.
———. 1992a. "Employment Cost Index—Compensation." *Monthly Labor Review*, March, p. 68.
———. 1992b. *Occupational Projections and Training Data*. Bulletin 2401, U.S. Dept of Labor, May 1992.
———. 1996. Press release, January.
———. Various years. *Employment and Earnings*, Table 56 and Table 60, January and April issues.
Whiting, Basil J. and Wade Sayer. 1995. *School-to-Work or School-to-What?* Philadelphia, PA: Public Private Ventures, October, pp. 1–41.

Discussion

Richard J. Murnane, Professor of Education, Harvard Graduate School of Education

I agree with the basic argument of John Bishop's paper, that college will continue to be a good investment in the years to come. I would like to address four questions raised by his paper. The first three might be asked by readers of media reports about hard times for college graduates. Many of these reports, as Bishop points out, are based on projections made by the U.S. Bureau of Labor Statistics. My responses to the questions posed by hypothetical readers are based on a paper that John Tyler, Frank Levy, and I recently published. The questions are as follows:

- Why are so many college graduates anxious about their economic positions, given that they are faring so much better than high school graduates?
- Is there any group of college graduates whose labor market experiences during the 1980s fit the gloomy prediction of the BLS?
- How can John Bishop's optimistic picture of the attractiveness of investing in college be reconciled with everyone's experience of knowing a college graduate from the class of 1994 or 1995 who is working at a coffee bar?
- How can states most effectively help low-income high school graduates pay for college?

Why Are Recent College Graduates (Especially Males) Anxious?

The first line of Table 1 lists the median earnings for 25- to 34-year-old male college graduates in the years 1979, 1989, and 1993, all in 1993 dollars. The second line lists comparable information for 25- to 34-year-old male high school graduates. The third line lists the college graduate/high school graduate earnings ratio, showing clearly the growth in the education-related earnings premium. However, another look at the top line shows that the median earnings of young male college graduates grew only 2 percent between 1979 and 1989 and fell by 4 percent during the subsequent four years.

As the figures in the second line make clear, the education-related earnings differential rose because of the dramatic decline in the earnings of high school graduates. The median income of 25- to 34-year-old high school graduates in 1993 was $20,000; this is less than three-fourths of the median earnings (in 1993 dollars) for the comparable group in 1979. Thus, while young college graduates are certainly better off relative to high school graduates today than was the case in 1979, young male college graduates do not have significantly higher incomes today than their counterparts did 15 years ago. This is one factor that contributes to their anxiety. Another is that most have larger college debt burdens than did their counterparts 15 years ago. This is a consequence of the rapid tuition increases, particularly at public colleges, that Bishop describes in his paper.

Is There Any Group of College Graduates Whose Labor Market Experiences Fit the Stories of the Media Jeremiads?

Table 2 lists two indicators of economic well-being in 1979 and 1989 for four groups of college graduates: 25- to 34-year-old women, 25- to 34-year-old males, 45- to 54-year-old women, and 45- to 54-year-old males. The two indicators are median earnings (in 1993 dollars) and the percentage of the group holding jobs classified as "high school jobs" by economists at the BLS. As the numbers make clear, young

Table 1
Median Earnings of 25- to 34-Year-Old Males and Females, in 1993 Dollars

		1979	1989	1993
Males	College Graduates	$31,579	$32,336	$31,000
	High School Graduates	$27,427	$22,791	$20,000
	Earnings Ratio: Coll. Grad/ H.S. Grad	1.15	1.42	1.55
Females	College Graduates	$19,593	$24,252	$24,340
	High School Graduates	$13,719	$13,858	$14,000
	Earnings Ratio: Coll. Grad/ H.S. Grad	1.43	1.75	1.74

Source: The 1979 and 1989 earnings figures were calculated from the 1980 and 1990 Public Use Microdata 1 Percent Samples of the U.S. Census of Population and Housing. The 1993 earnings figures were calculated from the March 1994 Current Population Survey.

Table 2
Indicators of Economic Well-Being in 1979 and 1989 for Four Groups of Four-Year College Graduates

Cohort	1979	1989	Percent Change
Young Women (25 to 34)			
Median Earnings (1993 $)	$19,593	$24,252	23.8
Percent in Jobs Requiring High School Education	28.2	25.2	−3.0[a]
Young Men (25 to 34)			
Median Earnings	$31,579	$32,336	2.4
Percent in Jobs Requiring High School Education	25.0	23.2	−1.8[a]
Older Women (45 to 54)			
Median Earnings	$21,552	$26,561	23.2
Percent in Jobs Requiring High School Education	27.6	23.6	−4.0[a]
Older Men (45 to 54)			
Median Earnings	$52,886	$50,814	−4.1
Percent in Jobs Requiring School Education	14.5	17.9	3.4[a]

[a]In percentage points.

Note: Data are for college graduates who worked at least one week during 1979 or 1989. All statistics reported in this table were calculated from the 1980 and 1990 Public Use Microdata 1 Percent Samples of the U.S. Census of Population and Housing.

women improved their position over the decade of the 1980s; young men held their own; older women improved their position. The one group in a worse average economic position in 1989 than the comparable group in 1979 is the 45- to 54-year-old men. As Bishop explains in his paper, there are reasons to be cautious in interpreting changes over time in the percentage of a group employed in what the BLS refers to as "high school jobs." But the decline over the 1980s in the median real earnings of older male college graduates is unequivocal. The difference between the declining economic position during the 1980s of older men and the stable or improving position for other groups of college graduates is missing from most BLS studies, because they tend to group all college graduates together in their analyses.

What about the College Graduates Working in Coffee Bars?

Figure 1 displays the median earnings of male high school graduates and male college graduates from the ages of 22 to 30, in 1989 and in 1993. The very low median earnings for college graduates at age 22 and 23 are consistent with everyone's anecdotes about college graduates working in coffee bars. But the earnings at age 30 are consistent with the earnings figures reported earlier. So the story is that it does take many college graduates a couple of years to find their way into jobs that have career potential. But it does happen. Moreover, it happened in 1993 as well as in 1989. In fact, the projected earnings profiles for college graduates in the two years are remarkably similar.

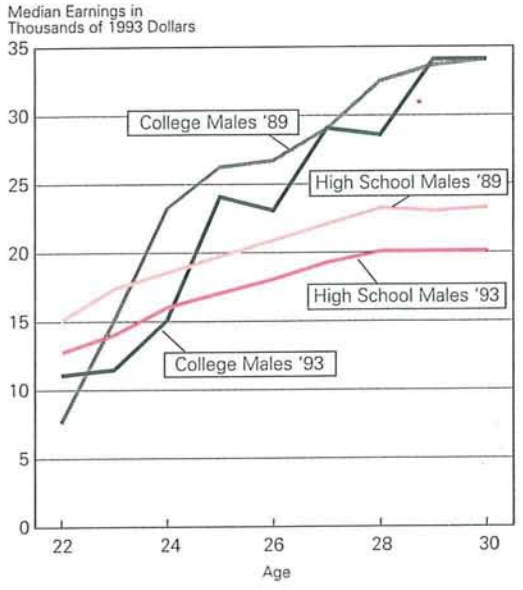
The deterioration in the earnings of male high school graduates that took place during the 1980s has continued into the 1990s.

In contrast, the charted earnings profiles for male high school graduates are much more shallow, illustrating that not only do they have low earnings at age

Figure 1

"Coffee Bars Story" for Males

High School vs. College Graduates, 1989 and 1993



22, they also have quite low earnings at age 30. Note also that at each age level, the median earnings of male high school graduates are lower in 1993 than in 1989, illustrating that the deterioration in the earnings of male high school graduates that took place during the 1980s has continued into the 1990s.

How Can States Most Effectively Help Low-Income High School Graduates Pay for College?

In closing, I would like to comment on Bishop's argument that the escalation of tuitions at public colleges and universities should stop because it is keeping many students from college, especially students from low-income families, who could benefit from this investment. I share his concern with the problem. However, I wonder whether a better response than arguing for tuition rollbacks might not be found. Currently, the states contribute about $40 billion to public post-secondary education. Over 90 percent is used to subsidize tuition rates. Given the fiscal situations in most states, this amount is unlikely to increase over the coming years, which means that it will be difficult even to maintain current tuition levels, never mind reduce them.

It seems to me that a better policy would be to allow tuitions to increase and use a significant part of the increased revenue for need-based financial aid, targeted to low-income students, whose enrollment decisions are especially sensitive to costs. This will work only if the availability of such aid is well publicized, and if significant steps are taken to simplify the application process for student aid. But these steps seem manageable, and targeting more of state financial assistance to low-income students seems important to do, given the tight fiscal situation.

Reference

Tyler, John, Richard J. Murnane, and Frank Levy. 1995. "Are more college graduates really taking 'high school' jobs?" *Monthly Labor Review*, vol. 118, no. 12, December, pp. 18–27.

Technology and Skill Requirements: Implications for Establishment Wage Structures

Peter Cappelli

Professor of Management, Wharton School of Finance, and Co-Director, National Center on the Educational Quality of the Workforce (EQW), at the University of Pennsylvania. The author's acknowledgments appear at the end of the paper.

The concept of skill reflects the capacities and human capital that workers bring to jobs—what psychologists refer to as "knowledge, skills, and abilities"—and the specific demands that individual jobs make on workers who occupy them. Whether the demand for skills is changing is a vitally important question for public policy. Such changes help determine the distribution of income and the extent of technological unemployment; they also help determine whether relative skill shortages exist that may lead to a lack of competitiveness, especially in relation to other economies that possess the valued skills in more abundance.

An extensive literature has examined the causes of technological change and its effects on the demand for skills and the structure of wages. This article begins by reviewing this literature, which spans economics, sociology, and other social science disciplines that examine industrial behavior. It then makes use of an extensive establishment-level survey to examine the effects of organizational structure and investment activity on wages. The study finds that establishments that adopt new technologies pay production workers more than those that do not, and also pay them more relative to the pay of supervisors. Thus, the results suggest that recent changes in workplaces are increasing skill requirements for production workers. The article concludes with some comments on how this trend will play out in terms of labor market adjustments.

Factors Shaping Changes in Skill

The demand for skill in the economy is derived from the objective requirements associated with jobs. Changes in the demand for skill are the result of changes either in the requirements associated with individual jobs or in the distribution of employment across jobs that have different skill requirements. A vast literature in the social sciences, most prominently in sociology, argues that technology drives skill require-

ments. This literature uses the word technology to refer to broad changes in production systems, such as the industrial revolution or the adoption of the factory system.

One tradition argues that technological change has tended to increase skill requirements by eliminating noxious physical labor. The focus here is often on technological changes so massive and inexorable that their effects on employment can be treated as exogenous.[1] Many of the more contemporary studies in this area begin with the analysis from *Workforce 2000*, which concludes that the distribution of employment across occupations and industries in the United States is shifting toward higher-skilled work (U.S. Department of Labor 1987). Examinations of Census occupational data over time suggest, however, that the rate at which this shift has occurred has slowed from the 1960s to the 1980s (Howell and Wolff 1991). And further reanalysis of the data used in *Workforce 2000* indicates that the anticipated shifts in the future will not in fact increase skill demands by much (Mishel and Teixeira 1991).

The "upskilling" tradition tends to rely on forces external to the organization for its explanations and changes in the distribution of employment; the "deskilling" tradition relies on forces internal to the firm and changes within individual jobs.

Another and perhaps equally long tradition sees technological change operating to reduce the breadth of skills required from workers and, in particular, their control over the way jobs are performed.[2] The "deskilling" research argued that the types of technologies used and the way they were implemented were choice variables that management could exercise in ways that depended on the circumstances. Marglin (1974), for example, argued that deskilling was a conscious management decision taken to increase control over workers and make the management process easier. This thesis reached its best-known form in the work of Braverman (1974), who extended it to clerical and other nonproduction jobs.[3] Growing worker dissatisfaction with production jobs in the 1970s led to explicit public policy acknowledgments that narrow, deskilled jobs were part of the cause. For an example, see *Work in America* (U.S. Department of Health, Education, and Welfare 1973).

The "upskilling" tradition tends to rely on forces external to the organization for its explanations and changes in the distribution of employment for evidence. The deskilling tradition relies on forces internal to the firm (management strategy) and changes within individual jobs for its explanations. (See Attewell 1990 for a review of this literature.)

The third research approach is more empirically driven and asserts explicitly that technology is a choice variable and that the effect on skill may vary. Spenner (1983) described this research as the "mixed effects" position in terms of the net change it predicts in skill.[4] This middle position assumes that situational factors such as labor costs or employee bargaining power are important in determining the utility of any technology or system of work organization.

[1] Arguments about the benefits to workers of technology began with Adam Smith, then with the scientific socialists, and continued in studies of economic development. Kerr and coworkers (1960), for example, saw industrialization as liberating production workers by leading to more skilled jobs. Students of industrial technology such as Woodward (1965) argued that assembly line work was only a stop on the road toward automated, "continuous production" factories where workers would be freed from machine-paced tasks. Blauner (1964) argued that such technologies would actually lead to an increase in skill, for example, as workers performed a broader range of monitoring tasks. This thesis reaches its high point with Bell's (1973) arguments that knowledge-based jobs would replace production work in the economy of the future.

[2] Adam Smith's observations about the increasing division of labor and the narrowing of jobs that results can also be seen as part of the beginning of the deskilling argument. Durkheim (1893), Veblen (1914), and others were concerned about the dehumanizing effects of automation and factory production and the broader effects it would have on society. Scientific management as a theoretical argument for deskilling and assembly line production methods in basic industries led to widespread acceptance of the deskilling argument supported by research findings (Walker and Guest 1952; Bright 1966) and to a shift in research to examine the *consequences* of deskilled jobs (for example, Blauner 1964).

[3] In particular, Braverman (1974) argued that the shift in the distribution of occupations toward administrative and white collar jobs was not an indication that overall skill levels are rising, but instead was simply a manifestation of deskilled production work where the "mental" aspects had been removed.

[4] Most of these studies are cases, and many are historical. Hobsbawm (1964) describes, for example, how craft workers were able to use the techniques of organized labor (for example, controlling supply) to resist management efforts to deskill jobs. Edwards, Reich, and Gordon (1979) suggest that changes in skill have been the result of a complex process of bargaining between management and labor. Flynn's (1988) survey of hundreds of case studies of technological change finds considerable variance in the effects on employment and skill levels, lending support to the "mixed effects" hypothesis.

Other studies have examined changes in skill and looked beyond technology for their explanations. For example, Piore and Sabel (1984) argue that the saturation of industrial markets and greater international competition have forced employers to find smaller market niches that demand quicker reactions to changing markets and, in turn, a more flexible workplace where jobs are defined more broadly and workers have greater control over them. The result is to create jobs with more skill, broadly defined. In other words, changing product markets have made a form of work organization that was always available suddenly much more effective. Cappelli and Sherer (1989) find a broadening of responsibilities in such a firm,

Outside of production, little evidence is seen of high-performance work systems, even in organizations that have production-like aspects.

and Loveman (1988) finds evidence of a shift in manufacturing occupations toward greater skill that is consistent with the "flexible-specialized" hypothesis.[5]

Measuring Changes in Skill

Exactly how one should attempt to measure skill changes has been a vexing problem for the research efforts described above. Studies sometimes attempt to use measures of worker characteristics, such as average education levels, to assess whether skill requirements have changed. The problem with this approach is the considerable evidence that such worker characteristics vary independently from the demands of jobs (Berg 1970). One approach is to ask workers directly about the requirements of their jobs (Mueller et al. 1969), but an individual's perceptions of job characteristics do not necessarily relate well to actual job characteristics (Roberts and Glick 1981). Myles and Eno (1989) found that workers' self-reports of skill requirements in their jobs differed substantially from those provided by expert raters.

A popular data source for measuring the skill requirements of jobs has been the U.S. Department of Labor's *Dictionary of Occupational Titles* (DOT), now in its fourth edition, which is compiled by government job analysts who provide detailed descriptions of some 12,000 job titles. By examining changes in these titles in subsequent editions, one can measure changes in job requirements (for example, Horowitz and Herrstadt 1966; Spenner 1979). But serious drawbacks are associated with using the DOT in this manner, in addition to the fact that it is not updated regularly.[6]

An alternative approach is to estimate skill changes by examining shifts in the composition of occupations in the economy, the approach followed by *Workforce 2000* and discussed above.[7] The problem with all such studies is the difficulty in controlling for the content of jobs. It is not obvious that the respondents are really using common definitions and that the results are reliable. The current questions used for gathering information about jobs are far from ideal. The Current Population Survey, the source of data for many of these studies, asks respondents about their business or industry, the kind of work they do, and

[5] Other studies in this period continued to emphasize the relationship between technology and skill. Hirshhorn (1984) suggests an argument similar to Bell's (1973) that new automated technologies will require higher-order mental and social skills from workers. Studies of the introduction of numerically controlled production machinery have suggested that the introduction of these machines is designed to reduce workers' skill (Noble 1977). Further, even where the mix of skills associated with numerically controlled jobs appears to grow, the changes may simply add more boring tasks and leave the content of the jobs degraded (Adler 1986). Again, studies in the "mixed result/it depends" tradition report a variety of changes in skill across situations, depending typically on contextual issues. (See the papers in Hyman and Streek (1988) and Zuboff (1988) for case-based examples and Kelley (1989) for a survey-based argument.) Overall, a National Academy of Sciences study (Cyert and Mowery 1987) concluded that changing technology was unlikely to increase skill requirements during the immediate future. See Levin, Rumberger, and Finnan (1990) for a similar conclusion.

[6] It is not clear that all of the entries were actually reanalyzed in subsequent editions, and there may have been a bias toward making the reports consistent over time. Further, by itself the DOT measure tells only what is happening to the content of specific jobs, not what is happening to average skill across a work force or an organization. For example, a given job such as drafting can be substantially deskilled by new technology while at the same time the composition of the design work force in a firm shifts from drafting jobs to higher-skilled engineering jobs. The overall skill level of the design function may rise because of this shift in its composition, even though the skill associated with some individual jobs is declining.

[7] Perhaps the best data source for compositional studies is the *Occupational Employment Statistics Survey* assembled by the Bureau of Labor Statistics (BLS). This survey examines 150 occupations in each industry with establishment-level surveys and reports the shift in employment across those occupations. The survey is actually conducted separately by each state, under the general guidance of, but not the control of, the BLS. The BLS takes the data from the states with little opportunity to check the reliability of the results or the methods used.

their most important activities at work, a relatively small amount of information by which to measure skills. Classification clerks then take these responses and code them into occupations. A number of tests are made for the reliability of the coding but not for the validity of the original responses. In about half the cases, employees believe that their occupation is something different than does their employer (Mellow and Snider 1985). At least half the time, then, one of the parties—employer or employee—is wrong in labeling an occupation.

Perhaps the most important problem with occupational data is that job titles do not always accurately reflect changes in skill requirements. Employees in less rigid organizations are sometimes rewarded with "promotions" and given higher job titles, even though their duties remain unchanged. Managers may also arrange such promotions to secure grade-based salary increases, especially when general salary increases are being restrained. (The practice is sometimes known in the compensation literature as "grade drift.") And as jobs get broader in scope, it becomes more difficult to match tasks and skills with specific job titles.

Finally, compositional studies do not indicate whether changes have been made in skill requirements within individual jobs, the reverse of the problem noted above in using the DOT. For example, the decline in aggregate skill levels associated with a shift in work force composition from quality control to assembly jobs may be offset if substantial upskilling of assembly jobs has occurred.

Spenner (1988; 1990) reviewed the research that has been based on aggregate data and concluded that the results have been mixed, at least through the 1980s—perhaps a small upgrading of content in the form of complexity, equivocal results for content in the form of autonomy, and not much change in composition. His conclusions suggest that "the poverty of quality data" (Spenner 1983) may be the main obstacle to obtaining better estimates of skill changes.

My own study of changes in skill requirements used a different set of data on 56,000 production workers over an eight-year period and found significant upskilling across the board for production jobs as measured by changes in Hay points, the job evaluation metric introduced by Hay Associates to measure job requirements. Some of the upskilling seems due to the fact that tasks associated with quality control and housekeeping have been pushed onto all the remaining jobs (the decline of employment in quality and housekeeping jobs is consistent with this interpretation). That is, not only has each job experienced upskilling but the overall distribution of production jobs has shifted away from less skilled and toward more skilled positions (Cappelli 1993).

