

Empirical Evidence

ON

Vertical Foreclosure

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Federal Reserve Bank of Boston

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Abstract

Recent papers have shown conditions under which vertical mergers can result in anticompetitive foreclosure of unintegrated rivals. These models imply that a necessary but not sufficient condition for anticompetitive foreclosure is that unintegrated rivals are less profitable after a vertical merger. We test this hypothesis by examining the stock prices of unintegrated rivals at the time of a vertical merger announcement and at the time of a government antitrust complaint. We find no evidence to support the foreclosure hypothesis.

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Empirical Evidence on Vertical Foreclosure

I. Introduction

Prior to the 1980s, the United States Department of Justice and the Federal Trade Commission actively challenged vertical mergers, on the theory that such mergers foreclosed unintegrated rivals in the downstream market from access to inputs supplied by the merged firm. This policy changed when critics of the foreclosure theory claimed that vertically integrated firms have no incentive to transfer products between the upstream and downstream markets at a price other than the market price and, therefore, vertical mergers have no effect on the price charged to consumers.¹ The arguments against attacking vertical mergers were also supported by research that demonstrated that vertical integration can enhance efficiency.² As a result, vertical mergers currently receive very little, if any, attention from the enforcement agencies.

Recent contributions by Ordoover, Saloner, and Salop (1990), Krattenmaker and Salop (1986), and Salinger (1988, 1989) have reopened the debate about the competitive effects of vertical mergers. They each use theoretical models to show that vertical foreclosures can raise costs to unintegrated rivals and

¹ See Allen (1971), Bork (1969), Peltzman (1969), and Liebler (1968). For a concise summary of the specific objections to the foreclosure theory, see Ordoover, Saloner, and Salop (1990).

² Some of these studies, Spengler (1950) and Liebler (1968), demonstrate that vertical mergers will improve social welfare if they eliminate the successive monopoly margins charged at each stage of production. Other studies, Klein, Crawford, and Alchian (1978) and Williamson (1979), demonstrate that vertical integration and hence vertical mergers may reduce transaction costs and therefore improve social welfare.

lead to higher prices for consumers. Although these models demonstrate that foreclosure can be a profitable strategy that injures competition, to date these theories have not been tested empirically. If vertical foreclosure rarely occurs, or if it occurs only in a narrow set of circumstances, changes in current policy on vertical mergers may not be justified.

A necessary but not sufficient condition for anticompetitive foreclosure is that the vertical merger cause the unintegrated rivals to be less profitable. This result from previous theoretical work is tested here on a sample selected from all vertical merger cases challenged by the Justice Department and the Federal Trade Commission during the period 1963 to 1982. We find no evidence of anticompetitive market foreclosure for the sample of cases challenged by the antitrust agencies.

One possible explanation for our results is that the tests over the entire sample are significantly affected by a few weak cases brought by the government during a period of aggressive antitrust enforcement. We test this by examining variables that have been identified by Krattenmaker and Salop (1986) and the Department of Justice merger guidelines as being conducive to foreclosure, such as barriers to entry and industry concentration. Even the cases with high industry concentration and barriers to entry, which potentially should exhibit substantial market power, provide no evidence of foreclosure. While this does not preclude anticompetitive foreclosure as a possibility, it does call into question the cases brought by the antitrust agencies during the 1960s and the 1970s. Until the proponents of the more rigorous economic version of the foreclosure theory provide clearer guidelines about the conditions under which vertical mergers are likely to injure

competition, continuation of the current policy of not contesting these mergers seems justified.

II. Theory of Anticompetitive Foreclosure

The foreclosure arguments used to challenge vertical mergers during the 1950s and 1960s were easily discredited because no formal theory was used to support them. More recent attempts to reconstruct the foreclosure theory have used economic models to demonstrate that vertical foreclosure can reduce competition. The key to each of these models is that foreclosure raises the costs to the unintegrated rivals of the merged firm and this, under certain conditions, raises the price of the final product to the consumer.

The legal definition of foreclosure focuses on the ability of unintegrated firms to buy from or sell to integrated rivals, while the economic definition of anticompetitive foreclosure focuses on whether prices to consumers increase. Salinger (1988) has provided a model that demonstrates the conditions under which anticompetitive foreclosure will occur. His basic model assumes that there is some preexisting market power in both the upstream (input) and downstream (final product) markets, and that both the input and the final product are produced under constant marginal costs.