Economic-Based Arguments

A different research stream has developed in economics on the question of skill levels. This research also focuses on the role of technology in driving skill changes. Here "technology" refers not to system or economywide developments but to firm-level decisions of the kind associated with production functions. In most cases, the analysis focuses on the effects of broad production decisions such as the level or type of capital spending. And, in contrast with the research cited above, the goal is less to assess skill changes than to explain where they occur and their effects on other aspects of operations.

Perhaps the most intriguing aspect of arguments about changing technology and skill requirements is their use in explaining changes in the wage structure.

One set of research in this tradition focuses on the complementarity between skills and firm production choices. For example, Bartel and Lichtenberg (1987) find that operations with more educated workers adopt new technologies sooner and that the decision to adopt new systems then increases further the demand for skill. Historical research finds that as early as the 1920s, more technologically sophisticated firms hired more educated workers (Goldin and Katz 1995). Other recent work (Bartel and Sicherman 1995) finds similar results for training, in that technological change increases training.

Still other research relies on changes in the distribution of employees across occupations to estimate changes in skill levels. Berndt and Morrison (1991) find that investments in certain kinds of physical capital (mainly office equipment) are associated with increased education among production workers and a shift toward presumably more highly skilled nonpro-

duction workers. Berman, Bound, and Griliches (1994) argue that a measure of the level and rate of change in computer investments for manufacturing firms is a good proxy for the firms' overall technological change and explains the shift toward higher-skilled workers in some operations.

Perhaps the most intriguing aspect of arguments about changing technology and skill requirements is their use in explaining changes in the wage structure. The research on changes in wage structures, especially the rise in the returns to education, is too voluminous to review in detail here. Levy and Murnane (1992) survey it and conclude that "the most striking evidence of change in the demand for skill is the increase in the premium associated with formal education." Wallace and Kalleberg (1982), Davis and Haltiwanger (1990), and others find rising wage differentials between occupations and an increase in the premium for skill.

Several studies have attempted to see how these technology choices, broadly defined, affect wage outcomes. Mincer (1991) offers one of the first studies to argue that technology explains some of the increase in the returns to education over time. Bound and Johnson (1992) compare different explanations for changes in the overall structure of wages in the 1980s using changes in education levels of workers as a proxy for technology. They conclude that technological change was the most important factor in explaining changes in wage premiums in this period. Krueger (1993) finds that workers who use computers on the job, other things equal, earn about 10 to 15 percent more and that computer use may explain as much as half of the increase in the rate of return to education in the late 1980s. Dunne and Schmitz (1995) find that the use of advanced production technologies in manufacturing is associated with higher wages for both production and nonproduction workers.

Mishel and Bernstein (1994) question whether the conclusion can really be drawn that technological change, however defined, can explain changes in wage differentials during the 1980s. They argue that research showing relationships between technology and wages—that is, between levels—does not explain *changes* in wage differentials. In order to do this, one needs to show that there has been a change in technology, specifically, that the rate of introduction of technology was somehow greater in the 1980s. And, as noted earlier, the evidence does not suggest that this was the case. Indeed, the pace of change may even have declined somewhat (Howell and Wolff 1991).

Further, as the "mixed effects" research in sociology suggests, the introduction of specific pieces of technology may not have an obvious effect on skill levels. Some of the clerical occupations that have been subject to innovations in office equipment of the kind emphasized by Berndt and Morrison (1991), for example, have been deskilled (for example, typists, following word processing) while others have been upskilled (bank tellers after the introduction of automated teller machines, Cappelli 1993). And as Kelley (1986) demonstrated with programmable automation, the introduction of a given technology may have very different effects on the skills of the workers using it across establishments, depending on factors like the power of unions in those establishments. Finally, it is worth asking, as Mishel and Bernstein (1994) do, whether the assumption that average education levels are a good proxy for skill levels, used in much of this research, is adequate.

Work Organization Studies

Yet another approach to the issue of changing skill requirements looks neither at systemwide changes nor at production function choices associated with capital decisions. This approach focuses on "technology" in the sense of management technology and, in particular, decisions about how work might be organized within individual jobs. The common theme in models of new work systems is that they represent a contrast to Tayloristic work systems associated with scientific management. These changes in the organization of work alter the hierarchy and internal organization of jobs.

The contemporary debate about these new models of work in the United States began by identifying "high performance" (HP) work systems in the context of new production systems: High performance production systems were identified based on productivity outcomes, and the work systems demanded by them were identified, by definition, as high performance work. These production systems are most clearly associated with Japanese manufacturing and include techniques such as statistical process control, just-in-time (JIT) inventory systems, continuous improvement, and total quality management (TQM). This approach is, not surprisingly, the one taken by research projects that focus on production, such as MIT's World Motor Vehicle Project (MacDuffie and Krafcik 1992) or the study of manufacturing conducted by the National Academy of Sciences (1986).

The models of "lean" production basically argue that increased quality, productivity, and flexibility can be obtained by making better use of employees. In particular, responsibility and decision-making are transferred from administrative structures directly to employees or to their teams. These arrangements demand significantly more from employees than do work systems associated with scientific management, where tasks are narrowed and virtually all decision-making is in the hands of management.

These new work systems are associated with a series of specific work practices such as employee empowerment and participation in decision-making, where employees take over some tasks previously performed by supervisors, engineers, and staff specialists; teamwork, where autonomous or semi-autonomous teams take over some direct supervision and substitute for formal management structures; and job rotation/cross-training, where employees within teams swap tasks and become more interchangeable.

The models of "lean" production basically argue that increased quality, productivity, and flexibility can be obtained by making better use of employees.

Measuring the incidence of these work practices is yet another way to proxy whether skill requirements are rising. The important question here is how to define those practices—is it a set of practices or individual ones? how extensive should they be to count? and so on. Lawler, Mohrman, and Ledford's (1992) study of *Fortune 1,000* firms in 1987 and again in 1990 provides extensive breakdowns of practices. Twenty-five percent have no employees involved in job redesign; 13 percent have a majority of the work force in quality circles, and 22 percent in some other participation group; 12 percent have a majority of employees receiving team-based incentive pay; and 68 percent have more than a majority of employees involved in cross-training.

Osterman's 1992 survey (1994) reports that about one-third of firms have some significant level of the practices associated above with high performance work. Forty percent have a majority of the workers in the "core" of their production process in teams and 26 percent in job rotation. Bassi's (1992) survey finds that one-half of non-manufacturing firms and three-quarters of manufacturing firms have undergone some reorganization of work along the lines of these practices, although very few had made substantial changes yet. A just-released survey conducted by the Census for the National Center on the Educational Quality of the Workforce (EQW) finds that between 20 and 30 percent of establishments surveyed had some combination of these practices (EQW 1995).

Work Organization Outside of Production

By definition, the techniques of high performance *production* systems are associated with production work, and not all of these techniques apply directly to other industries. The equivalent study to the one noted above using Hay data for clerical jobs finds no consistent pattern; some clerical occupations show increases in skill while others experienced decreases (Cappelli 1993).

One important attribute of these high performance systems is the increased flexibility needed to handle variations in products. Situations that do not demand change—indeed, may punish it—may not make great use of these techniques. HP production techniques are used little in industries like transportation, distribution, or public utilities, perhaps because reliability and consistency are the prime considerations there. Indeed, the work systems in these industries are often referred to as "high reliability" systems.

One of the more curious findings, however, is that little evidence is seen of work practices associated with high performance production systems even in organizations that have production-like aspects. The processing of transactions in the back offices of financial services and related industries, for example, looks very much like an assembly line, and in fact more people are employed in these industries than in manufacturing. Yet there appears to be little, if any, evidence that HP production practices or even specific HP work practices are being used in these operations. Indeed, the management focus in these facilities seems to be quite strongly in the opposite direction—to automate employees out of the process altogether.[8]

It is not obvious that there is a common trend in service jobs. In health care, for example, anecdotal evidence suggests that the biggest development has

[8] Preliminary findings from a study of transaction processing at the Wharton School's Financial Services Center finds virtually no evidence of HP production practices.

been the deskilling of jobs along the lines of Taylorism: Many of the simple tasks traditionally performed by nurses are now being transferred to lower-skilled workers. In customer contact jobs in retailing and hospitality, some efforts are being made to "empower" workers by giving them more authority to solve problems. Overall, there appears to be a clear trend toward high performance work in production-oriented jobs because it is associated with a new production process. It is not clear that this movement will make equal progress elsewhere.

Do These Arrangements Raise Skills?

Whether these new models of work organization are changing skills—and if so, in what way—is a central issue in a number of public policy arguments. Advocates assume that they raise skill requirements substantially and that the introduction of these systems may well require significant upgrading of work force skills (National Center on Education and the Economy 1990; U.S. Congress, Office of Technology Assessment 1990). Closer inspection suggests that the changes in skill demands may not be so obvious. Consider, for example, the issue of individual worker autonomy, a key concept of participative work systems thought to raise skill demands. As Klein (1989) observes, just-in-time inventory systems that eliminate buffers of materials or intermediate products between work groups make those groups highly interdependent. Changes in the production arrangements within any individual group can change their work pace, causing either shortages or pileups of material downstream. Because the overall flow of work across *all* teams in the assembly process must be absolutely consistent, the autonomy that any individual team has to make changes in work organization is tightly constrained.

As Adler (1993) discovered at the New United Motor's (NUMMI) joint venture between Toyota and General Motors, the principle of continuous improvement requires that the performance of individual tasks be completely routinized, so that the work teams can discover whether minute changes in tasks lead to an improvement in performance. In this sense, continuous improvement in work processes is like a laboratory experiment where everything is held constant except the one change being investigated. For employees, individual tasks appear to be every bit as rigidly defined as under scientific management. They do not have the individual autonomy that demands higher skills.

Lean production essentially eliminates some jobs and pushes their tasks onto production workers. Some of those tasks, such as housekeeping, make few demands on skills. Other tasks such as coordinating job design changes across teams demand considerably higher skills, especially behavioral skills such as communication and negotiation, and group dynamics skills. Adler notes that many of the tasks previously performed by industrial engineers, such as job analysis and redesign, are now being pushed down to the production teams.[9]

Research Questions

The literature from various fields reviewed above points toward several important issues under the general heading of skills and the economy. Perhaps the most fundamental question is, what factors determine why skill requirements appear to be rising in some sectors or establishments? Answers to this question may help address the more general issue as to whether some average trend in skill levels exists in the economy as a whole or in broad sectors within it, a trend that might require a response either from public policy or from the private sector. And the final question, which follows from the above, is whether changes in skill requirements might help explain some of the changes in the structure of wages—particularly, rising wage differentials for skilled versus less skilled workers—in the economy as a whole.

The EQW National Employer Survey

A recent establishment-level survey of employment practices conducted by the U.S. Bureau of the Census for the National Center on the Educational Quality of the Workforce (EQW) may help address some of the above questions. The EQW National Employers Survey (designed by Lisa Lynch in collaboration with EQW Co-Directors Robert Zemsky and Peter Cappelli) was administered by the U.S. Bureau of the Census as a telephone survey in August and September 1994 to a nationally representative sample of private establishments with more than 20 employees. The survey represents a unique source of information on how employers recruit workers, organize

[9] It is also important to remember that while these skill requirements are rising for production workers, they often start at a low base. It is certainly possible, therefore, that workers already have the skills to meet the increasing skill demands represented by these new systems.

work, invest in physical capital, and utilize education and training investments. It is structured to provide information on all categories of incumbent workers, not just new hires or those in core occupations.

The survey oversampled establishments in the manufacturing sector and establishments with over 100 employees. Public sector employees, not-for-profit institutions, and corporate headquarters were excluded from the sample. Although the survey excluded establishments with fewer than 20 employees (which represent approximately 85 percent of all establishments in the United States), the sampling frame represents establishments that employ approximately 75 percent of all workers. This is because while most establishments are small (fewer than five employees), most workers are employed in larger establishments. We concentrated on those establishments employing the most employees. The target respondent in the manufacturing sector was the plant manager and in the nonmanufacturing sector was the local business site manager. The survey was designed to allow for multiple respondents so that information could be obtained from establishments that kept financial information, for example, in a separate office—typically at corporate headquarters, for multi-establishment enterprises. Computer Assisted Telephone Interviewing (CATI) was used to administer each survey, which took approximately 28 minutes to complete.

Research suggests several factors that might be contributing to rising skill requirements at the establishment level: management structure, union coverage, computer use, R&D investment, and new work systems like TQM.

The sampling frame for the survey was the Census Bureau's SSEL file, one of the most comprehensive and up-to-date listings of establishments in the United States. Of the 4,633 eligible establishments contacted by Census, 1,275 refused to participate in the survey. This represents a 72 percent response rate, which is substantially higher than that of many similar establishment surveys. The usual reason given by employers for not participating was that they did not participate in voluntary surveys or they were too busy to participate. Probit analysis (described in Lynch and Black 1995) of the characteristics of nonrespondents indicates no significant pattern at the 2-digit industry level in the likelihood of participating in the survey. The only businesses more likely not to participate were manufacturing establishments with more than 1,000 employees, which represent 0.1 percent of the sample. Of the 3,358 establishments that participated in the survey, not all respondents completed all parts of the survey by the interview cutoff date of October 1, 1994. The final number of surveys in which all parts of the survey were completed was 1,621 for establishments in the manufacturing sector and 1,324 establishments in the nonmanufacturing sector. This represents a 64 percent overall "completed" survey response rate. The results presented below refer to this final sample of 2,945 establishments. (See the Appendix for more details on the response rates, the distribution of establishments by industry, and the distribution of establishments by employer size, weighted and unweighted.)

The National Employers Survey (NES) is used below to examine the factors that predict whether skill requirements are increasing for production workers at the establishment level and then to explore how the characteristics associated with rising skill requirements affect the wages of production workers and their supervisors, the first level of management in most organizations. The research reviewed above suggests several possible factors that might be contributing to rising skill requirements at the establishment level. From the sociological traditions, especially the "mixed effects" approach, come arguments about management structure and union coverage (raising skills), and arguments about size and structure affecting skills. From the economics-based research on skills complementarity comes the argument that innovation should be higher when education levels in the work force are higher, further increasing skill demands. From the production-function-oriented research comes the argument that computer use and research and development investments are raising skill levels. And from the work organization research come arguments about how new work systems that involve programs like total quality management (TQM) and employee participation raise skill requirements.

The NES asks a very simple and straightforward question of each establishment: Have the skills required to perform production jobs adequately risen

over the past three years? Because the question asks about perceptions, it is subject to all kinds of error at the level of the individual respondent; the criteria that respondents use to aggregate the different changes going on in the workplace into an overall conclusion about skill changes will surely differ across individuals. But it is difficult to see a priori how errors of this kind would vary with establishment characteristics. And it is worth noting that other measures of skill change, such as occupational titles, have their own measurement problems, as noted above.

The fact that the question asks about a change in skill levels suggests that ideally we would like to have information about changes in establishment practices, data that we do not have, unfortunately. On the other hand, many of these practices are essentially new; widespread computer use among regular employees, for example, is quite a recent phenomenon, as are most of the work systems examined here.

We begin the analysis with an equally straightforward logit model examining the responses as to whether skill requirements have risen. Controls are included for industry at the 2-digit level, establishment size, whether it is part of a multi-establishment operation, and the percentage of the work force accounted for by production and supervisory employees. (Appendix Table A-4 contains summary statistics for all variables included in the regressions.)

In particular, we are interested in seeing whether skill requirements have risen where the education levels of production and supervisory employees (the groups most directly affected by technology changes of the kind described here) have risen; whether the use of computers, the presence of research and development operations, and capital lead to rising skill requirements; whether skill requirements are rising where TQM programs and self-managed teams are in place, where the ratio of production workers to supervisors is greater, and where the organization is "flatter"—as measured by the number of levels of management.[10] The argument concerning the latter two variables is that they measure changes that essentially push tasks down onto the more numerous, lower-level employees, raising the skill requirements of their jobs.

Hypotheses concerning the influence of union representation are more ambiguous. The "mixed effects" literature suggests that unions may help lower-level employees prevent their jobs from being deskilled. But employers also appear to treat unionized establishments very differently, for example, underinvesting in the kinds of new techniques that might otherwise raise skills.

Table 1
Logit Results for Establishments Reporting Rising Skill Requirements for Production Jobs

Variable	Parameter	Standard Error
Intercept	.85	.28
TQM Program	.15	.03
Percent of Nonmanagerial Workers in Self-Management Teams	.001	.006
Ratio of Employees to Their Supervisors	.0002	.0007
Number of Management Levels	−.008	.010
Log Capital Stock/Total Sales	.03	.009
R&D Center Present	.12	.03
Percent of Managers Using Computers	.0007	.0005
Percent of Nonmanagerial Employees Using Computers	.001	.0005
Percent of Employees with Less than One Year of Tenure	−.0005	.0009
Education of Production Workers (years)	−.025	.018
Education of Supervisors (years)	.02	.01
Percent of Employees Unionized	−.0007	.0005

R^2 = .17
$\overline{R^2}$ = .14
F = 5.146
Prob > F = .0001

The results presented in Table 1 are generally supportive of the hypotheses. For example, computer use is associated with rising skill requirements (not quite approaching conventional significance levels for managerial computer use) as are capital levels and research and development operations. TQM programs and self-managed teams also raise skill requirements. The presence of unions seems to lower skill requirements, although the effect is very small and estimated imprecisely. Perhaps the most surprising result is that while skills are rising where supervisors are more educated, they appear to be rising more where education levels of production workers are *lower*.

Part of the complication in understanding these education results is that the dependent variable measures only whether skill requirements are rising, not whether they are high or low, in contrast to the skills complementarity research, which attempts to measure levels of technology. So, for example, the skill levels at

[10] Supervisors are defined as the first level of management.

establishments with uneducated production workers could be rising very quickly, precisely because they start from a low base. In other words, these establishments are playing catch-up with more sophisticated establishments. The relationship between rising skills and higher education levels of supervisors is perhaps easier to see. Given that supervisors serve important training and teaching functions, it is important that they be more educated when efforts are under way to raise the skill requirements of the workers they supervise. Interpreting the magnitude of these relationships in a practical way is difficult, given the categorical nature of the dependent variable.

The next issue to examine is how some of these same factors that raise skills might affect the structure of wages in these establishments. One way to think about this relationship is as a system of equations, where establishment practices with respect to technology, broadly defined, drive increases in skill requirements and, in turn, wages. But there are several reasons for examining the reduced form, where potential relationships between practices and wages are considered directly. First, the average level of skill requirements is more likely to be related to wage levels than is the increase in skills, the dependent variable examined above, and we do not have a measure of average skill levels. Second, the establishment practices considered here may have effects on wages other than through skill levels. They may demand more effort, for example, or generate stress that requires commensurate compensation. The variable measuring skill increases is included in the analysis, however, to see how rising skill requirements affect wages.

For production workers, wages are higher where teams and TQM are used and where organizations are flatter, and where capital is more intensive.

Another potential issue is that wage levels may affect the choice of practices. This is perhaps most obvious with capital decisions like computer purchases, where capital could be substituted for labor, depending on relative prices. It is less obvious for these other practices, where the effects on labor are not at all clear. For example, does a TQM program increase or decrease total labor requirements or change the mix of workers by skill? Where wages affect the choice of practices, the relationship may well be recursive, as Bartel and Lichtenberg (1987) argue in a similar context—practices drive wages, which then affect the choice of practices, and so on. In that case, more straightforward, single-equation ordinary least squares techniques may be sufficient.[11]

Simple OLS estimates relating establishment practices to wages are presented for production workers, for supervisors, and for the differential between the two. The same set of independent variables is used as in the skill requirements equation, and for similar reasons—practices that demand more from employees should lead to higher wages for production workers. The one exception is that we also include the variable measuring whether skills have risen for production workers in the equation.