Using a Cournot model, Salinger shows that a vertical merger will have two effects. First, the number of competitors in the unintegrated segment of the input market is reduced because the merged firm neither buys from nor sells to the unintegrated firms, causing the price of the input to unintegrated firms in the downstream market to rise. Second, the merging firm lowers its marginal cost because it is able to avoid the successive monopoly rents in the upstream market. The lower marginal cost for the integrated firm

allows it to expand output by reducing its price, thus reducing the derived demand for unintegrated rivals in the upstream market. When the effect of the decrease in competition in the upstream market dominates the decrease in the derived demand for unintegrated upstream firms, the price of the input to the unintegrated firms in the downstream market increases. When the latter effect exceeds the reduction in the integrated firm's cost, the price of the final product increases.

Our primary concern in this paper is whether anticompetitive foreclosure occurs, since that is the motivation for antitrust policy. In all of the models of foreclosure we have examined, it can be shown that the foreclosed unintegrated rivals in the downstream market will be less profitable after a vertical merger of a rival. The Appendix provides a simple Cournot model consistent with Salinger's model to illustrate that a necessary condition for anticompetitive foreclosure is that unintegrated rivals are less profitable after the merger. However, the effects on integrated rivals or unintegrated rivals in the upstream market are model specific. For example, in the Ordoover, Saloner, and Salop (1990) model, the unintegrated rival in the downstream market suffers a decrease in profits as a result of foreclosure. However, it is interesting to note that in their model the profits of the unintegrated firm in the upstream market increase, because of the increase in its market power that occurs as a result of foreclosure in the downstream market.

III. Empirical Examination of Vertical Mergers

The models discussed above suggest that a test of whether vertical mergers contested by the government resulted in economic foreclosure can be

implemented by examining the returns to stockholders of unintegrated rivals at the time of the announcement of a vertical merger. The foreclosure hypothesis suggests that unintegrated rivals will be less profitable. If this is true, returns to stockholders for these rivals will fall because of a lower expected present discounted value of future earnings.

A problem with this study, as well as with many similar event studies, is that there may be alternative explanations for changes in stock prices as a result of an announcement. The most serious alternative explanation is that vertical integration provides the merging firm with cost advantages that are unavailable to unintegrated rivals, so the profits of unintegrated rivals will fall because their rivals are more competitive (efficient). For the efficiency gains to imply lower stock prices for rivals, the gains must be available only to the merging firm. If rivals also can realize the efficiency gains, either by internal expansion or merger, than the merging firm does not realize a cost advantage. Thus, if vertical integration is available to all, then the rival's value should fall only from foreclosure, not from efficiency gains, and all reductions in rivals' values can be attributed to foreclosure.

Second, the merger announcement may convey information to management and shareholders of the unintegrated rivals. Information that significant efficiency gains are available from vertical integration may cause unintegrated rivals to vertically integrate themselves, either by merger or by internal expansion of their own operations. Alternatively, the information may relate to the existence of significant underutilized assets, which may cause rivals that also have underutilized assets to be "in play." Both types of information will cause the profits and therefore the stock price of

Table 1
Impact of Vertical Merger on Unintegrated Rivals' Profit

<u>Hypothesis</u>	<u>Vertical Merger Announcement</u>	<u>Complaint Announcement</u>
1. Foreclosure	-	+
2. Cost Advantage ^a	-	+
3. Information		
a. Efficiency gain	+	No effect
b. Underutilized assets	+	No effect

^aIf the gains to rivals can be realized by internal expansion, no effect would occur.

unintegrated rivals of the merging firm to increase. The predictions of these alternative hypotheses are summarized in the first column of Table 1.

A finding of no significant negative stock price movement has two possible implications for the foreclosure hypothesis. One possibility is that the effects on rivals are small, so no significant anticompetitive foreclosure occurred. The second possibility is that the effects are large and significant, but the negative foreclosure effect is offset by the positive information effects.