Given that the work organization practices in particular are aimed primarily at production workers, we might expect their effect on supervisors to be different from the effect for production workers. The complication in framing hypotheses about supervisors is that they often serve two very different roles. On the one hand, they are teachers and monitors of employees, serving as a substitute for lower-quality workers; on the other, they also serve as lead workers, contributing side-by-side with production employees and functioning as complements when the ability of their workers increases. To illustrate, having more educated production workers may reduce the monitoring tasks of supervisors but may increase the standards to which supervisors have to perform in their own tasks.

An interesting question is the extent to which the practices measured by the independent variables demand more of the skills and abilities that trade in labor markets, suggesting that higher-quality workers should be needed, or require greater effort and attention of the kind that commands higher wages as a compensating differential. Traditional wage equations

[11] The kind of practices outlined here may be associated with better organizational performance, which in turn makes it possible to pay higher wages through some kind of rent-sharing model. These practices may generate such performance themselves, or better performance produced through some other means may provide resources that make possible both these practices and higher wages. We hope to estimate the extent to which rent-sharing is involved in these results in subsequent models by including controls for establishment performance.

Table 2
Regression Results for Log Average Annual Pay for Production Workers

Variable	Parameter	Standard Error
Intercept	9.10	.17
TQM Program	.05	.02
Percent of Nonmanagerial Workers in Self-Management Teams	.001	.0004
Ratio of Employees to Their Supervisors	−.0005	.0005
Number of Management Levels	−.01	.006
Log Capital Stock/Total Sales	.01	.006
R&D Center Present	.02	.02
Percent of Managers Using Computers	.0008	.0003
Percent of Nonmanagerial Employees Using Computers	.0006	.0003
Percent of Employees with Less than One Year of Tenure	−.005	.0006
Education of Production Workers (years)	.05	.01
Education of Supervisors (years)	.008	.007
Percent of Employees Unionized	.002	.0003
Skills Rising for Production Jobs	.05	.02

R^2 = .17
$\overline{R^2}$ = .14
F = 5.146
Prob > F = .0001

of the kind presented here that control for education may well ignore effects on wages caused by demanding more skilled workers.

The results for the wage equations are generally stronger than for the skills regression (Table 2). For production workers, wages are higher where teams and TQM are used and where organizations are "flatter" (that is, have fewer management levels). Wages are also higher where capital is more intensive, but having an R&D operation seems to have little effect. The use of computers by both production workers and managers is associated with higher wages for production workers. The magnitude of these effects is much smaller than Krueger's (1993) finding, however, and management's use of computers appears to have a somewhat larger effect on production worker wages than does computer use by production workers. It may well be that when supervisors are working directly with computers, they have less time to serve as monitors and teachers, and higher-skilled production workers are required as a result.

The results are somewhat different for supervisory wages (Table 3). Despite the fact that teams in production work generally transfer tasks from supervisors to employees, the presence of teamwork among production workers appears to raise supervisor wages. The new role that supervisors play in such settings (for example, "coach," not "boss") may be sufficiently challenging to command greater pay. Flattening the organization also raises supervisor pay, presumably because it pushes more tasks down to supervisors. But a wider span of control (the production worker to supervisor ratio) has no effect, suggesting that the monitoring function traditionally proxied by the span of control may not be all that important in determining supervisor pay.

Perhaps the most interesting results are that supervisor pay is higher when production workers are more educated and make greater use of computers. These results also seem to suggest that supervisors may serve more as complements for the skills of production workers than as substitutes.

The estimates of the ratio of production to supervisory pay within the same establishment speak more directly to issues of inequality, at least inside organi-

Table 3
Regression Results for Log Average Annual Pay for Supervisors

Variable	Parameter	Standard Error
Intercept	9.78	.17
TQM Program	.02	.02
Percent of Nonmanagerial Workers in Self-Management Teams	.0009	.0004
Ratio of Employees to Their Supervisors	−.0003	.0004
Number of Management Levels	−.01	.006
Log Capital Stock/Total Sales	.007	.005
R&D Center Present	−.008	.02
Percent of Managers Using Computers	.0003	.0003
Percent of Nonmanagerial Employees Using Computers	.0007	.0003
Percent of Employees with Less than One Year of Tenure	−.004	.0006
Education of Production Workers (years)	.02	.01
Education of Supervisors (years)	.02	.007
Percent of Employees Unionized	.001	.0003
Skills Rising for Production Jobs	.05	.02

R^2 = .17
$\overline{R^2}$ = .14
F = 5.146
Prob > F = .0001

Table 4
Regression Results for Log of Ratio of Average Annual Pay for Production Workers to Supervisors' Pay

Variable	Parameter	Standard Error
Intercept	−.68	.15
TQM Program	.03	.02
Log Capital Stock/Total Sales	.007	.005
Percent of Managers Using Computers	.0004	.0002
Percent of Employees with Less than One Year of Tenure	−.001	.0005
Education of Production Workers (years)	.03	.009
Education of Supervisors (years)	.01	.006
Percent of Employees Unionized	.0008	.0002
Skills Rising for Production Jobs	.05	.02

R^2 = .17
$\overline{R^2}$ = .14
F = 5.146
Prob > F = .0001

zations. Because supervisors earn more than production workers on average, an increase in the ratio of production to supervisory pay can be seen as reducing the wage differential between the two occupations. We might expect that work practices like TQM would reduce pay inequality, because they raise the skill requirements of production workers—and their pay—more than they raise those of supervisors.

The results in Table 4 suggest that TQM programs reduce the differential between production and supervisory employees.[12] Perhaps the most interesting finding, however, is that increased computer use by management reduces the differential in pay between production and supervisory employees. Again, such computer use appears to identify working arrangements where the supervisors are serving as complements for skilled production workers. Among the control variables reported here, the average education level for production workers has the expected effects on the ratio, although the positive relationship with supervisor education is a surprise. Unions, which represent production workers but not supervisors, reduce the wage differential, while worker turnover increases the gap between production and supervisory pay. Together, the results in Table 2 and 3 might suggest that the introduction of computers and new work practices may increase inequality within occupations (comparing establishments that use them with those that do not) but reduce inequality between occupations within establishments where they are introduced.

Conclusions

The results described above suggest that technology has an important impact on changes in skill requirements within establishments and on the structure of wages within those establishments. Management practices—especially decisions on work organization—may be as much a source of that influence as are capital spending, computer use, and R&D.

Overall, these results seem to support the general argument that changes in the workplace are increasing skill requirements, at least for production workers. But the conclusions about the structure of wages may be somewhat different from those of previous studies, at least in part because there are many different dimensions on which to evaluate whether wage structures have changed. Specifically, many of the practices associated with new workplace technology, broadly defined, do lead to higher wages for production workers. These practices may well increase the inequality of wages between production workers in establishments that have these practices and workers in establishments that do not. On the other hand, at least some of these practices seem to reduce the wage differential between production workers and supervisors within the same establishments.

A movement toward workplace practices that raise skill requirements and wages will benefit workers, but it may also create a new equilibrium in the labor market with some potentially undesirable consequences for employers—delays in filling positions and increased wages for skilled jobs that may damage an establishment's competitiveness.[13] As with most

[12] Other insignificant coefficients from the regressions are not reported here but are available upon request.

[13] *Workforce 2000* (U.S. Department of Labor 1987) focused the attention of both employers and policymakers on the issue of a potential mismatch between the skills of the labor force and the demands of employers in the years ahead. Complaints by employers of difficulties in finding workers with adequate basic skills, despite a plentiful supply of applicants, was one of the major forces that led to another U.S. Department of Labor investigation, the Secretary of Labor's Commission on Workforce Quality and Labor Market Efficiency (1989). A recent report by the U.S. Congress, Office of Technology Assessment (1990) also argues that a mismatch between the existing labor force and skill requirements will occur as manufacturing, in particular, shifts to the flexible-specialized production techniques described by Piore and Sabel (1984).

developments, however, it is difficult to guess at the precise general equilibrium effects of such changes on the economy as a whole. For example, the changes in the distribution of employment across occupations that might result could alter the income distribution in other ways. Employers might respond to higher wages by substituting capital for labor and redesigning jobs to have lower skill requirements. This should expand the supply of applicants and address the relative shortage of skilled workers in the long run, but it may also create less challenging jobs that pay less. The National Center on Education and the Economy (1990) and Kane and Meltzer (1990) both conclude from interviews that many employers have responded to a relative shortfall/rising wages for skilled workers by "deskilling" jobs.[14] Studies like the one by the Office of Technology Assessment present the worrisome possibility that the products of these deskilled production systems will not be of the quality necessary to compete internationally. The potential consequences of rising skill requirements are therefore complex, and it may not be obvious how best to accommodate them.

[14] The rising wage differentials associated with skill and education noted above suggest that deskilling must not be the dominant trend in the economy, although it may be particularly important in some sectors and may in part offset what would otherwise be even greater increases in skill differentials.

Acknowledgments

The data used in this analysis were collected with support from the Education Research and Development Center program, agreement number R117Q00011-91, CFDA 84.117Q, as administered by the Office of Educational Research and Improvement, U.S. Department of Education. The findings and opinions expressed in this report do not reflect the position or policies of OERI, the U.S. Department of Education, or the U.S. Bureau of the Census. The analyses presented here are part of a larger project on the structure of wages conducted for EQW with Kermit Daniel. Thanks to Steve Rudolf and Arnie Reznek at the Bureau of the Census for help with the data project and to Barbara Gelhardt for careful computer programming.

Appendix

Appendix Table A-1
EQW National Employer Survey Response Rates[a]

	Percentage	Number of Cases
Manufacturing Sector		
Completed + All Partials[b]	75.0	1,831
Completed + Workplace Partials	70.4	1,728
Completed Interviews	66.0	1,621
Nonmanufacturing Sector		
Completed + All Partials[b]	69.4	1,516
Completed + Workplace Partials	66.2	1,445
Completed Interviews	60.6	1,324

[a]Empirical analysis of the determinants of the probability of refusing to participate in the survey showed no significant impact of establishment size or industry on the probability of responding for the nonmanufacturing sector. For manufacturing, establishments in the largest size category (1,000 employees or more) were slightly more likely to refuse to participate in the survey than establishments in all other size categories.

[b]Since all interviews had to be completed by the end of September 1994, some of the surveys were not completed. The survey allowed for multiple respondents and was divided into two main sections: establishments' sales and financial information, and employment practices. The bulk of the survey's questions were contained in the employment practices section of the survey. Therefore, the final sample includes some partial interviews. Our analysis focuses on both the completed and the workplace partial interviews.

Source: The EQW National Employer Survey, The National Center on the Educational Quality of the Workforce.

Appendix Table A-3
Distribution of Sample by Establishment Size

Number of Employees at Establishment	Unweighted Percentage	Weighted Percentage
20–49	17	53
50–99	15	23
100–249	19	14
250–999	29	8
1,000 or more	20	2

Total unweighted observations = 3,173

Source: The EQW National Employer Survey, The National Center on the Educational Quality of the Workforce.

Appendix Table A-2
Distribution of Sample by Industry

	Unweighted Percentage	Weighted Percentage
Manufacturing		
Food and Tobacco (SIC 20, 21)	5	2
Textile and Apparel (SIC 22, 23)	4	2
Lumber and Paper (SIC 24, 26)	6	2
Printing and Publishing (SIC 27)	5	2
Chemicals and Petroleum (SIC 28, 29)	6	1
Primary Metals (SIC 33)	6	2
Fabricated Metals (SIC 34)	5	2
Machinery & Computers, Elec. Machinery, and Instruments (SIC 35, 36, 38)	6	4
Transportation Equip. (SIC 37)	6	1
Misc. (SIC 25, 30, 31, 32, 39)	6	2
Nonmanufacturing		
Construction (SIC 15–17)	5	7
Transportation (SIC 42, 45)	4	3
Communication (SIC 48)	2	2
Utilities (SIC 49)	4	1
Wholesale Trade (SIC 50, 51)	5	11
Retail Trade (SIC 52–59)	4	34
Finance (SIC 60–62)	4	4
Insurance (SIC 63, 64)	4	2
Hotels (SIC 70)	5	2
Business Services (SIC 73)	4	7
Health Services (SIC 80)	4	8

Total unweighted observations = 3,173

Source: The EQW National Employer Survey, The National Center on the Educational Quality of the Workforce.

Appendix Table A-4
Means and Standard Deviations of Variables Used in Regressions

Variable	Unweighted Mean	Standard Deviation
Percent of Managers Using Computers	75.2	30.4
Percent of Nonmanagerial Employees Using Computers	37.5	34.3
Percent of Nonmanagerial Workers in Self-Management Teams	12.9	25.9
Number of Management Levels	2.6	1.6
TQM Program? (1 = yes)	.55	.50
Ratio of Employees to Their Supervisors	18.6	20.6
Percent Supervisors	8.9	5.5
Percent Production Workers	58.6	22.6
Firm Size:		
20–49	.12	.32
50–99	.18	.39
100–249	.20	.40
250–1,000	.32	.47
Multi-Establishment Firm? (1 = yes)	.67	.47
Log of Capital Stock/Total Sales	−1.4	1.7
R&D Center Present? (1 = yes)	.58	.49
Skill Rising for Production Jobs? (1 = yes)	.66	.47
Education of Production Workers (years)	12.1	.9
Education of Supervisors (years)	13.3	1.5
Percent of Employees with Less than One Year of Tenure	13.9	14.9
Percent of Employees Unionized	20.3	32.6

References

Adler, Paul. 1986. "Technology and Us." *Socialist Review*, vol. 16, January/February.

———. 1993. "Time-and-Motion Regained." *Harvard Business Review*, vol. 44, no. 1, pp. 97–108.

Attewell, Paul. 1990. "Skill and Occupational Changes in U.S. Manufacturing." Presented at Stanford University Conference on Technology and the Future of Work, 28–29 March, Stanford, CA.

Bartel, Ann P. and Frank R. Lichtenberg. 1987. "The Comparative Advantage of Educated Workers in Implementing New Technology." *The Review of Economics and Statistics*, vol. 69 (February), pp. 1–11.

Bartel, Ann P. and Nachum Sicherman. 1995. "Technological Change and the Skill Acquisition of Young Workers." National Bureau of Economic Research Working Paper No. 5107.

Bassi, Laurie. 1992. "Reorganization of Work and Workplace Education: Scope and Impact." Washington, D.C.: Southport Institute.

Bell, Daniel. 1973. *The Coming of Post-Industrial Society*. New York: Basic Books.

Berg, Ivar. 1970. *Education and Jobs: The Great Training Robbery*. New York: Praeger.

Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor within U.S. Manufacturing Industries: Evidence from the Annual Survey of Manufactures." *Quarterly Journal of Economics*, vol. 109, no. 2 (May), pp. 367–97.

Berndt, Ernst R. and Catharine J. Morrison. 1991. "High-Tech Capital, Economic Performance, and Labor Composition in U.S. Manufacturing Industries: An Exploratory Analysis." Mimeo, Massachusetts Institute of Technology.

Blauner, Robert. 1964. *Alienation and Freedom*. Chicago, IL: University of Chicago Press.

Bound, John and George Johnson. 1992. "Changes in the Structure of Wages During the 1980s: An Evaluation of Alternative Explanations." *The American Economic Review*, vol. 82 (June), pp. 371–92.

Braverman, Harry. 1974. *Labor and Monopoly Capital: The Degradation of Work in the 20th Century*. New York: Monthly Review Press.

Bright, James R. 1966. "Increased Automation and Skill Requirements." In *Technology and the American Economy*. Washington, D.C.: Government Printing Office.

Cappelli, Peter. 1989. "The Role of Unions in Improving Workforce Quality, Labor Market Efficiency, and Effective Employee Management." In *Investing in People: A Strategy to Address America's Workforce Crisis*. U.S. Department of Labor, Commission on Work-

force Quality and Labor Market Efficiency. Washington, D.C.: USDL.
———. 1993. "Are Skill Requirements Rising? Evidence for Production and Clerical Workers." *Industrial and Labor Relations Review*, April, pp. 515–30.
Cappelli, Peter and Peter D. Sherer. 1989. "Spanning the Union/Nonunion Boundary." *Industrial Relations*, vol. 28 (Spring), pp. 206–26.
Cyert, Richard M. and David C. Mowery, eds. 1987. *Technology and Employment*. Washington, D.C.: National Academy of Sciences.
Davis, Steven J. and John Haltiwanger. 1990. "Wage Dispersion Between and Within U.S. Manufacturing Plants, 1963–1986." Unpublished manuscript, University of Chicago Graduate School of Business.
Dunne, Timothy and James A. Schmitz, Jr. 1995. "Wages, Employment Structure and Employer Size-Wage Premia: Their Relationship to Advanced-Technology Usage at U.S. Manufacturing Establishments." *Economica*, vol. 62, no. 245 (February), pp. 89–107.
Durkheim, Emile. [1893]. 1964. *Division of Labor in Society*. Glencoe, IL: Free Press.
Edwards, Richard, Michael Reich, and David Gordon. 1979. *Labor Market Segmentation*. New York: Basic Books.
EQW (Educational Quality of the Workforce). 1995. "First Findings: Results of the EQW Employer Survey." Philadelphia, PA: National Center on the Educational Quality of the Workforce (EQW).
Flynn, Patricia M. 1988. *Facilitating Technological Change: The Human Resource Challenge*. Cambridge, MA: Ballinger.
Goldin, Claudia and Lawrence F. Katz. 1995. "The Decline of Non-Competing Groups: Changes in the Premium to Education, 1890–1940." Harvard University Working Paper, July 23.
Groshen, Erica L. 1995. "Wage Variation Among Establishments Within Industry." *Quarterly Journal of Economics*, forthcoming.
Hirshhorn, Larry. 1984. *Beyond Mechanization: Work and Technology in a Post-Industrial Age*. Cambridge, MA: The MIT Press.
Hobsbawm, Eric J. 1964. "The Labor Aristocracy in the 19th Century." In *Laboring Men*, Eric J. Hobsbawm, ed. New York: Basic Books.
Horowitz, Morris and Irwin Herrstadt. 1966. "Changes in Skill Requirements of Occupations in Selected Industries." In *Technology and the American Economy*. Washington, D.C.: Government Printing Office.
Howell, D.R. and E.N. Wolff. 1991. "Trends in the Growth and Distribution of Skills in the U.S. Workplace, 1960–1985." *Industrial and Labor Relations Review*, vol. 44, no. 3 (April), pp. 486–502.
Hyman, Richard and Wolfgang Streek, eds. 1988. *New Technology and Industrial Relations*. Oxford: Blackwell.
Kane, Michael and Ann Meltzer. 1990. *Upgrading Training for Employed Workers*. Washington, D.C.: Pelavin Associates.
Kelley, Mary Ellen. 1989. "Unionization and Job Design Under Programmable Automation." *Industrial Relations*, vol. 28 (Spring), pp. 174–87.
———. 1986. "Programmable Automation and the Skill Question: A Reinterpretation of the Cross-National Evidence." *Human Systems Management*, vol. 6, no. 3, pp. 223–41.
Kerr, Clark, John T. Dunlop, Frederick Harbison, and Charles Myers. 1960. *Industrialism and Industrial Man*. Oxford: Oxford University Press.
Klein, J.A. 1989. "The Human Costs of Manufacturing Reform." *Harvard Business Review*, vol. 42, no. 2, pp. 60–66.
Krueger, Alan B. 1993. "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984–1989." *Quarterly Journal of Economics*, vol. 108, (February), pp. 33–60.
Lawler, Edward E. III, Susan Albers Mohrman, and Gerald E. Ledford, Jr. 1992. *Employee Involvement and Total Quality Management: Practices and Results in Fortune 1000 Companies*. San Francisco, CA: Jossey-Bass.
Levin, Henry M., Russell Rumberger, and Christine Finnan. 1990. "Escalating Skill Requirements or Different Skill Requirements?" Paper presented at Conference on Changing Occupational Skill Requirements: Gathering and Assessing the Evidence. 5–6 June, Providence, RI, Brown University.
Levy, Frank and Richard Murnane. 1992. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature*, vol. 30, no. 3 (September), pp. 1333–81.
Loveman, Gary W. 1988. "Structural Change and the Composition of Manufacturing Employment." Cambridge, MA: Massachusetts Institute of Technology, Department of Economics Working Paper.
Lynch, Lisa M. and Sandra E. Black. 1995. "Beyond the Incidence of Employer-Provided Training: Evidence from a National Employers Survey." National Bureau of Economic Research Working Paper No. 5231, August.
MacDuffie, John Paul and John F. Krafcik. 1992. "Integrating Technology and Human Resources for High Performance Manufacturing: Evidence from the International Auto Industry." In Kochan, T.A. and Useem, M., eds., *Transforming Organizations*, pp. 209–26. New York: Oxford University Press.
Marglin, Stephen A. 1974. "What Do Bosses Do? The Origins of Hierarchy in Capitalist Production." *Review of Radical Political Economics*, vol. 4, pp. 60–112.
Mellow, Wesley and Hal Snider. 1985. "Accuracy of Response in Labor Market Surveys: Evidence and Implications." *Journal of Labor Economics*, vol. 1, no. 4, pp. 331–44.
Mincer, Jacob. 1991. "Human Capital, Technology, and the Wage Structure: What Do Time Series Show?" National Bureau of Economic Research Working Paper No. 3581.
Mishel, Lawrence and Jared Bernstein. 1994. "Is the Technological Black Box Empty? An Empirical Examination of the Impact of Technology on Wage Inequality and the Employment Structure." Washington, D.C.: Economic Policy Institute Working Paper.
Mishel, Laurence and Ruy A. Teixeira. 1991. "The Myth of the Coming Labor Shortage: Jobs, Skills, and Incomes of America's Workforce 2000." Washington, D.C.: Economic Policy Institute.
Mueller, Eva, Judith Hybels, Jay Schmiedeskamp, John Sonquist, and Charles Staelin. 1969. "Technological Advance in an Expanding Economy: Its Impact on a Cross-Section of the Labor Force." Ann Arbor, MI: Survey Research Center, University of Michigan.
Myles, J. and G. Eno. 1989. "Job Skills in the Service Economy: Final Report to the Economic Council of Canada." Ottawa, Canada: Carleton University.
National Academy of Sciences. 1986. *Human Resource Practices for Implementing Advanced Manufacturing*. Washington, D.C.: National Academy Press.
National Center on Education and the Economy. 1990. "America's Choice: High Skills or Low Wages?" Rochester, NY: National Center.
Noble, David F. 1977. *Forces of Production: A Social History of Industrial Automation*. New York: Alfred A. Knopf.
Osterman, Paul. 1994. "How Common Is Workplace Transformation and Who Adopts It?" *Industrial and Labor Relations Review*, vol. 47, no. 2 (January), pp. 173–88.
Piore, Michael J. and Charles F. Sabel. 1984. *The Second Industrial Divide*. New York: Basic Books.
Roberts, Karlene and William Glick. 1981. "The Job Characteristics Approach to Task Design: A Critical Review." *Journal of Applied Psychology*, vol. 66, pp. 193–217.
Smith, Adam. 1937. *The Wealth of Nations. 1776*. New York: Random House.
Spenner, Kenneth I. 1979. "Temporal Changes in Work Content." *American Sociological Review*, vol. 44, pp. 968–75.
———. 1983. "Deciphering Prometheus: Temporal Change in the Skill Level of Work." *American Sociological Review*, vol. 48, pp. 824–37.
———. 1988. "Technological Change, Skill Requirements, and Education: The Case for Uncertainty." In Richard Cyert and David Mowery, eds., *The Impact of Technology and Change on Employment and Economic Growth*, pp. 131–81. Cambridge, MA: Ballinger.
———. 1990. "The Measurement of Skill: Strategies and Dilemmas