To disentangle these two possibilities, we also examine the returns to stockholders of unintegrated rivals on the announcement that the Justice Department or the Federal Trade Commission is contesting the merger to prevent foreclosure of competitors. If foreclosure is a problem, the stock price of the unintegrated rivals should increase when the government announces its antitrust complaint to prevent foreclosure. Preventing a merger with efficiency gains would also cause the stockholder returns of unintegrated rivals to rise, because the firms that are attempting to merge will be unable to realize those gains through a merger.

The information effect, on the other hand, is likely to be minimal. If the original merger proposal revealed that the industry had significant undervalued assets, no new information concerning the undervaluation would be revealed by an antitrust complaint. If the information suggested that efficiency gains could be realized by vertically integrating, the unintegrated firms still have the option of integrating by internal expansion.³

Consequently, if foreclosure is the dominant effect of a vertical merger, the stock price of unintegrated rivals should drop on the announcement of the merger and rise on the announcement of an antitrust complaint. If the foreclosure effect was significant but offset by information effects, then the merger announcement would have no effect but the complaint announcement would have a positive effect. Since the efficiency and foreclosure hypotheses move in the same direction, the pattern of stock prices described above will be consistent with the foreclosure hypothesis, but it cannot prove that foreclosure occurred. However, it is possible to reject the foreclosure hypothesis if the stock price movements are not consistent with the pattern described above and in Table 1.

Note that these different hypotheses have similar implications for the reaction of stock prices of target and acquiring firms. Regardless of the effects of a vertical merger, the stock price for the target firm should rise, since target shareholders will sell their shares only if the acquiring firm offers them a premium. For the acquiring firm, the effects are ambiguous.

³A possible complication is that if the unintegrated rival could gain the efficiency benefit by integrating, its value would rise on the announcement that the merger is contested, because it might become more efficient than the merging partners. However, even if the merging partners are prevented from vertically integrating by acquisition, they still have the option to vertically integrate by internal expansion.

While the combined share value of the acquiring and target firms should rise under the market efficiency or foreclosure hypothesis, the effects on the acquiring firm will depend on how much of the increased value is captured by target shareholders. In our sample, the two-day cumulative average return was 12.2 percent for the targets and 1.9 percent for the acquirers, and both were statistically significant at the 1 percent confidence level.⁴

The different hypotheses also have similar implications for the reaction of stock prices of target and acquiring firms to the announcement of an antitrust complaint. An antitrust complaint should increase the probability that the merger will not be consummated, preventing any potential gains that would accrue from the acquisition. In addition, it increases the probability of incurring significant legal expenses. As a result, both the target and acquiring firms are expected to react negatively to a an announcement of an antitrust complaint. In our sample, the two-day cumulative average return was -6.1 percent for the targets and -1.2 percent for the acquirers, and both were statistically significant at the 1 percent confidence level.⁵ Since the competing hypotheses are not differentiated by examining the share prices of targets or acquirers, we focus our empirical test on the rivals.⁶

⁴The target firms in the 20-day event window have risk-adjusted gains of 20 percent and for the largest event window (35 days) the risk-adjusted gains are 24 percent. Both are significantly different from zero at the 1 percent confidence level. These gains are similar to the gains reported in Jensen and Ruback's (1983) survey of gains from mergers. Thus, at the time of the announcement, the merger is expected to succeed.

⁵Because the antitrust complaints frequently occurred subsequent to the acquisition, only 7 targets remain in the sample for the complaint date.

⁶For both the acquirer and the target, the merger and complaint announcements are statistically significant at the 1 percent confidence level. Thus, any failure to find an effect on rivals is not because the announcements are viewed as economically insignificant.

Data

To determine if anticompetitive foreclosure is a serious problem, we examined all vertical mergers challenged by the Justice Department and the Federal Trade Commission for the period from 1963 to 1982. These cases are summarized in the American Bar Association's Merger Case Digest and in various editions of the Commerce Clearing House Trade Regulation Reporter. From the case summaries and a reading of the actual cases, the products and their vertical relationships are established. Because vertical relationships are difficult to determine, we examine only challenged cases in which the antitrust authorities had not only established the vertical relationship, but also indicated the belief that foreclosure was a serious potential problem.