with Special Reference to the *Dictionary of Occupational Titles*." Paper presented at Brown University Conference on Changing Occupational Skill Requirements: Gathering and Assessing the Evidence. 5–6 June, Providence, RI, Brown University.
U.S. Bureau of Labor Statistics. 1988. "Occupational Employment in Manufacturing Industries." Bulletin 2312. Washington, D.C.: Government Printing Office, August.
U.S. Congress, Office of Technology Assessment. 1990. *Worker Training*, Government Printing Office.
U.S. Department of Health, Education, and Welfare. 1973. *Work in America*. Washington, D.C.
U.S. Department of Labor. 1987. *Workforce 2000: Work and Workers for the 21st Century*. Washington, D.C.
———. Various Years. *Dictionary of Occupational Titles*. Washington, D.C.: Government Printing Office.
U.S. Department of Labor, Commission on Workforce Quality and Labor Market Efficiency. 1989. *Investing in People: A Strategy to Address Americas's Workforce Crisis*. Washington, D.C.: USDL.
Veblen, Thornstein. 1914. *The Instinct of Workmanship*. New York: Viking.
Walker, Charles R. and Robert H. Guest. 1952. *Man on the Assembly Line*. Cambridge, MA: Harvard University Press.
Wallace, Michael and Arne L. Kalleberg. 1982. "Industrial Transformation and the Decline of Craft: The Decomposition of Skill in the Printing Industry, 1931–1978." *American Sociological Review*, vol. 47 (June), pp. 307–24.
Woodward, Joan. 1965. *Industrial Organization: Theory and Practice*. Oxford: Oxford University Press.
Zuboff, Shoshana. 1988. *In the Age of the Smart Machine*. New York: Basic Books.

Discussion

John Bound, Associate Professor of Economics, University of Michigan, and Visiting Scholar, the Russell Sage Foundation.

I would like to begin by reviewing what I think we know and do not know about technological change and its implications for the structure of wages. I will then go on to discuss the specific research reported in Peter Cappelli's paper.

I believe it is fair to say that we *know* with reasonable certainty that, over the past two decades, technological changes have raised skill requirements and that, as such, technological change has been an important contributor to the growing gap in wages between skilled and less skilled workers. In his review of the direct evidence on skill requirements, Cappelli emphasizes that such evidence is open to various interpretations, largely because of data limitations. I basically agree with this point. However, the most compelling evidence on the nature of the technological change over the past two decades comes, I believe, from indirect evidence. Despite the fact that the relative cost of skilled labor has been rising, relative utilization has also been rising (Bound and Johnson 1992; Katz and Murphy 1992; Murphy and Welch 1993). This is true whether one looks at the educational or the occupational distribution of the work force. Most of the shifts towards higher skills appear to occur within an industry (Berman, Bound, and Griliches 1994) and even within a plant (Bernard and Jensen 1994). The shifts are occurring not just in manufacturing, where foreign outsourcing might explain them, but in all sectors of the economy (Murphy and Welch 1993). From a neoclassical perspective, it is easy to explain such shifts as a result of technological change, but it is hard to explain them as a result of other factors.

I do not intend to claim that technological change will always be "biased" towards more skilled labor. Both history and the recent past offer clear examples of the opposite. For example, computer technology has led to a decrease in the demand for skilled draftsmen. However, the evidence mentioned above suggests that, certainly within the last few decades and probably for most of this century, on net, technological change has favored the more skilled.

We know with reasonable certainty that technological change has been an important contributor to the growing gap in wages between skilled and less skilled workers.

While we can be reasonably certain that technological change has increased the skill requirements in the overall economy, there is a lot we do not know. We do not know much about the nature of the innovations involved or the nature of changes in the skill requirements of jobs. What is more, I do not believe that we will learn much about the nature of the changes using the kinds of data sets that have been used successfully

to document the rise in skill premia. The Current Population Survey (CPS) has asked questions of individuals about computer utilization on the job, while the Census of Manufactures asks questions about computer investments, but such data are too crude to give us much insight into the actual nature of the changes that are occurring.

If we are to learn more, we need to turn to a combination of case studies and special surveys. Case studies can be extremely informative and interesting, and they are the best way to find out about what has been occurring in the context of specific industries. However, the obvious limitation of case studies is that one can never be sure how representative they are. This is where the special survey can be useful. It is from this perspective that I read Cappelli's paper. Cappelli's tabulations are based on a new survey of the workplace, the Educational Quality of the Workforce (EQW) National Employers Survey. The data, containing information on recruitment strategies, workplace organization, and skill requirements, are representative of private establishments nationwide with more than 20 workers.

We do not know much about the nature of the innovations involved in technological change or the nature of changes in the skill requirements of jobs.

In his analysis of the EQW data, Cappelli reports on the association between various explanatory factors and changes in both the skill requirements for production jobs and the wages of production workers and their immediate supervisors. While other interpretations of the wage equations are possible, I suspect that the right way to explain them is to assume that they reflect variation across establishments in terms of the skill level of the workers. More direct measures of skills would have been useful; but in lieu of such measures, I think it reasonable to assume that, in the context of a reasonably high degree of mobility across establishments and industries, higher wages are closely associated with higher skills.

It is tempting, but mistaken, to use Cappelli's wage equation results to make inferences about the effects of various factors on the distribution of wages in the overall economy. It is easiest to make this point within the context of a specific example. Cappelli finds that computer utilization is associated with higher wages among production workers. More specifically, the wages for production workers tend to be higher in establishments where the utilization of computers is the norm. However, this result says nothing about the overall effect of computers on production worker wages. In fact, it is entirely possible that while those who work with computers are paid a premium, the introduction of computers (more broadly, the micro chip) has led to a substitution of machines for humans, a decline in the demand for production labor, and, as a result, a decline overall in the wages of production workers.

It is worth noting that by limiting his analysis to production workers and their immediate supervisors, Cappelli is missing an important part of the action. The fraction of the work force in production or nonsupervisory jobs has been declining dramatically, and this shift away from production or nonsupervisory work is a very important part of the skill upgrading that has been occurring in the U.S. economy. This comment should not be seen as a criticism of what Cappelli has done. Others, including myself, have focused on the shift away from production work but have largely ignored changes in the nature of production work itself. Thus, Cappelli's work should be seen as complementary to the tabulations that others have done. It is important, however, to bear in mind the limited focus of Cappelli's tabulations when interpreting them.

I will not review Cappelli's findings in any great detail, but do want to comment on a few of them. He finds that the use of computers is associated with higher wages or skills. This result mirrors other results in the literature, although here Cappelli finds this result for production, nonsupervisory workers. Krueger (1993), using the CPS, found an association between the use of computers and wages, but his sample included all workers. In my own work (Berman, Bound, and Griliches 1994), I have found investments in computers to be positively associated with the shift away from production work, but that study ignored changes that were occurring in production work itself. Thus, Cappelli's finding is newer than it might appear from a superficial reading of the literature.

The EQW includes a variety of measures reflecting the organization of the workplace (for example, Total Quality Management or TQM). A variety of

researchers have speculated that recent changes in the organization of the work place are likely to have increased the skill requirements of the typical production or nonsupervisory job. The tabulations Cappelli reports represent the first statistical evidence supporting this notion that I know of.

While Cappelli is interested in studying changing skill requirements, the EQW data are not ideal for this purpose, being cross-sectional rather than longitudinal. Thus, for example, we find out that computer utilization and TQM are associated with higher wages, but we cannot be sure that changes in either were associated with increases in wages or skill requirements. Cappelli can do little about this problem within the context of the EQW data; and before having much confidence in his findings, he cautions, we need to have them confirmed with longitudinal data.

Perhaps most discouraging to me about Cappelli's paper is the fact that, despite the focus of the EQW employers' survey, the variables he uses continue to be very much "black boxes." What was it about the introduction of computers or TQM into the workplace that entailed enhanced skill requirements among production workers? To a large extent this limitation may characterize any survey, though narrowly targeted surveys (for example, the Census "Survey of Advanced Technologies" in selected manufacturing industries) may suffer less from this problem. However, I suspect that a better understanding of the effect of human resources management practices or advanced technology on skill requirements may necessitate detailed longitudinal case studies of the sort recently completed by Ichniowski, Shaw, and Prennushi (1995) on the steel industry.

References

Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor Within U.S. Manufacturing Industries: Evidence from the Annual Survey of Manufactures." *Quarterly Journal of Economics*, vol. CIX, pp. 367–97.

Bernard, Andrew B. and J. Bradford Jensen. 1994. "Exporters, Skill Upgrading and the Wage Gap." Mimeo, MIT and U.S. Bureau of the Census.

Bound, John and George Johnson. 1992. "Changes in the Structure of Wages During the 1980s: An Evaluation of Alternative Explanations." *The American Economic Review*, vol. 82, pp. 371–92.

Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi. 1995. "The Effect of Human Resource Management Practices on Productivity." National Bureau of Economic Research, Working Paper No. 5333.

Katz, Lawrence F. and Kevin M. Murphy. 1992. "Changes in Relative Wages. 1963–1987: Supply and Demand Factors." *Quarterly Journal of Economics*, vol. CVII, pp. 35–78.

Krueger, Alan B. 1993. "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984–1989." *Quarterly Journal of Economics*, vol. CVIII, pp. 33–60.

Murphy, Kevin M. and Finis Welch. 1993. "Industrial Change and the Rising Importance of Skill." In *Uneven Tides: Rising Inequality in America*, Sheldon Danziger and Peter Gottschalk, editors. New York: Russell Sage Foundation.

Labor Market Institutions and Earnings Inequality

Richard B. Freeman

Herbert Ascherman Professor of Economics, Harvard University, and Program Director, Labor Studies, National Bureau of Economic Research. This paper was presented at the symposium by Elaine Bernard, Executive Director, Harvard University Trade Union Program.

Most explanations of the decline in the real earnings of American workers and of the rise in earnings inequality here in the 1980s and 1990s focus on factors that shift the demand for and the supply of labor. On the demand side, the favorite shifters are technical change, notably computerization, and trade, especially trade with less developed countries, both of which can contribute to deindustrialization of employment (an earlier favorite shifter). On the supply side, the favorites are the decelerated growth in the number of college graduates relative to less educated workers, and the influx of low-skill immigrants. The influx of women into the work force has been mentioned as an additional possible factor.

Each of the popular causes of change has its supportive evidence; for a summary, see Levy and Murnane (1992). Each also has its evidentiary problems.

- If our labor market problems are due to technical change, why has productivity growth been so modest, and why has that growth not translated into higher real wages, as in the past?
- If the cause of inequality is exclusively imports from less developed countries, how does a mere 2 to 3 percent of the economy dominate wage-setting, and why have women, who disproportionately work in industries that compete with LDC imports, not suffered the huge losses of real wages that hit men? Why has the proportion of skilled workers risen in all sectors, despite the contraction of low-skill-intensive, import-competing sectors that displace low-skill labor to other parts of the economy?
- If the 1980s' decelerated growth in the supply of college graduates was so important, why has the accelerated growth of the 1990s not reduced the college/high school earnings gap?
- If immigration harms native workers, why have natives in immigrant-intensive cities not suffered huge wage or employment losses?
- Finally, if the cause is any or all of these, why has pay inequality

risen within all detailed occupations—among waiters, laborers, carpenters, mathematicians—groups subject to technical change and trade, groups not so subject, and so on? Why have earnings differentials increased within all deciles of the earnings distribution?

Explaining a major economic change is no easy matter. The argument in this paper is not that the usual suspects are innocent. I believe that they have contributed to the rise in inequality and that some of the preceding questions can be answered satisfactorily. Rather, my argument is that the shortcomings noted above (and others) show that, even taken together, the suspects fall short of offering a full explanation of the extraordinary rise in inequality. This suggests that we should widen the range of suspects.

My candidates for additional suspects are changes in labor market institutions, notably the decline in collective bargaining, and the reduction of the government role in the job market, evinced, for instance, in the reduced real value of the minimum wage. Changes in labor market institutions have, I argue, contributed to the rise in inequality overall and to the increase in inequality within groups that other factors cannot readily explain. My claim is not that institutions are everything. Rather, my claim is that changes in the institutional structure are a contributing factor to the earnings problem, and that the evidence for their effects is at least as strong and arguably stronger than the evidence for the other proposed causal factors. I leave it to others to speculate why many economists and government officials give short shrift to institutions in explaining the failure of the U.S. economy to reward workers in the past two decades.[1]

Candidates for additional causes of the rise in income inequality are changes in labor market institutions, notably the decline in collective bargaining, and the reduction of the government role in the job market.

My claim rests on three bodies of evidence:

1) Cross-country evidence that labor market institutions largely explain the difference in earnings inequality between the United States and other advanced countries. A factor that explains cross-country differences in inequality merits serious attention as an explanatory factor of changes over time.

2) Shift-share calculations that show declining union representation to account for at least one-fifth of the rise in earnings differentials and dispersion of pay within groups.

3) Evidence from analyses of the shape of earnings distributions that the declining real minimum wage has contributed to the rise in inequality, to which I would add the counterfactual assessment that the failure of the government to lean against the market wind has also played a role in the observed trend.

Some may object to the theme of this paper on the grounds that institutions are mere epiphenomena—the smokescreen through which market forces operate. If the labor market of the past two decades had been at full employment and competitive pressures put every firm on the knife-edge of existence, with no discretion in pay policy, I would take this objection to heart. But a wide body of research has shown that industries and firms have scope for independent pay policies, be it because they have economic rents or because they can strike innovative, efficiency-wage contracts. And it is difficult to characterize the past two decades of sluggish economic growth and rates of joblessness as full employment. Displaced workers cannot readily obtain jobs at their previous pay, and even huge wage reductions have left jobless large proportions of the less-skilled. In a world with rents and pay discretion, and with labor market slack, institutions have greater scope to affect outcomes than in tight job markets.

In any case, the evidence provides a compelling set of facts to add to the story of this epoch of increased inequality.

Claim 1: Labor Market Institutions Explain the U.S. Lead in Earnings Inequality

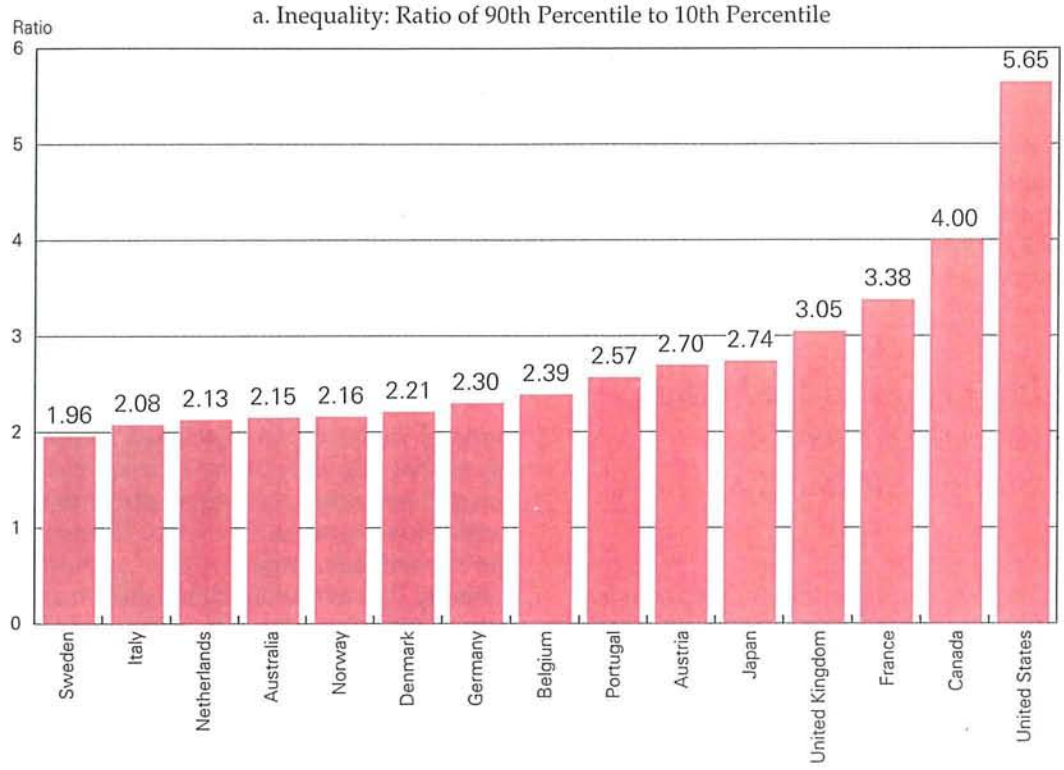
First, for the fact: the United States leads the industrialized world in earnings inequality. Figure 1A, based on OECD data, makes this clear. The ratio of the earnings of the top decile of American full-time

[1] The 1994 *Economic Report of the President* notes that several studies conclude that the decline of unionization accounts for about 20 percent of the increase in inequality, but this point did not gain much attention (Council of Economic Advisers 1994, p. 120).

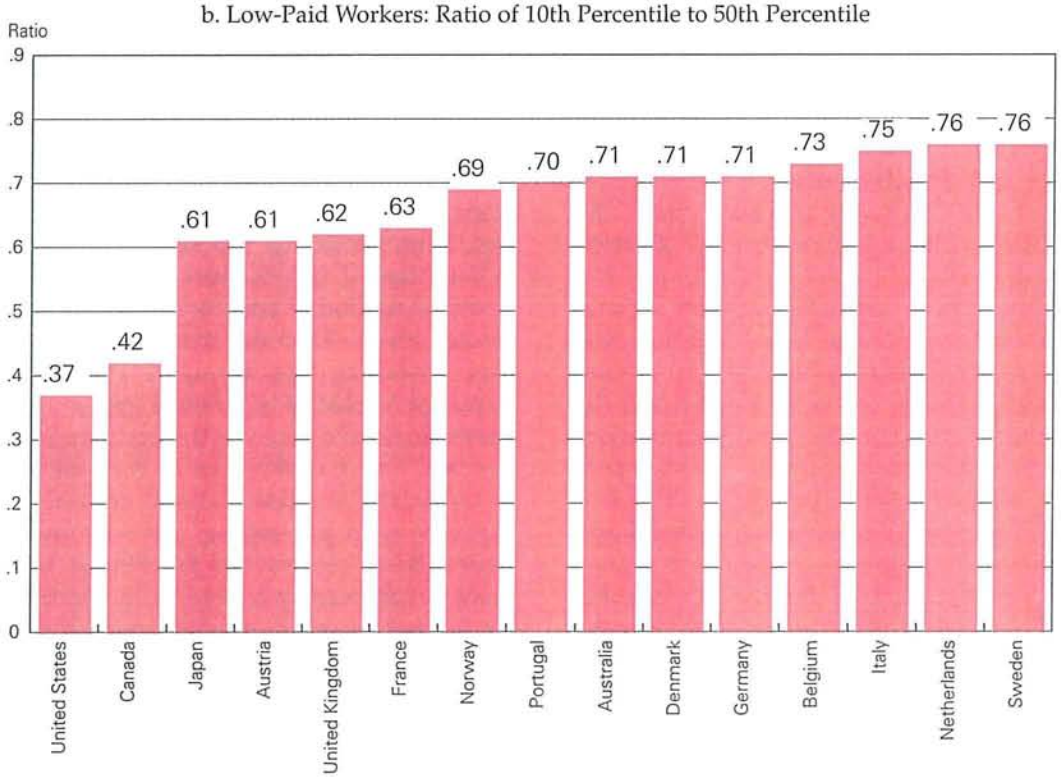
Figure 1

Spreads of Earnings Differentials

a. Inequality: Ratio of 90th Percentile to 10th Percentile



b. Low-Paid Workers: Ratio of 10th Percentile to 50th Percentile



Source: Bjorklund and Freeman (1996).

male earners to the earnings of those in the bottom decile is far greater here than in other countries. A major reason for this is the low pay of Americans in the lower income deciles. Figure 1B shows that workers in the bottom decile earn just 37 percent of the median wage in the United States, compared to 60 to 76 percent of the median in most other countries. Since, on average, Americans earn only moderately more than Europeans in purchasing power parity of pay (we earn a lot less at current exchange rates than workers in several other countries), the disparity in earnings at the bottom translates into markedly lower real earnings for poorer Americans. A full-time American worker in the bottom decile of our earnings distribution earns per hour, for instance, less than half of what a comparable German worker earns, and three-quarters as much as a comparable British worker (Freeman 1994).

The United States leads the industrialized world in earnings inequality.

The position of the United States as the industrialized world's leader in earnings inequality is not unique to these earnings distribution data. During the 1980s and 1990s, educational differentials widened in the United States to create exceptionally large premia for the more educated. In the 1960s and 1970s, industrial wage differentials widened to produce an exceptionally wide interindustry wage structure. The United States also has large size-of-firm pay differentials and large differentials in pay by age (Japan has sizable differentials here, too). Differentials among women are exceptionally large here (although the male advantage in pay has dropped), and so too are differentials among young workers just entering the job market (although the age or experience premium has risen). Moreover, data on fringe benefits—pensions, medical insurance, and the like—show that low-paid U.S. workers have fewer benefits than high-paid U.S. workers, adding to the inequality in money compensation. Finally, data on family incomes, before-tax or after-tax, show this country at or near the top in overall income inequality. And, we are far ahead of comparable countries in child poverty, whether measured in relative terms or, as I prefer, in absolute family earnings adjusted for purchasing power parity. At the other end of the spectrum, the United States rewards its CEOs more relative to employees than do other countries; academic economists, bankers, and rap singers also do fine, thank you.

The facts on inequality are clear and beyond dispute. Even before the rise in inequality in the 1980s and 1990s, the United States had a more dispersed distribution of pay than other countries. Before trying to explain the rise of inequality in the United States over time, it will be fruitful to see what underlies the greater inequality here at *any* point in time.

People or Wage-Setting Institutions?

Two possible explanations can be offered for high earnings inequality in the United States. One possibility is that this inequality reflects our diversity: the not-quite-complete mixing of ethnic groups. After all, unlike homogeneous Sweden or Germany or Japan, or the Netherlands, or Italy, we are a diverse people with differing cultures, education, ethnic backgrounds, living in diverse regions on a large continent. Surely, a diverse society can be expected to generate more inequality in pay.

A second possibility is that U.S. inequality reflects the way pay is determined here—our great reliance on market forces compared to labor market institutions, versus other advanced countries. Unlike most of OECD-Europe, we have a "thin" structure of labor market institutions: We do little to regulate pay by statute, we have no employer federations to speak of, and we use collective bargaining less than virtually every other country.

Is it the people or is it the wage-setting institutions that produce inequality, at U.S. levels? To find out, I proposed the following experiment. From a population of babies from an advanced European country, randomly select a few and move them to the United States. Then watch those babies grow up and reach working age. Compare their distribution of earnings to that of a "control group" of brothers or sisters in the old country. If inequality is in the people, we will find no difference in the spread of earnings between the experimental and control groups. If inequality is in pay-setting, we will find large differences. Now, reverse the experiment with American babies: Take a sample, send them overseas, and watch as the babies grow up, enter the job market, earn a living. Will the American babies have as great an inequality in earnings overseas as in the United States? Is inequality in us, or is it in wage-setting and other social institutions?

For unknown reasons, the National Science Foundation discouraged my undertaking this experiment,[2] so I will report to you the results of the closest approximation I could make using nonexperimental data—a pseudo-experiment. My pseudo-experiment compares the distribution of earnings of U.S.-born men of Swedish descent working in the United States with the distribution of earnings of men of Swedish descent working in Sweden. By looking at the descendents of Swedish immigrants rather than at immigrants, I eliminate the danger that the data will be driven by the selectivity of immigrants.[3]

To identify persons of Swedish background in the United States, I used the "ancestry" question in the U.S. Census of Population. In 1990 the question was: "What is this person's ancestry or ethnic origin?" The coding allows persons to report two ancestry groups (for example, German-Irish). I extracted from the 1990 Census the record of all men who listed Swedish ancestry and obtained a sample of 53,468 observations. For comparison, I also extracted a random sample of 98,181 Americans of whatever ancestry. These samples are sufficiently large to provide reasonably accurate measures of earnings and incomes distributions.

On the Swedish side, my co-worker, Anders Bjorklund, extracted a sample of persons with Swedish parentage who grew up in Sweden (which eliminates immigrants and the children of immigrants) from the leading socioeconomic survey of individuals for that country.[4] The number of observations is considerably smaller than those in the U.S. samples, but still sufficient for the pseudo-experiment (Bjorklund and Freeman 1996).

Table 1 presents the results of this analysis in terms of the 90/10 and 10/50 percentiles of hourly earnings ratios for male workers. The line labeled all U.S. men gives the distributional measures for Americans, regardless of ancestry. The line labeled U.S. men of Swedish ancestry gives the same statistics for persons of full Swedish descent in the United States. The line labeled Swedish men in Sweden refers to persons of Swedish ancestry working in Sweden, while the line labeled non-Nordic men in Sweden refers to persons of non-Nordic ancestry working in Sweden.

Table 1
Hourly Earnings Differentials for Men, Sweden and United States, 1989 to 1991

	Ratio of Earnings, 90th Percentile to 10th (90/10)	Ratio of Earnings, 10th Percentile to Median (10/50)
All U.S. Men	5.53	.39
U.S. Men of Swedish Ancestry	5.05	.41
Swedish Men in Sweden	2.02	.77
Non-Nordic Men in Sweden	1.85	.74

Source: Bjorklund and Freeman (1996).

When we first conceived these calculations, I anticipated that the men of Swedish descent in the United States would have a distribution of earnings narrower than that of other Americans but wider than that of Swedes in Sweden. They were, after all, more homogeneous than the "average" American. I planned to use the differences to calculate a kind of heritability (both genetic and environmental) coefficient for earnings dispersion. But, as you can see, such an analysis would have no point: Persons of Swedish descent living in the United States have a dispersion of earnings similar to that of other Americans—a distribution utterly unlike that of Swedes in Sweden.

Too few descendents of American immigrants live in Sweden to permit the reverse experiment, but Bjorklund noted that we could examine how adults born of all immigrants fare in Sweden. Contrary to the image of homogeneous Sweden, 15 percent of Swedish residents aged 20 to 64 reported in 1991 that one or both their parents were not Swedish citizens at birth; many said that the language at home was something other than Swedish; and half of them said it was a non-Nordic language (Bjorklund and Freeman 1996). We tabulated the hourly earnings distribution for all 20- to 64-year-old adults who reported that at least one parent was not Swedish and that the language at home was neither Swedish nor another Nordic tongue. The 90/10 and 10/50 ratios of earnings for these descendents of immigrants are

[2] My suspicion is that the National Science Foundation felt the study team should have had M.D.s or Ph.D. biologists rather than economists on it.

[3] This leaves the dangers of selectivity among the immigrant parents (which they pass on to their children through genes and home environment), and of possible differences as to which parents have children, between Swedes in Sweden and in the United States. My suspicion is that selectivity among immigrant parents would produce a less dispersed distribution of children here than in Sweden, as immigrants usually come from one social group rather than being a random sample of persons in the sending country. I have no idea about the differential behavior of Swedes in Sweden and of Swedish immigrants in the United States.

[4] This is the LNU survey, or the Survey of Living Conditions.

comparable to those for persons with parents born in Sweden. The Swedish system of wage determination produces a dispersion of earnings among those with foreign parentage comparable to that of other Swedes.

Sweden is, to be sure, more committed to egalitarianism than other capitalist countries. The most conservative Swedes are "off the map" of American political life by their desire to give the poor a decent living standard. But while Sweden is at the top of the scale in reducing pay differentials (Figure 1), it is not an outlier. Its distribution of earnings is comparable to that of other advanced European countries; it is in its tax and transfer policies that Sweden differs from other European Union countries. The United States is the outlier. If we performed the same "pseudo-experiment" comparing Americans of French, or German, or Italian or whatever parentage with their peers born in the old country, I predict that the results would mimic those for Swedish-Americans. Americans have unequal earnings because we have a wage-setting system that produces inequality. The earnings distribution is not "in us" nor "in our stars" but resides in the institutions that set pay in our country.

Americans have unequal earnings because we have a wage-setting system that produces inequality. The earnings distribution resides in the institutions that set pay in our country.

What Are Those Institutions?

In the United States, pay in the private sector is largely determined by companies subject to market constraints. Only a modest proportion of workers have their pay set by collective bargaining, and few have their pay set by industrywide bargaining with an employers' federation that covers all firms. Governmental pay rules, such as minimum wages or mandatory extension of collective bargaining (whereby the government extends the terms of a collective bargain to firms and workers not party to the bargain), also affect only a small number of U.S. employees. And the proportion of the work force in the public sector is less than in most other countries.

We are not the only country that relies on the decentralized market to determine pay. The United Kingdom and Canada also rely heavily on markets, although they have larger union movements and greater public sector employment than we do. With a modestly sized and declining firm-based union movement, Japan might also fit into this grouping, but perhaps not: Japan's Shunto Offensive for wage-setting and in general the Japan, Inc. corporate behavior have led some analysts to classify it with Europe's more centralized labor systems. All of these countries—the United States, the United Kingdom, Canada, and Japan—are among the top five in inequality in Figure 1, although Japan is comparable to OECD-European countries in having a fairly moderate differential between the median worker and the 10th decile worker.

By contrast, in Western Europe (save the United Kingdom and Ireland), most pay setting is by labor market institutions. Collective bargaining sets the pay of 92 percent of workers in France, of 68 percent in Spain, of 95 percent in Finland, of 90 percent in Germany (OECD 1994, Table 5.8). In some countries, bargaining takes place at a national level, though this is declining in importance. In most countries, it occurs at an industry or industry-region level. In France, minimum wages are also important, since the government has set the basic minimum at about 60 percent of the average pay (compared to a U.S. minimum of about 35 percent of hourly earnings in manufacturing in recent years). Finally, government employment tends to be large in many European countries, so that public pay policies affect national wage determination to a substantial extent. Katz and Krueger (1991) show that, in the United States at least, public sector pay is less dispersed than private sector pay and pay inequality increased much less in the public sector than in the private sector in the 1980s.

Institutional pay-setting reduces inequality by three mechanisms. First, institutional determination compresses pay within a firm. Unions, in particular, seek to establish pay by rules rather than by management discretion. As a result, pay differences among union workers are smaller than pay differences among otherwise comparable nonunion workers in all countries for which we have data (Freeman 1982).

Second, institutional wage determination, especially industry bargaining with mandatory extension of collective bargaining agreements, reduces differences in pay among establishments. As a result of such

extensions, union/nonunion differentials in European countries are modest compared to the differentials in the United States (Blanchflower and Freeman 1992).

Third, for whatever reason, institutional pay-setting reduces industry differentials. The United States and other decentralized wage-setting countries have greater differences in pay across industries compared to countries that rely on institutions to set pay, including those that make extensive use of industry bargaining.

The "deeper" reason that underlies all of these relations is that institutions operate on averages; they represent average workers or firms, whereas markets operate on margins; they represent the pressure of supply and demand on the marginal firm/employee. Institutions are insurance mechanisms for employees and firms; they may reject changes that reduce the well-being of the average employee/firm even though this change fits with the marginal calculus.

Institutions operate on averages; they represent average workers or firms, whereas markets operate on margins; they represent the pressure of supply and demand on the marginal firm or employee.

The 1980s and 1990s were a good period to assess the difference in market and institutional pay-setting. When supply and demand operate to reduce inequality, market and institutional wage-setting produce changes in the same direction (as in the 1950s and 1960s), and it takes a subtle analyst to discern their relative importance. When, by contrast, supply and demand operate to increase differentials (as in the 1980s and 1990s), markets move rapidly in that direction, while institutions "lean against the wind."

Claim 2: Declining Unionization Is a Big Cause of Rising Inequality

Unionization declined precipitously in the U.S. private sector from the 1970s through the 1990s. In most advanced countries, unionization grew in the 1970s as workers sought protection from inflation, then fell in the 1980s and 1990s, though only to levels at or above those in the 1960s. Here the decline was continuous, with the private sector fall overwhelming a rise in public sector unionization in the aggregate. As a result, the United States was further from the OECD mean unionization rate in the 1990s than in earlier decades.

But changes in union density have different consequences for collective bargaining among countries. As the United States does not rely on industry-level bargaining nor extend collective bargaining contracts within an industry,[5] the decline in density translates into a decline in coverage and thus in institutional wage-setting. By contrast, even in European countries where union density dropped sharply, such as the Netherlands, the percentage of workers covered by collective bargaining barely changed. Why? One reason is that firms remained part of their sector's employers' association, which obligated them to follow the contract the association bargained with the union. A second reason is that mandatory extension laws required firms that were not members to abide by the conditions of the contract in their sector. The bottom line is that declining unionization had a much greater effect on earnings outcomes in the United States than in European countries.

How much of the increase in earnings inequality here might we attribute to the decline in collective bargaining coverage? One way to answer this question is to conduct a shift/share analysis, weighting observed changes in coverage by estimates of the effect of coverage on pay outcomes. In the U.S. private sector, collective bargaining produces higher wages for blue-collar employees and reduces white-collar/blue-collar pay differences, by roughly the same amount. From 1973 to 1993 union coverage fell by roughly 20 points. Assume that the union wage differential was 25 percent and that union wage gains did not spill over to other employees. Then, a 20-point drop in coverage would lower the pay of blue-collar workers by 5 percentage points ($= 20 \times .25$). This is about one-half of the increased white-collar/blue-collar differential among men (Freeman 1992). Since college and high school graduates are found in both white-collar and blue-collar jobs, the power of the decline in unionization to explain the rise in the college/high school wage premium is smaller: it accounts for about one quarter of that change (Blackburn, Bloom, and Freeman 1990; Freeman 1992).

[5] Save for the Davis-Bacon Act, which the government interprets as requiring that federal contractors pay going union wages in most cases.

In the United States (and elsewhere) collective bargaining coverage is also associated with lower dispersion of earnings among covered workers. Reduced collective coverage thus offers one possible explanation for the increase in within-group inequality. Multiplying the 20-point drop in collective coverage by the estimated effect of unionization on dispersion of pay within sectors (measured by the standard deviation of the logarithm of wages), I estimate that about 20 percent of the rise in overall dispersion can be attributed to the drop in unionization. Note that this is only a rough estimate of the determinants of the rise in dispersion within groups. More sophisticated estimates (Blackburn, Bloom, and Freeman 1990; Freeman 1992; Card 1992; DiNardo, Fortin, and Lemieux 1994) give comparable results. Bell and Pitt (1995) have reported a similar finding for the United Kingdom. The uniformity of the estimates is impressive: It is rare in economics for different techniques applied by different analysts in different countries to come up with approximately the same estimate.

The 20 percent estimate is, however, almost certainly an underestimate of the true effect of declining union density on inequality. It is, after all, based on a simple counterfactual—that the decline of unionization affects inequality only by reducing the share of the less dispersed or higher-paid blue-collar work force in employment. But it is highly likely that such a decline has "spillover" effects to other workers as well. Consider how the U.S. job market might operate if the percentage of private sector workers covered were two or three or four times the 1995 level of 10.5 percent. With private sector union density of 20 percent (the level in the mid-1970s), or 30 percent (early 1960s), or 40 percent (mid-1950s), I would expect union wage agreements that reduce dispersion to spill over to nonunion firms. In the 1950s and 1960s, many nonunion firms paid union rates or introduced union-style pay structures in order to remain nonunion. The smaller dispersion in pay within union workplaces would thus be extended to nonunion workplaces, at least to some extent. The hard question is to obtain a valid and robust estimate of how big that "to some extent" would be now.

A rough estimate is that about 20 percent of the rise in within-group inequality of pay can be attributed to the drop in unionization in the U.S. private sector.

One way to measure the possible "full" effect of labor market institutions on pay inequality is to compare collective bargaining coverage/unionization and measures of inequality across countries, using a regression analysis. Given estimates of the effect of labor market institutions on inequality, one can—bravely—use the coefficients to infer how much lower U.S. earnings inequality might be if we had higher levels of collective bargaining coverage. Since many things differ between countries, and collective bargaining coverage means something different in different settings, such an analysis will be at best indicative. Still, for the purpose of gauging the possible effects of labor market institutions on economy-wide earnings distributions, a cross-country exercise will at least be provocative. If one believes that entire economies are the right units of observation, there is not much else one can do in any case to get the "full impact" of labor market institutions.

Table 2 gives levels of collective bargaining coverage and union densities[6] and the two measures of inequality from Figure 1. There is a positive relationship between coverage and the nearness of the 10th decile to the median, and between coverage and the ratio of the earnings of the 90th to 10th deciles, but there are also clear divergencies: Japan has the second lowest collective bargaining coverage, but a "European" distribution of low pay; Sweden has less inequality than Germany, which has higher coverage, and so on. There is also a relationship between the two measures of inequality and unionization. The regressions at the bottom of the table summarize these patterns: They show that collective bargaining coverage is more closely linked to the level of inequality than is unionization per se.

The regressions provide one indicator of the potential effect of differences in national coverage and union density on differences in inequality. Consider, for example, the difference in inequality between the United States and Germany. In the early 1990s, collec-

[6] The reader will note that in Japan collective coverage is slightly below the unionization rate. One possible explanation for this is that it reflects the crudeness of the data. But it could also be a real phenomenon, as some unions may have membership that is not large enough to produce collective contracts.

Table 2
Collective Bargaining Coverage, Unionization, and Earnings Inequality, by Country

Country	Coverage	Unionization	Earnings Ratio 90/10	Earnings Ratio 10/50
United States	.18	.16	5.65	.37
Japan	.23	.25	2.74	.61
Canada	.38	.36	4.00	.42
United Kingdom	.47	.39	3.05	.62
Netherlands	.71	.26	2.15	.76
Norway	.75	.56	2.16	.69
Portugal	.79	.32	2.57	.70
Australia	.80	.40	2.15	.71
Sweden	.83	.83	1.96	.76
Germany	.90	.33	2.30	.71
Belgium	.90	.51	2.39	.73
Austria	.98	.46	2.70	.61

Summary Regressions (standard error in parentheses)

90/10 differential = 4.95 −2.03 coverage −1.89 union R^2 = .55
(.85) (1.23)

10/50 differential = .39 +.29 coverage +.13 union R^2 = .55
(.10) (.15)

Source: OECD 1993; 1994.

tive bargaining coverage was 0.18 compared to 0.90, and unionization was 0.16 versus 0.33. Taking the regression coefficients from the equations, I estimate that much of the U.S.-German difference in inequality is due to differences in pay-setting institutions. The U.S.-German difference in the 90th/10th decile of earnings is 3.35 points; the regression suggests that 1.79 points of this difference is due to the differences in coverage and unionization—a bit over one-half. Similarly, the U.S.-German difference in the 10th decile/median of earnings is 0.34; the regression suggests that 0.23 points of the observed difference between the countries is due to differences in collective bargaining coverage and unionization—about two-thirds. While these data are limited to one period[7] and do not cover all the OECD countries, they are consistent with the notion that a significant portion of the U.S.-European gap in inequality is associated with differences in wage-setting institutions. On the other hand, the regression does not account for the U.S.-Japanese difference in inequality. Whether this is because the coverage variable incorrectly specifies Japanese institutions (nearly all Japanese firms raise pay by nearly the same percentage amounts, after the Shunto Offensive) or for other reasons I am not prepared to say.

But the issue of concern is whether declines in collective bargaining coverage are associated with rising inequality. Table 3 summarizes the limited available data in terms of the change in coverage and the absolute and percentage increases in the 90th/10th decile earnings ratios. The countries with the largest declines in density of collective bargaining coverage had the largest increases in inequality in absolute and percentage terms; countries with modest declines had modest changes in inequality; while those with little change or an increase averaged even smaller growth in inequality. But the country variation in these groups is substantial: The U.S.-Canada comparison shows that Canada had as substantial a percentage increase in inequality as the United States, with essentially no change in density, whereas the decline in density in the United Kingdom is associated with a large increase in inequality. The overall pattern is in the expected direction, but here we clearly need more data over more time periods, and perhaps a more careful look at the U.S. and Canadian contrast. Card and Freeman (1993) and ensuing work suggest that Canada did not have as large an increase in inequality as the United States, contrary to the picture given by the OECD figures on which my table relies.

These diverse calculations show that while the U.S. might or might not have a more effective economy if union density were higher, it would surely be a less unequal society.

Claim 3: Government Interventions Affect Inequality

The United States government might have intervened in the labor market in various ways to lean against the winds of inequality in the 1980s and 1990s. It could have directly intervened in wage-setting, through increases in the minimum wage. It could have provided greater support for job training or higher education. It could have offered public sector employment or wage subsidies to employers for lower-paid employees. Going beyond the labor market, the government could have acted to offset the effects of rising labor market inequality on disposable incomes by redistributive tax and transfer policies. Note, however, that cuts in the income tax for the low-paid or increases in the earned income tax credit might potentially raise before-tax inequality (assuming that they

[7] I cannot readily analyze earlier periods because the source for collective bargaining coverage, the OECD *Employment Outlook* for 1994, does not provide figures for earlier periods.

Table 3
Changes in Collective Bargaining Coverage and in Measures of Inequality, 1980s[a]

	Change in Coverage	Change in 90/10 Ratio		Change in 10/50 Ratio	
	Percent	Absolute	Percent	Absolute	Percent
Countries with Large Drops in Coverage					
United Kingdom	−23	.95	40	−.10	−14
Australia	−8	.27	14	−.04	−5
United States	−8	.92	15	−.03	−7
Countries with Modest Drops in Coverage					
Japan	−5	.25	10	−.02	−3
Netherlands	−5	.05	2	−.04	−5
Countries with Little Change in Coverage					
Germany	−1	−.08	−4	.04	6
Canada	1	.50	14	−.04	−10

[a]The years covered are 1979 to 1991 or to the latest year available (U.S. to 1989, Canada 1981 through 1990). See OECD (1993, Table 5.2).

have an incidence similar to payroll taxes), requiring us to look as well at after-tax earnings patterns. In any case, the range of possibilities is substantial, and beyond the scope of this study. I consider the one that has recently attracted considerable attention: the minimum wage.

Studies have estimated the effect of maintaining the real value of the minimum wage on the distribution of earnings, usually under the assumption that such a change in policy would have little or no effect on employment. As estimates of the effect of higher minima on employment invariably yield modest elasticities—the most reliable "large" elasticity is −0.24 (Neumark and Wascher 1995)—this is a tenable initial assumption. For men aged 25 to 64, few of whom are paid the minimum, Blackburn, Bloom, and Freeman (1990) simulated that maintaining a minimum wage at its 1979 real level throughout the 1980s would have had only a modest effect on the earnings of less skilled workers, but these estimates appear to be overly conservative. Using a more sophisticated simulation methodology, DiNardo, Fortin, and Lemieux (1994) estimate that failure to maintain the minimum wage at its 1979 real value accounts for 10 percent of the increase in the standard deviation of adult male wages over the period and for 30 percent of the increase among adult women workers. Card and Kreuger (1995) compare earnings inequality and the proportion of workers covered by minimum wages across states and come up with a 30 percent estimate of the contribution of the decreased real minimum to the inequality among all workers. Mishel and Bernstein (1994) come up with the biggest estimates. Their simulations suggest that had the minimum wage been maintained at its 1979 real value, the growth of the 90/10 earnings differential inequality among adult men would have been some 50 percent lower in 1993 than it actually was, and the growth of the differential among women would have been two-thirds lower. Without endorsing any of these figures, this line of research can be seen as showing that maintaining the minimum wage at historically plausible levels relative to the average would have helped limit the near free-fall in wages at the bottom of the earnings distribution that characterized the U.S. job market in this period.

A second possible set of government activities is on the quantity side of the market. Inequality in pay is less evident in the public sector than in the private sector. As noted, Katz and Krueger (1991) show that inequality was lower and increased less in the 1980s in the public sector than in the private sector. But the change in public sector employment was modest and between 1980 and 1993 the public sector share of nonagricultural employment fell from 18 percent to 17 percent, so that this change could not have contributed much to the change in overall inequality. Still, a more active government policy that used the public sector to hire low-skill workers directly or to subsidize the employment of low-paid workers, say through reductions in payroll taxes, might have reduced inequality. Such policies would raise the employment of the low-skilled, but not necessarily their pay, in the short run; but over time, earnings consequences would follow as the low-paid would accrue greater job experience, the number of jobless would decline, and so forth. I have not estimated the possible impact of such a program on the earnings of the low-paid and on inequality, nor whether its benefits would exceed its costs. My suspicion is that a reasonably sized, targeted employment program would have at least modest effects on inequality.

Conclusion

Assume that you accept the evidence and argumentation in this paper that you cannot tell the economic history of the rise in inequality and fall in real earnings in the United States in the latter decades of the twentieth century without bringing labor market institutions into the story. Does this mean you should run out and demand that your favorite political candidate copy FDR and declare "As President, I want workers to join unions?" (Do it, guys —it may not be popular but it's right!) Or that you should risk your job by trying to organize your fellow employees into a union? Or try to organize your fellow employers into a European-style employers' federation?

Not necessarily. The causes and cures of problems are not necessarily linked. We cure myopia (a largely genetic disease) with glasses and contact lenses. We develop new genetic strains of animals or plants to deal with environmental diseases or rusts that threaten those animals or plants. Similarly, the best cure to the problem of falling real earnings and rising inequality may be unrelated to the factors that caused the problem. If you believe that trade is *the* cause of rising inequality, you can still reject protectionism, on the grounds that the potentially large costs to trade barriers outweigh any benefits in the form of reduced inequality. Or, if you believe that technology has impoverished low-skill workers, I suggest you do not trash your computer or march on M.I.T. The costs of stopping the advance of technology (were it possible) far outweigh any benefits in the form of reduced inequality.

You can logically look instead in other directions for cures. Maybe the most efficacious solution to rising inequality is a more progressive tax and transfer system or greater expenditures on public goods, which the poor consume equally with the rich. Or maybe it is providing laptops for every poor child, so that they become more adept at dealing with modern technology.

In the case at hand, I believe that institutional interventions in pay-setting have potential costs, some substantial. These costs have exercised Europeans for some time. Europe has not had much job growth. OECD-Europe has lower employment/population rates than the United States. OECD-Europe has long spells of joblessness. I am not convinced that the "right" institutional pay-setting necessarily lowers employment by enough to worry about in a country whose problem is not job creation but earnings inequality. The workers whose pay has fallen in the United States have also experienced loss of time worked, and the minimum wage studies suggest that elasticities of demand for the low-skilled are small. Still, I would not dismiss the potential cost of labor market institutions in employment.

At the same time, labor market institutions bring benefits beyond lower inequality—the voice benefits of democracy in workplaces—that must be factored into any overall assessment of those institutions. A society in which bosses boss and workers obey—where workers have no independent say in the decisions that affect their working lives ("if you don't like the way the company does it, leave")—is likely to miss out in efficiency (see Freeman and Lazear 1995) as well as in fairness and decent treatment of all. An assessment of any scheme to rebuild American labor institutions must take account of the full spectrum of costs and benefits of those institutions.

The message of this paper is not that the best or only cure to inequality and impoverishment of workers is increased institutional wage-setting. For what it is worth (full disclosure of biases and all that) I believe that greater reliance on labor institutions is a plausible cure to rising inequality and is probably a necessary part of any solution. But this is belief, not evidence. The message of the paper is that institutions are important in distributing earnings, and that institutional developments in the United States in the past several decades have contributed to our earnings problem. To ignore the role of unions and government policies is to ignore part of the real world —not a wise strategy for understanding what happens in the economy nor for devising policy solutions to improve outcomes. Rising inequality is too serious a national problem for us to exclude from discourse any set of potential candidates for cause or cures.

References

Bell, Brian and Michael Pitt. 1995. "Trade Union Decline and the Distribution of Wages in the UK: Evidence from Kernel Density Estimation." Nuffield College, Oxford, Discussion Paper 107, November.

Bjorklund, Anders and Richard Freeman. 1996. "Generating Earnings Equality and Eliminating Poverty: The Swedish Way." Forthcoming in *Reforming the Welfare State*, Richard Freeman, Birgitta Swedenborg, and Robert Topel, eds., Chicago, IL: University of Chicago Press.

Blackburn, McKinley, David Bloom, and Richard Freeman. 1990. "The Declining Position of Less-Skilled American Males." In G. Burtless, ed., *A Future of Lousy Jobs?* pp. 31–67. Washington, D.C.: The Brookings Institution.

Blanchflower, David and Richard Freeman. 1992. "Unionism in the U.S. and Other OECD Countries." *Industrial Relations*, vol. 31, no. 1 (Winter), pp. 56–79.

Bound, John and George Johnson. 1992. "Changes in the Structure of Wages in the 1980s: An Evaluation of Alternative Explanations." *The American Economic Review*, vol. 82 (June), pp. 371–92.

Card, David. 1992. "The Effect of Unions on the Distribution of Wages: Redistribution or Relabeling?" National Bureau of Economic Research Working Paper No. 4195, October.

Card, David and Richard B. Freeman, eds. 1993. *Small Differences That Matter*. Chicago, IL: University of Chicago Press.

Card, David and Alan Krueger. 1995. *Myth and Measurement*. Princeton, NJ: Princeton University Press.

Council of Economic Advisers. 1994. *Economic Report of the President*. Washington, D.C.: Government Printing Office.

DiNardo, John, N. Fortin, and T. Lemieux. 1994. "Labor Market Institutions and the Distribution of Wages, 1973–92." University of Montreal, processed.

Freeman, Richard B. 1982. "Union Wage Practices and Wage Dispersion Within Establishments." *Industrial and Labor Relations Review*, vol. 36, no. 1 (October), pp. 3–21.

———. 1992. "How Much Has De-Unionization Contributed to the Rise in Male Earnings Inequality?" Chapter 4 in Sheldon Danziger and Peter Gottschalk eds., *Uneven Tides*, pp. 133–63. New York: Sage Press.

———. 1994. *Working Under Different Rules*. National Bureau of Economic Research Project Report, pp. xii, 261. New York: Russell Sage Foundation.

Freeman, Richard B. and Edward Lazear. 1995. "An Economic Analysis of Works Councils." In Joel Rogers and Wolfgang Streeck, eds. *Works Councils*. Chicago, IL: University of Chicago Press.

Katz, Larry and Alan Krueger. 1991. "Changes in the Structure of Wages in the Public and Private Sectors." In *Research in Labor Economics*, vol. 12, R. Ehrenberg, ed. Greenwich, CT: JAI Press.

Krueger, Alan B. 1993. "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984–1989." *Quarterly Journal of Economics*, vol. 108, no. 1 (February), pp. 33–60.

Levy, Frank and Richard Murnane. 1992. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature*, vol. 30, no. 3 (September), pp. 1333–81.

MacFail, Fiona. 1993. "Has the Great U-Turn Gone Full Circle? Recent Trends in Earnings Inequality in Canada, 1981–1989." Dalhousie University, Halifax, Department of Economics Working Paper 93–01, January.

Mishel, Lawrence and Jared Bernstein. 1994. *The State of Working America, 1994–95*, p. 411. Economic Policy Institute Series. Armonk, NY and London: M.E. Sharpe.

Neumark, David and William Wascher. 1995. "The Effect of New Jersey's Minimum Wage Increase on Fast-Food Employment: A Reevaluation Using Payroll Records." National Bureau of Economic Research Working Paper No. 5524, August.

Organisation for Economic Cooperation and Development. 1993 and 1994. *Employment Outlook*, July. Paris: OECD.

Discussion

Peter Gottschalk, Professor of Economics at Boston College

In this paper Richard Freeman has put the best case forward for the importance of labor market institutions in explaining the level and trend in earnings inequality. Motivated by his broad reading of the literature and unhindered by any fear of going too far out on a limb, Freeman offers us what is probably an upper bound on the importance of labor market institutions. Many will wince at his willingness to draw broad conclusions from bivariate relationships. However, as is usually the case, many of his observations show real insight.

I view my role as the sympathetic yet cautious observer who enjoys seeing the daring of others, while at the same time wanting to bring a mild dose of caution to this endeavor. My hope is that my more restrained case for the importance of labor market institutions will strike the proper balance.

Do institutions matter? The answer is obviously "Yes." One simply cannot believe that market forces have been so consistently different in the Nordic and Northern European countries than in the United States and the United Kingdom as to generate such wide and persistent differences in earnings inequality. So the question is not whether institutions matter, but how much they matter. This raises the question, "How much compared to what?" If there is going to be a horse race, one needs to have at least one other horse on the track. The most obvious competition is between the importance of market forces and that of institutional forces.

Conceptual Issues

Before moving to the empirical evidence, let me raise three conceptual issues. The first focuses on the difference between explanations for changes in earnings inequality that focus on *levels* and on *changes* in institutions. Conceptually, nothing is wrong with thinking that both levels and changes may matter. Institutional constraints may provide an imperfect screen limiting changes in the wage distribution. The tighter the screen, the slower the growth in inequality. Therefore, levels may matter. Likewise, tightening the screen may reduce the growth in inequality. Therefore, changes in institutions may matter.

While nothing is conceptually wrong with using both the level and the change in institutions to explain trends in inequality, this gives the institutional explanations a great deal of latitude. If a country has tightly regulated labor markets which are then weakened (as was the case in many countries during the 1980s), then one can explain either increases or decreases in inequality. If inequality did not rise, it was because of the level of institutional constraints. If inequality rose, it was because of the changes in constraints.

The pattern of large increases in inequality in countries with the more decentralized labor markets forms the core of the argument for the importance of institutions.

This degree of latitude, of course, can be limited by imposing some structure on the data. In principle, nothing stops us from including more than one explanatory variable in a regression with changes in inequality as the dependent variable. But this raises the second issue. Any cross-national comparison is limited by the very small number of countries. Most studies compare just two or three countries. Ten countries is a large sample. To ask these data to distinguish between the effects of levels and trends in institutions while holding other relevant factors constant (changes in relative supply, change in international trade, and the like) is asking a lot.

The third conceptual issue is that a full answer to the question of the relative importance of institutional and market forces would have to take account of feedback between the two. Inasmuch as institutional changes are caused by changes in market forces, one would need to allocate this endogenous change to market forces, not to changes in institutions. The most obvious example is the decline in unionization, which was certainly caused in part by increased foreign competition that weakened the bargaining power of workers. But causation does not go only from markets to institutions. For example, the downsizing of government, which is clearly an institutional change, results in a change in relative demand for skilled workers as long as the public and private sectors differ in skill intensity. I mention this endogeneity problem not because it is solvable at this stage, but only to

be clear about the accounting exercise we are involved in. As a practical matter, my guess is that endogeneity is small potatoes compared to the other empirical problems.

Empirical Evidence

With these preliminaries out of the way, let me turn to the empirical evidence presented in Freeman's paper. The first claim is that institutional differences explain much of the differences in levels and trends in inequality. I will focus my comments on changes in inequality over time, since this is what has preoccupied the profession recently and because I have little doubt about the importance of institutional differences in explaining levels of inequality. (Differences in market forces could not be large enough to explain the substantial cross-national differences in the levels of inequality that have persisted over decades.)

The strongest case for the importance of institutions comes from the simple correlation between almost any ranking of countries by the degree of centralization of wage setting and by increases in earnings inequality. Finland, Sweden, and the Netherlands experienced small increases in inequality, followed closely by Israel and France. These are all countries that have either strong union coverage or other forms of centralized wage setting. The sole exception is France, which has fairly decentralized labor markets but has a widely applied and rising real minimum wage. At the other extreme are the United States and the United Kingdom, which experienced large increases in inequality and have very decentralized labor markets. This pattern of large increases in inequality in countries with the more decentralized labor markets forms the core of the argument for the importance of institutions.

It is, however, instructive to go behind these aggregate measures of inequality and to look at changes in inequality between and within groups. The large increase in overall inequality in the United States and the United Kingdom reflected increases in the education premium, increases in the experience premium, and increases in inequality within groups. The pattern is not nearly as uniform for countries that experienced little or no increase in inequality. The small changes in inequality in Sweden and Finland reflect a decline in the age premium matched by an increase in the education premium. In the Netherlands, the pattern is just the opposite, with the age premium rising but the education premium falling. So the first question to ask is whether market-based or institutional-based explanations fit these within-country differences better.

Two additional sources of information can help inform the debate. If changes in relative supplies of factors are consistent with changes in relative wages between education or experience groups, then this is clearly consistent with a market-based explanation. On the other hand, if institutional rigidities kept wages from falling to market-clearing levels, then one should observe a change in the relative employment rates of the least skilled.[1] My claim is not that changes in relative supplies or changes in relative unemployment rates provide conclusive evidence for market-based or institutional explanations, but rather that they provide additional evidence which helps get us beyond the simple cross-country correlations between changes in overall inequality and levels of institutional barriers.

France and Sweden provide the strongest case for the importance of institutional constraints.[2] In France, the minimum wage (the SMIC) increased faster than the average wage during the first half of the 1980s, then slowed later in the decade. These changes in the minimum wage closely parallel the relative stability of inequality through the mid-1980s followed by a mild increase in inequality during the late 1980s and early 1990s. If the minimum wage was a binding constraint, then we should observe an increase in the relative unemployment rates of the young and less-educated workers. This is exactly what we observe.

Likewise, the patterns of changes in relative unemployment rates are consistent with an institutional explanation for the change in inequality between experience groups in Sweden. During the 1980s, the earnings of young workers actually rose faster than the earnings of older workers. This was mirrored by an increase in the relative unemployment rates of young workers in Sweden, strongly suggesting that institutional constraints were propping up the wages of the young while demand for their skills was falling.

The Netherlands and Finland also have institutions that potentially could have limited the rise in inequality. The evidence on changes in relative supply and unemployment rates suggests, however, that these constraints were not binding. Recall that in the Netherlands, the small increase in overall inequality

[1] Unemployment would not rise if demand were totally inelastic, an assumption that Freeman rejects implicitly when he writes about the cost of institutional interventions in pay setting as taking the form of lower employment/population rates.

[2] Change in returns to skills, relative supplies, and relative unemployment rates are from Gottschalk and Joyce (1995).

reflected two fairly large but offsetting forces. The education premium dropped considerably, while the age premium increased. The drop in the education premium does not seem to be the result of institutional constraints on wages of the least educated. Rather, a substantial increase occurred in the relative supply of college-educated workers in the Netherlands during the 1980s. This market-driven force offset the increase in demand for educated workers, with the result that wages of college-educated workers actually fell relative to wages of less-educated workers. The importance of institutional factors is further undermined by the fact that the relative unemployment rates of less-skilled workers did not increase.

The only policy that I would add to Freeman's list is changes in the earned income tax credit. This seems to be a straightforward way of dealing with changes in the earnings distribution.

The pattern in Finland is similarly consistent with a market-driven explanation. Here, the small overall increase in inequality reflects an increase in the education premium countered by a decline in the age premium. But the increase in the relative wages of younger workers is consistent with a market explanation, since the relative supply of younger workers also decreased in Finland. Furthermore, changes in relative unemployment rates again do not point to binding constraints on wages of young workers, even in this country with centralized labor market institutions.

In summary, the raw correlation between the level of institutionalized wage settings and changes in earnings inequality gives an incomplete picture. In essence, it shows only one horse in the race. When we look behind these numbers at changes in relative supplies, we find that roughly half of the countries with centralized wage-setting institutions also experienced changes in relative supplies that are consistent with the data. In essence, the raw correlations tell us only about the potential for binding constraints, not whether these constraints were binding. It should come as no surprise that in some countries constraints were binding, while in other countries they were not.

The second claim in Freeman's paper is that declining unionism was a big cause of the rise in inequality. He provides two types of evidence. The first is a summary of studies of the United States that have tried to estimate the impact of changes in unionism on inequality. As he points out, all but one of these studies come to similar conclusions. Roughly 20 percent of the increase in inequality came from the decline in unionization. I have no quibble with this body of research, other than to point out that changes in unionization may have partially reflected changes in market forces. But as a purely accounting statement, the number 20 percent seems reasonable. Whether 20 percent is large or small is clearly in the eye of the beholder. One can make equally strong statements about the importance of foreign trade, computerization, or other factors that explain part, but by no means all, of the change in inequality.

The second body of evidence provided by Freeman (his Table 3) uses cross-national comparisons to try to tease out the importance of declines in unionization. This is one of those cases where his creative imagination may have taken him a bit too far. While the correlation between changes in inequality and overall measures of centralization of wage setting is fairly strong, the relationship between changes in this specific institution and changes in inequality is far from overwhelming. When these data are plotted, one sees that the negative relationship is almost totally driven by the United Kingdom. Even if one were to draw conclusions from simple correlations like this, one would not want to bet on the institutional horse, based on these weak patterns. In my opinion, this cross-national comparison does little to strengthen the case for the importance of institutions.

The third claim is that government interventions can affect inequality. I have no objection to this claim. As Freeman himself points out, the causes and cures of problems are not necessarily linked. The United States could have done substantially more than it did to offset the changes in the labor market, even if changes in institutions were not an important cause for the increase in inequality.

The only policy that I would add to Freeman's list is changes in the earned income tax credit. In 1993, a low-income worker with children was eligible for a 19.5 percent tax credit on earnings. This was supposed to be raised to 40 percent by 1996. While one can argue about the incentive effects of the EITC and the difficulty of administering a program that encourages people to overstate their earnings, this seems to be a very straightforward way of dealing with changes in

the earnings distribution. The question is not whether changes in government policy can offset increases in inequality, but whether the nation wants to offset the declines in earnings of persons who, through no fault of their own, were born during a century when wages of less-skilled workers plummeted.

In summary, I come away from this paper with the conclusion that institutions can and, at times, do matter. What Freeman has offered us is an upper bound on the importance of institutions. Even if one moderates his conclusions, one is left with the impression that institutions provide binding constraints in some countries in some periods. Furthermore, the United States could have done a great deal more than it has done to offset changes in labor markets.

Reference

Gottschalk, Peter and Mary Joyce. 1995. "Is Earnings Inequality Also Rising in Other Industrialized Countries? The Role of Institutional Constraints." Boston College, mimeo.

Policy Implications: A Panel Discussion

A Statement of Our Concerns

Moderator Anita A. Summers

Professor Emeritus of Public Policy and Management, the Wharton School of the University of Pennsylvania, and Senior Research Fellow at the Wharton Real Estate Center.

I will begin with two general comments and then summarize the possible policy implications that flow from today's papers.

Defining the Problem

To my mind, an important issue remains that we have not discussed, and should: the fact that we are all here because we agree that existing inequalities are too great. We have not really demonstrated that such inequalities are so terrible, however, and we need to lay out the welfare function explicitly. It is not clear that the current Congress has the same welfare function in mind as the one that seems to prevail here.

The biggest divisions about what is the right amount of inequality can be described as follows. One way of thinking would support some sort of safety net that would protect medical care, housing, and education at a minimal level, while leaving the rest up to the market. The other way of thinking about inequality argues that we should allow the market to operate sufficiently to ensure that such programs maintain an efficient purpose in society. The United States now has such a large group relying on our safety net precisely because we have not done so, according to this point of view. Some statement about the actual level and reasons for concern about earnings inequality should accompany any policy discussion.

My second general comment relates to the decision, in this conference, to focus on both spatial and labor market contributions to earnings inequality. Spatial inequality analysis usually emphasizes the group with the lowest level of income, the bottom decile, the underclass. We have concentrations of the poor, and growing disparities between the city and the suburbs in income and many related socioeconomic measures. Policies derived from spatial inequality studies emphasize improved mobility of residential location, and improved ability of people living in one place to get to employment in another. Such policies assume that if the poor were more dispersed, we would have fewer problems.

Labor market inequality analysis, on the other hand, looks at the whole range of the income distribution. A researcher may compare the lowest income group to the highest, or measure the difference between the second and the eighth deciles. Such studies are interested in how the market rewards skills in relation to productivity, and in wage determination as it is related to the demand for and supply of labor. The focus on the lowest income group, in some labor market studies, overlaps the similar focus of most studies of spatial distribution. The policies flowing from these studies are directed to education, training, the minimum wage, and the role of internal private sector management.

Mobility and Neighborhoods

The spatial papers—the overview paper by Mayer, and the papers by O'Regan and Quigley, and Holzer and Ihlanfeldt—point strongly and clearly to both the role of transportation and the role of neighborhood effects in the spatial reinforcement of earnings inequality. Such papers provoke much discussion and interest here, because we operate at the margin in determining which is more important: neighborhood effects or transportation effects. As empirical social scientists, however, we must understand the tension that exists between the partial equilibrium or individual questions that drive our research and the general equilibrium reality in which both transportation and neighborhood play an important role.

Over the past quarter century, one of the great flaws in public policy has been to use single-pronged policy programs to aid those at the lowest end of the income distribution, rather than to use the more

complex, multi-pronged approaches. We who do research have helped to drive that misguided policy approach. We identify one or another input as a significant coefficient in our regressions and tend to design policies accordingly. Much of the current thinking in research circles and in the experimentation funded by large foundations has shifted to ways to assist low-income families by addressing many areas simultaneously. While specific research projects may point to one approach, effective results will require combining the knowledge from all our research efforts into a comprehensive policy program.

Much of the current thinking about assisting low-income families emphasizes addressing many disadvantages simultaneously.

The research results on transportation and neighborhood effects discussed today combine in the following questions: Can an individual freely choose where to live, given the income constraints? Does every geographic area provide a supply of residential locations for whoever wants to live there? And can people get to the places where the jobs are located? The papers presented today said that mobility matters and that neighborhoods do have effects on earnings.

So what are the policies to think about? In our policy discussions, we must take into account the devolution of power that is taking place in this country. How much, and in what form, we may not know yet, but some devolution surely will take place. One tool to implement devolution is block grants to state and local governments. Although block grants have received much support, little attention is being paid to just how they will be distributed—not even by big city mayors, who will certainly be among those most affected. This is clearly a case where it is all in the details! There is a well-known example from the 1970s of the need to understand the details. The formula for the distribution of Community Development Block Grants used the log of the unemployment rate to calculate funding. How could big city mayors have allowed the log to get in, rather than the level? The question is whether states, with their increased power, will regard spatial and labor market inequalities as a major concern. And the question is also whether the federal government will use the block grant formulas to give incentives for them to do so.

How much will be spent on increasing mobility by tailoring transportation to provide access to jobs? Will there be constant legal pressure for the availability of housing for all who can pay? Much of the current immobility comes from a certain fixity, or even expansion, in the size of the underclass, the poorest group. We have not been successful in breaking through that fixity, and it is not clear that transportation will change it, either. Marginal effects are important, so we should ensure that transportation is available, but we should think about them as marginal effects.

When thinking about neighborhood effects, it is important to focus on the dispersion of poverty. No systematic study has been done on what happens to income inequality if neighborhoods are changed by a reduction in the spatial concentration of poverty. In New Jersey, for example, the latest Mt. Laurel decision was interpreted to mean suburbs could "pay" or "play"—either contribute financially or build low-income housing—and all opted to pay. If the decision had been to put low-income housing in many of these suburbs, rather than sharing only fiscally, this would have been a good case study for the effect of dispersion policies. That is the only such court decision I know of that has gone so far in trying to alter the poverty concentration—and legal scholars differ as to whether that decision will, in fact, have wide implications.

A few years ago, I organized a conference that took place in that great urban setting, Bellagio on Lake Como, comparing urban economic development in Western Europe and the United States. A major conclusion emerging from the comparison was that European cities are healthier than U.S. cities for two reasons. First, the poor are much more dispersed in Europe than in the United States; lower-income families tend to live around the periphery of major cities, not in the center, as in the United States. Second, most European cities receive centralized funding. Their state of well-being is nowhere near as dependent on the local tax base as that of cities in the United States. So, I encourage thinking about deconcentration policies.

The Kain-Singleton paper suggests that spatial inequality translates into fewer resources going to schools in poor and minority communities than to schools in more affluent areas. We still do not know whether these resources matter. If they do, we need

to think about ways to add or reallocate dollars to resources that in fact have an impact on education. If resources do not matter, then we are left thinking about policies that do not necessarily involve resources but, rather, involve a major restructuring of the organization and incentives of our educational system.

Labor Market Issues

What are the real labor market issues in connection with earnings inequality for those at this conference? If they are not primarily issues about those at the bottom, then what is there to worry about? We might worry about those unemployed who have a temporary skills mismatch for labor market needs, who need help with mobility or retraining. We might worry about today's middle class that has less income than its predecessors. To my mind, this does not seem to be such a worrisome thing to contemplate. We might worry about international competitiveness, in which case we want to ensure that international markets are freed up, leaving it to the market to translate those changes into the labor market. It is the group at the bottom, however, that warrants most of the attention from public policies—a view that probably reflects the social welfare function of the participants in this conference.

Immigration policy has strong spatial implications, as well as general implications for the labor force as a whole. In the past decade, most of the new immigrants ended up concentrated in the central cities.

Peter Cappelli and Richard Freeman see some possible solutions in the private sector. Cappelli argues that managers influence the wage structure; but if you believe in markets, then presumably they manage the wage structure so as to maximize profits. It is difficult to think of managers of private companies as the guardians of more equality; they have quite different roles. I do not see any significant public policies about income inequality arising from the activities of internal management, although the notion of an independent role for internal management in lessening earnings inequality is quite interesting—profit-driven training programs and educational standards for hiring, for example.

Richard Freeman's policy recommendations were based on a reexamination of a number of institutions that affect earnings. I agree with Peter Gottschalk that such institutions are largely endogenous. They obviously have been supported by laws, but on the whole, they emerged from our society endogenously rather than exogenously.

So to address inequality in the general distribution of earnings and income, the list of non-spatial public policies would include changing tax policies, raising the minimum wage, improving training and higher education opportunities for low-income individuals, and changing immigration policy. Immigration policy, of course, has strong spatial implications, as well as general implications for the U.S. labor force as a whole. Five metropolitan areas in the United States received 58 percent of all new immigrants in the past decade, with Los Angeles accounting for 24 percent. Most of the new immigrants ended up concentrated in the central cities. Although immigration policy is set nationally, the effects are concentrated in a limited number of metropolitan areas. In the central cities of those areas, the fiscal impact of that concentration affects the local governments' abilities to provide services to those at the bottom of the income distribution.

Cities Are Special

As we look ahead, new policy options will emerge as power devolves from the federal government, largely in the form of block grants to states. These grants offer a new opportunity to build in incentives that would encourage state and local governments to reduce the inequality of income by reducing the spatial concentration of poverty. We do not know now how policymakers will choose to structure these block grants, but they certainly open up the possibility of establishing incentives to change the spatial distribution of the poor within a state, to change the minimum wage, and to alter tax policy. It is a big challenge to our current thinking to focus our concerns about income inequality on the roles of state and local governments. In the past, based on very

sound public finance principles, redistributional policies were activated on the federal level. Now, we will have 50 political arenas to consider. This certainly suggests that spatial inequality will not be addressed in a uniform way, and that we will have to concern ourselves, increasingly, with the effects of competition among the states in welfare reform—who will spend the least?

This should leave us worried about one of America's greatest problems—our large old cities, where the biggest inequalities of income are found. Within the states with these large cities, the vote counts of the suburbanites plus the rural areas exceed the vote of the cities. That is not grounds for optimism about the likelihood of reducing income inequality in the United States!

Income Trends and the Housing Market

Panelist Ann B. Schnare

Vice President for Housing Economics,
Federal Home Loan Mortgage Corporation

I was asked to address the impact the mortgage market may be having on income inequality. I find that a difficult hypothesis to address and have decided to turn it around a bit. I will discuss the impact that income trends are having on the housing market and the pressures they are putting on the mortgage industry as well as on the housing programs that serve the poor, such as those run by the Department of Housing and Urban Development (HUD).

Let me begin with a few words on how the effects of earnings inequality have played out in the housing market historically. Enormous and rapid improvements occurred in the homeownership rate after World War II. We went from a nation of renters to a nation of owners. But in the early 1970s, homeownership rates began to decline and continued to do so until last year. Many feared that the American Dream of homeownership was being threatened.

If you look at the numbers, much of the decline in the homeownership rate can be explained by demographic trends, for example, the rise of single-person households. But more important, in my view, are the income trends we have examined today. Younger, middle-class households between 25 and 35 years old, the classic first-time homebuyers, have experienced stagnating or even declining wages. Homeownership rose among younger households without children, both singles and married couples, but it fell significantly for both single and married parents with children. These were also the groups who experienced declining incomes.

Poverty in the Cities

The middle class certainly has been affected, as the stagnation in wages put pressure on homeownership rates, but the big impact has been on the rental market, as both relative and real incomes fell for those at the bottom of the income distribution, the people who traditionally have been renters. As a result, there is a large and growing gap between what it costs to operate an apartment building and the rents households can afford to pay. This has led to two problems,

Not only are individuals pulling apart, so are neighborhoods and communities. Increasingly, the poor are concentrated in highly impacted neighborhoods within the city.

the physical decay we see in urban areas and an increased demand for government subsidies. And HUD has been severely hit by reductions in the resources put into low-income programs, a trend that will only intensify in the future, in my opinion.

These are individual effects, in a way. But the papers we discussed earlier make clear that not only are individuals pulling apart, so are neighborhoods and communities. Increasingly, the poor are concentrated in highly impacted neighborhoods within the

city. Most who can get out have been getting out. These changes are having a growing impact in turn on the fiscal health of cities and their ability to pay for essential services. And city fiscal difficulties may in turn intensify some of the negative neighborhood effects that we have discussed today. The problems of urban areas are now linked intrinsically to problems of income distribution. To what extent they are contributing to or causing such problems is a matter for debate, but income distribution problems certainly are affecting the future viability of urban areas.

Implications for the Mortgage Industry

What does this mean for the mortgage industry? Certainly there is a lot of concern about the ability of low- and moderate-income households, especially minorities, to get access to the mortgage market. Following the Boston Fed study, as well as other work on mortgage flows in low-income and minority neighborhoods, the response by the mortgage industry has been fairly dramatic as we reexamined our underwriting criteria to see if we had unnecessary barriers to getting credit to inner-city neighborhoods.

This reexamination has led to a lot of experimentation, which has intensified in recent years. Unfortunately, the initial results are not very comforting. The mortgage industry has seen a real decline in credit quality, due in part to a drop-off in loan origination volumes. Mortgage originators were staffed up, and then they saw the refinancing market go away. Thus, there has been increasing economic pressure to preserve volume as well as political pressure.

At Freddie Mac we have found it important to distinguish between the performance of special programs and that of mainstream programs as they relate to the income of the borrower. In our special programs designed to lift certain underwriting guidelines, the record is not very good. These programs are relatively new, but as the data begin to come in, they are showing significantly higher default and foreclosure rates. These are low-equity loans, where only 2 percent of the money comes from the borrower's equity, and often even this is paid by or borrowed from the bank. Other aspects of risk are typically involved as well; in fact, layering of risk appears to be a significant problem. In my opinion, it is bad public policy to put individuals into houses they cannot afford to support. Some of the biggest abuses of government programs occurred in FHA during the early 1970s, when neighborhoods were blown away by bad underwriting.

If one examines mainstream programs, in particular the relationship between loan performance, borrower income, and neighborhood income, some interesting results appear that we do not fully understand yet but that relate to spatial effects. We have found, for example, that low-income loans perform the same way as high-income loans, with not much difference between the two groups. The important factor seems to be, rather, neighborhood income, which may mean that neighborhood income is picking up something more fundamental about permanent income than is revealed by examining only the current income of the borrower.

In looking at Freddie Mac's own mortgage purchases, we have found again that credit quality is not related to the borrower's income but rather to neighborhood income. This gets at the fact that serving distressed inner-city neighborhoods does involve more risk, that these are very difficult loans to do. The lending industry has much to learn. It is doing a lot of experimentation but concern remains about how far to go.

People versus Places

Shifting the focus now from Freddie Mac to HUD, one issue HUD has always been unsure about is whether it should subsidize people or places, rely on supply-side programs or on voucher programs. HUD has tried to serve both purposes with the same set of programs. Over time, as HUD monies dried up, they have increasingly targeted their subsidies to the poorest of the poor. The problem is that they locate such households in precisely the neighborhoods they are trying to upgrade. While housing programs may improve individuals' bricks and mortar, public housing has consistently reduced the quality of the neighborhoods people are living in, compared to equally poor households not involved in housing programs—a pretty serious indictment. These findings suggest several policy recommendations: One is to increasingly regard vouchers and mixed-income developments as solutions; another, more fundamental, is to break the link between trying to provide assistance to the poor and doing community development. Trying to do both together simply has not worked.

Inequality, Growth, and Restructuring

Panelist Frank Levy

Daniel Rose Professor of Urban Economics, Massachusetts Institute of Technology.

What is the effect of inequality on growth? In particular, will growing income inequality retard growth? The answer, I think, is mixed. In the long run, increasing inequality may limit the national rate of growth, for reasons I discuss below.

In the short run, I think the causality works in exactly the opposite way. The inequality we now see is a by-product of enormous industrial restructuring that began in manufacturing in the early 1980s and spread to the services sector by the end of the decade. On the one hand, this restructuring is responsible for raising the rate of productivity growth across the economy. On the other hand, this same restructuring has sharply reduced the demand for semi-skilled labor, and their falling wages have significantly increased earnings inequality.

The inequality we see now is a by-product of enormous industrial restructuring that began in manufacturing and spread to the services sector.

The underlying problem is that labor demand can shift much faster than labor supply. In this case, the demand for semi-skilled labor can fall much faster than semi-skilled labor can acquire new skills. The issue is much bigger than minority communities in central cities. Median earnings for 25- to 34-year-old men with a high school diploma or a GED is now $20,500. This is a big decline; 15 years ago, similar men earned about $28,000 in today's dollars. The number is particularly significant because 40 to 45 percent of all 30-year-old men have not gone beyond high school. A plausible connection can be made between these wage numbers and the "angry white males" we hear about in political argument. A lot is at stake. We need short-run policies to address how we can get through this period without atomizing our society. We need longer-run policies to help us get out of this situation.

In the short term, I would recommend that we treat the situation as an unanticipated natural disaster—like a flood or a hurricane. In response, we might expand our safety net to ensure that, say, health care is not linked to jobs, since the trends that are pushing down wages also reduce fringe benefits. In addition, we could expand or at least strengthen the earned-income tax credit. In all of this, we must recognize that for a large part of the population who played by the rules, the rules have changed in the middle of the game, leaving people in economic jeopardy when it may be too late to alter their choices. In this regard, we know from training studies that it is difficult for workers to pick up new skills at the age of 35 or 40.

Special Role of Schools

As for the future, the major issue is education and the provision of human capital; this is where the spatial aspect of these problems comes in. Schools, in particular our public schools, run on routines, like most organizations. In the 1970s, the established routines were perfectly adequate because high school graduates still could get decent jobs. The labor market has changed quite fast since then, but it is hard to get schools to change their routines in response. The highly decentralized structure of our schooling system makes it doubly hard. Local schools operate within their state's context. And states have become something of a deregulated industry themselves, with the federal budget playing a much smaller role in supporting state budgets. This leaves the states in very intense competition for jobs, putting pressure on resources. Within states, schools are governed in fairly income-homogeneous local districts. So the schools and communities that have been hit hardest must make the biggest adjustments. The towns where all the parents are highly educated have fine schools to begin with, and their taxpayers are also doing pretty well. But poorer working-class communities that have been hit harder by economic restructuring are also the places that need to make the biggest changes in their schools.

As John Bishop noted, kids make decisions early that have a kind of path-dependence in terms of which classes or tracks they are put in. The issue of their access to information about what is out there for them is very important. Programs such as apprenticeships

for students in low-income high schools, like Project ProTech here in Boston, change the information on which kids are acting.

But more than that, we must keep saying that states should be upgrading educational standards and imposing minimum requirements, even though it may run against their short-run interests. These standards and measures should give parents some sense of what their kids are learning. In a period when we need to upgrade standards and increase the provision of human capital, providing more information externally to the school district is crucial.

The Migration Question

I will close with one final issue, migration, that I wish had been discussed more this morning. Massachusetts, for example, recently flirted with zero population growth. During the "Massachusetts Miracle" of the 1980s, the wage structure got pushed much higher than national wages because of a lack of in-migration. The loss of manufacturing jobs here was masked by a construction boom, then the construction boom ended. Anecdotally we hear that fewer decent jobs remain for less-educated people, although well-educated people have few problems. Is zero population growth being pushed by the out-migration of less-educated or more-educated workers? A more general question is, to what extent is migration affecting the distribution of human capital around the states and the underlying issue of earnings inequality? I hope this issue will be discussed more in the future.

Shifts in Labor Demand and Supply

Panelist Lawrence F. Katz

Professor of Economics, Harvard University.

The presentations at this excellent conference have shed further light on rising inequality, one of the truly big stories in American economic life over the last 20 years. The enormous disparities in the fortunes of American families in recent years have largely been associated with labor market changes that have increased overall wage inequality and shifted wage and employment opportunities in favor of the more-educated and more-skilled. Less-educated young men have suffered unprecedented losses in real earnings and are at greater risk of nonemployment than in years past, both in absolute terms and relative to more-skilled workers. In short, the U.S. labor market has experienced a massive twist against "disadvantaged" workers—those with limited education or skills or from impoverished families and neighborhoods—that has diminished their earnings prospects and made it more difficult for them to keep their families out of poverty and intact.

Many analysts believe a key driving force behind these changes has been a strong shift in relative labor demand against the less-educated and those doing more routinized tasks and toward more-educated workers and those with problem-solving skills. Changes over time in wage inequality can be thought of as being the outcome of a footrace between technology (the demand for skills) on the one side and the supply of educated labor on the other side. It is clear that the technology and demand side has been winning the footrace, outstripping supply and stretching out the wage structure during most of the past two decades. These demand shifts favoring the more-skilled have been reinforced by changes in pay-setting norms, increased competition in many product markets, increased immigration of less-educated workers, and the weakening of institutions that have protected non-college workers (for example, the decline of unions and the erosion of the real value of the minimum wage). While much debate exists concerning the relative importance of these different underlying causes of rising inequality and increased returns to skill, none of the suspected factors show any apparent signs of abatement.

The Role of Macro Policy

Strong macroeconomic performance traditionally has been a crucial factor in improving the labor market

prospects for disadvantaged workers. But the experiences of the long boom of the mid and late 1980s and the current U.S. expansion suggest that sustained economic growth by itself, unassisted by specific initiatives to deal with increased structural labor market barriers facing the less-skilled, is unlikely to be sufficient to reverse recent trends in inequality or to overcome increased labor market barriers facing the disadvantaged in America's inner cities.

Market incentives for increased individual educational investments and skills upgrading can play some role in alleviating growing inequality in the United States. The large increase in the college wage premium in the 1980s has been associated with an increase in college enrollment rates from 49 percent of high school graduates in 1980 to more than 60 percent in the early 1990s. Evidence from U.S. time series and cross-country studies strongly suggests that rapid expansion of the supply of more-educated workers narrows earnings differentials and improves the labor market position of the less-skilled. But the process of supply adjustment can take many years, and many disadvantaged individuals face financial and informational barriers to pursuing further education and training. Furthermore, the overall supply of college graduates has not grown very rapidly in recent years, as John Bishop showed, because the current baby bust cohort is quite small. Not many 40-year-olds return to college when the college premium expands.

Rapid expansion of the supply of more-educated workers narrows earnings differentials and improves the labor market position of the less-skilled. But the process of supply adjustment can take many years.

These facts suggest a number of different strategies. First, we could try to improve the supply side of the labor market, as Frank Levy discussed. Obviously, primary and secondary education is key to that, although access to higher education is important as well. Second, we could try to affect the demand side of the labor market. We are not going to shut down the borders to trade; that would be foolhardy. But we could undertake some form of targeted demand policies, such as employer-side wage subsidies for economically disadvantaged workers, based either on people or on place. Third, government could play a better role in trying to make work pay, through an expanded earned income tax credit, possibly a higher minimum wage, or even doing more with the tax system. Fourth, we could do more to match up jobs and people who have very little connection to the labor market, such as welfare recipients and disadvantaged youth. Given that a lot of state and local governments will be making these decisions, we should draw lessons from the past on which approaches work best.

Choosing Policies That Work

Our 30 years of experimenting since the Great Society with training and wage subsidies and location-based assistance policies have given us a menu of options from which government can make its current decisions. We have had a number of negative messages, but this is probably the one area in the government budget where we have the most random-assignment evidence on which programs actually might work. So from this menu of options, policymakers such as state governors could make better-informed decisions than those made in the past.

The first thing we have learned on the negative side is that it is extremely hard to turn around the lives of people who have become disconnected from the mainstream educational system and dropped out of high school. Countless programs have attempted to help disadvantaged youth who have dropped out of high school and, aside from the Job Corps, a very expensive residential program, almost all have shown very little return. On the other hand, a number of recent demonstration projects suggest we can be more successful by starting earlier to work to keep kids in high school and prevent dropouts. The Quantum Opportunities program is a good private sector example, and the Department of Education has run a number of very successful demonstration projects: not traditional programs that help a 16-year-old get a summer job and do not last very long, but rather programs that start at age 14 or earlier and set up an inexpensive infrastructure with extra tutoring, together with a group at school responsible for helping kids make connections to the labor market. Some of the best examples, like the "I Have a Dream" programs, also guarantee some financial assistance for

college. A number of these programs have had substantial effects on high school dropout rates and college attendance rates, and certainly they seem like potentially good uses of the funds that states will have available.

The second thing we have learned is that the returns to getting more education, such as attending college, are particularly high for those from disadvantaged backgrounds. Thus, the limited response of this group is not because they themselves do not generally experience high returns. When we have seen interventions such as increasing access to college or cutting tuition levels and studied them as natural experiments for estimating the rates of return to schooling, people from lower-income households have been the most affected. These are people on the margin who decide whether or not to go to school when you change access or tuition levels. When you estimate their rates of return, as David Card did in a recent survey, they look higher than the average difference in earnings between college- and high-school-educated workers, which suggests that capital market constraints are important. That does not mean that we know exactly the right ways to reduce the cost of education. But access to education combined with information seems to have a very high return for low-income people with high abilities. Policies to prevent dropouts and increase access to college do not work complete miracles, but they are also not that expensive when targeted to those at the margin, for example, in inner cities.

Access to education combined with information seems to have a very high return for low-income people with high abilities.

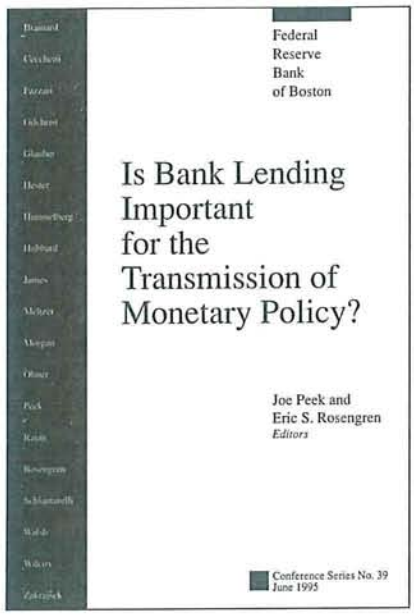
In another area, we have learned from the Gautreaux program and from a number of other quasi-experimental programs that neighborhoods, and the spatial concentration of the poor, do seem to matter. There is no chance in the world that the public will agree to huge residential dispersion policies, as the Baltimore experience with the Moving to Opportunity (MTO) program and the Mt. Laurel decision indicate. Small-scale attempts have a role, however, as shown in the current MTO program that, despite Baltimore talk radio disparagement, is in operation in the Baltimore metropolitan area as well as in Boston, Chicago, New York, and Los Angeles.

A striking characteristic of this program is that the majority of those who agree to participate in it say that the primary reason they want to move out of their neighborhood is because of problems with crime and worry for their children, but they lack the resources to leave public housing. Most claim to have been victimized by crime within the previous six months. In terms of transportation, 87 percent of them do not have cars, and the vast majority do not have driver's licenses. It is, therefore, plausible that these people are not choosing a place to live after evaluating neighborhood and transportation possibilities, but rather that public housing is the one place where they can get a subsidized living situation. Dispersion policies could accomplish a bit here, and what I call place-based people policies could do a lot more. This would not be subsidizing employers with tax breaks for setting up warehouses in enterprise zones, but rather targeting training and human resources funds towards areas with greater needs. Such programs may be less stigmatizing than those based on individuals' characteristics, such as the targeted jobs tax credit.

Finally, good returns may come from greater investments in improving information for kids. A number of mentoring programs provide such connections. Project Strive in Harlem is a good example: It provides training and two years of follow-up services for youth, where they try to make connections with and help resolve problems with employers. States and localities can do a lot to break down the barriers between the offices of central-city Job Training Partnership Act agencies and suburban employers, providing connections beyond just the transportation link.

In conclusion, massive increases in human capital investments would be required to overcome the changes of the past 15 years, increases in the $100-billion-a-year range for a decade, based on some estimates by Jim Heckman. We are certainly not going to embark on such an investment. But in a limited "cut and invest" budget situation, we could probably target our money better. States and localities should be looking at the research on what has worked and what has not, to determine how to use possible future block grants and their current resources. Also, these policies will be more effective in an environment of tighter labor markets.

Conference Series



Is Bank Lending Important for the Transmission of Monetary Policy?, the proceedings of a conference sponsored by the Federal Reserve Bank of Boston in June 1995, is now available. The conference brought together central bankers, policymakers, academics, and economists to review the role of bank lending as an important transmission mechanism for monetary policy. The group, representing academia and the public and private sectors, also considered such questions as the relationship of bank lending to output, and the experience both from this country and abroad concerning the effects of financial constraints on firms' decisions.

The proceedings include all the papers presented at the conference and the prepared comments of the discussants, along with an overview of the entire conference. The paper-givers are Simon G. Gilchrist and Egon Zakrajšek; Charles P. Himmelberg and Donald P. Morgan; Joe Peek and Eric S. Rosengren; Fabio Schiantarelli; and Carl E. Walsh and James A. Wilcox. The discussants include William C. Brainard, Stephen G. Cecchetti, Steven M. Fazzari, Robert R. Glauber, Donald D. Hester, R. Glenn Hubbard, Christopher James, Allan H. Meltzer, Stephen D. Oliner, and Raghuram G. Rajan.

Copies of conference volume no. 39, *Is Bank Lending Important for the Transmission of Monetary Policy?*, may be obtained without charge upon request to the Research Library—D, Federal Reserve Bank of Boston, P.O. Box 2076, Boston, MA 02106–2076. Or telephone (617) 973–3397.

Please type or print

Name _____ Title _____

Organization _____

Address _____

_____

Please check

☐ Please send Conference Series No. 39 *Is Bank Lending Important for the Transmission of Monetary Policy?*

☐ Please send back-issue Conference Series No. _____

Note: Single volumes will be mailed without charge, but a $10.00 payment (check drawn on a branch of a U.S. bank) will be required for more than 10 volumes or more than 10 copies of the same volume.

PLACE
STAMP
HERE

Research Library—D
Federal Reserve Bank of Boston
P.O. Box 2076
Boston, Massachusetts 02106-2076

Conference Series

The Federal Reserve Bank of Boston Conference Series

No. 1	Controlling Monetary Aggregates	June 1969
No. 2	The International Adjustment Mechanism	October 1969
No. 3	Financing State and Local Governments in the Seventies	June 1970
No. 4	Housing and Monetary Policy (out of print)	October 1970
No. 5	Consumer Spending and Monetary Policy: The Linkages	June 1971
No. 6	Canadian-United States Financial Relationships	September 1971
No. 7	Financing Public Schools (out of print)	January 1972
No. 8	Policies for a More Competitive Financial System	June 1972
No. 9	Controlling Monetary Aggregates II: The Implementation	September 1972
No. 10	Issues in Federal Debt Management	June 1973
No. 11	Credit Allocation Techniques and Monetary Policy	September 1973
No. 12	International Aspects of Stabilization Policies (out of print)	June 1974
No. 13	The Economics of a National Electronic Funds Transfer System	October 1974
No. 14	New Mortgage Designs for Stable Housing in an Inflationary Environment	January 1975
No. 15	New England and the Energy Crisis (out of print)	October 1975
No. 16	Funding Pensions: Issues and Implications for Financial Markets	October 1976
No. 17	Minority Business Development	November 1976
No. 18	Key Issues in International Banking	October 1977
No. 19	After the Phillips Curve: Persistence of High Inflation and High Unemployment	June 1978
No. 20	Managed Exchange-Rate Flexibility: The Recent Experience	October 1978
No. 21	The Regulation of Financial Institutions	October 1979
No. 22	The Decline in Productivity Growth	June 1980
No. 23	Controlling Monetary Aggregates III	October 1980
No. 24	The Future of the Thrift Industry	October 1981
No. 25	Saving and Government Policy	October 1982
No. 26	The Political Economy of Monetary Policy: National and International Aspects	July 1983
No. 27	The Economics of Large Government Deficits	October 1983
No. 28	The International Monetary System: Forty Years After Bretton Woods	May 1984
No. 29	Economic Consequences of Tax Simplification	October 1985
No. 30	Lessons from the Income Maintenance Experiments	September 1986
No. 31	The Merger Boom	October 1987
No. 32	International Payments Imbalances in the 1980s	October 1988
No. 33	Are the Distinctions between Debt and Equity Disappearing?	October 1989
No. 34	Is There a Shortfall in Public Capital Investment?	June 1990
No. 35	The Financial Condition and Regulation of Insurance Companies	June 1991
No. 36	Real Estate and the Credit Crunch	June 1992
No. 37	Safeguarding the Banking System in an Environment of Financial Cycles	November 1993
No. 38	Goals, Guidelines, and Constraints Facing Monetary Policymakers	June 1994
No. 39	Is Bank Lending Important for the Transmission of Monetary Policy?	June 1995

Working Papers

1994 Series

No. 94–1—"Monetary Policy When Interest Rates Are Bounded at Zero," by Jeffrey Fuhrer and Brian Madigan
No. 94–2—"Optimal Monetary Policy in a Model of Overlapping Price Contracts," by Jeffrey C. Fuhrer
No. 94–3—"Near Common Factors and Confidence Regions for Present Value Models," by Stephen R. Blough
No. 94–4—"Estimating Revenues from Tax Reform in Transition Economies," by Yolanda K. Kodrzycki
No. 94–5—"Gifts, Down Payments, and Housing Affordability," by Christopher J. Mayer and Gary V. Engelhardt
No. 94–6—"Near Observational Equivalence and Persistence in GNP," by Stephen R. Blough

1995 Series

No. 95–1—"Banks and the Availability of Small Business Loans," by Joe Peek and Eric S. Rosengren
No. 95–2—"Bank Regulatory Agreements and Real Estate Lending," by Joe Peek and Eric S. Rosengren
No. 95–3—"Housing Price Dynamics within a Metropolitan Area," by Karl E. Case and Christopher J. Mayer
No. 95–4—"Tobin's q, Economic Rents, and the Optimal Stock of Capital," by Richard W. Kopcke
No. 95–5—"Small Business Credit Availability: How Important Is Size of Lender?" by Joe Peek and Eric S. Rosengren
No. 95–6—"The (Un)Importance of Forward-Looking Behavior in Price Specifications," by Jeffrey C. Fuhrer
No. 95–7—"Modeling Long-Term Nominal Interest Rates," by Jeffrey C. Fuhrer
No. 95–8—"Debt Capacity, Tax-Exemption, and the Municipal Cost of Capital: A Reassessment of the New View," by Peter Fortune
No. 95–9—"Estimating Demand Elasticities in a Differentiated Product Industry: The Personal Computer Market," by Joanna Stavins
No. 95–10—"Discrimination, Redlining, and Private Mortgage Insurance," by Geoffrey M.B. Tootell
No. 95–11—"Intergenerational Transfers, Borrowing Constraints, and Saving Behavior: Evidence from the Housing Market," by Gary V. Engelhardt and Christopher J. Mayer
No. 95–12—"A New Approach to Causality and Economic Growth," by Steven M. Sheffrin and Robert K. Triest

1996 Series

No. 96–1—"The International Transmission of Financial Shocks: The Case of Japan," by Joe Peek and Eric S. Rosengren

Single copies of these working papers and information about the 1991, 1992, and 1993 series may be obtained without charge from the Research Library—D, Federal Reserve Bank of Boston, P.O. Box 2076, Boston, MA 02106–2076 or phone (617) 973–3397.

Federal Reserve Bank of Boston
P.O. Box 2076
Boston, Massachusetts 02106-2076

Address Correction Requested

Bound
Printed Matter
Bulk Rate
U.S. Postage Paid
Permit No. 930
Richmond, VA