Since the test of the foreclosure theory requires an evaluation of the effect of vertical merger announcements on the rivals of the merged firm, it is important to carefully determine the rival firms that produced the same products at the time of the merger. Generally, competitors were not listed in the cases, so we referred to various trade publications for the year prior to the merger. For most cases, competitors were found in Thomas' Register of Products and Services, which provides a list of the producers of raw materials, industrial products, and intermediate goods and services. This list of rivals at the time of the merger was supplemented by contacts with trade associations, trade publications, phone conversations with company officials, and general sources such as the Chemical Buyers Handbook. To be included in the sample, the rival had to trade on the New York or American stock exchange so that its share prices were available on the CRSP tapes.

This procedure has several advantages over alternative test designs. Other studies examining horizontal mergers have found rivals by using 4-digit

SIC product codes from the CRSP tape, Standard & Poor's Registry of Corporations, or Dunn and Bradstreet's Million Dollar Directory. However, SIC product codes are sometimes broader than the product relevant for a case. Our classification system omits some rivals, but it has the advantage that our rivals produce the products cited in the case.

Only unintegrated rivals may be foreclosed by a vertical merger, because integrated rivals will not face the higher marginal costs that occur because of the vertical merger. We eliminated any firm that we found to be producing in both upstream and downstream markets according to the sources we used to identify rivals. In addition, we talked with company officials and used SIC codes from Standard & Poor's Registry of Corporations to verify that our rivals were unintegrated. Since 4-digit SIC designations were often broader than the product categories in the case, some unintegrated competitors are eliminated. However, this approach is preferred, because including integrated firms in the sample will bias the results against finding effects from foreclosure. We dropped from our sample vertical merger cases challenged by federal agencies under any of the following conditions:

1. If no clear vertical relationship could be established, either because horizontal or conglomerate concerns dominated the vertical aspects of the case or because the potential for foreclosure could not be defined. For example, in the ITT Canteen case the vertical relationship was both a food service provider and a buyer of food services. Since any firm could purchase food services, no clear potential for foreclosure could be established and the case was dropped from this study.

2. If all of the rivals were vertically integrated or the unintegrated rivals were not listed on the New York or American stock exchanges.

3. If no merger announcement could be established. The New York Times, The Wall Street Journal, and in some cases employees of the firms were consulted to ascertain merger dates.

4. If neither the acquirer nor the target appeared on the CRSP tape.

The major reason for dropping cases was that the merger announcement was not available. The final sample included 19 cases and 150 rival firms for the merger announcement window and 134 firms for the complaint announcement window.

IV. Methodology and Empirical Results

This study follows the methodology of event studies that look at the impact of mergers on stock prices. The methodology used in this paper is more completely described in Dodd and Warner (1983) and Dodd (1980). While horizontal mergers have been studied extensively, few authors have examined vertical mergers.⁷

The daily stock prices for all the rival firms were gathered for a period 200 days prior to the first announcement of a vertical merger until 10

⁷Eckbo (1983) focused on horizontal merger cases and used vertical mergers primarily as a control group in his study of horizontal mergers. While anticompetitive horizontal mergers imply higher profit for rivals, anticompetitive foreclosure implies lower profit for rivals. Eckbo's discussion and tests do not address these differences. As well as being less selective in choosing cases and rivals, his study does not examine acquirers as well as targets, upstream and downstream differences, or structural variables related to potential foreclosure.

days after the merger announcement. We first formed an equally weighted portfolio of the relevant rivals in the industry. This provides an estimate of the impact of the merger announcement on the average rival in the industry and avoids problems with the contemporaneous correlation across rival firms. To test the effects of the merger, the market model is estimated from 200 to 30 days before the merger announcement. To determine the expected return prior to the vertical merger, the following regression is estimated:

$$(1) \quad R_{it} = a_i + b_i R_{mt} + e_{it} \quad t = -200 \dots -30$$

where R_{it} is the return to firm i in period t , R_{mt} is the return to the market at time t , and e_{it} is a normally distributed error term. The abnormal return is calculated as the difference between the actual return and the estimated return,

$$(2) \quad ER_{it} = R_{it} - a_i - b_i R_{mt}$$

and the cumulative average residual (CAR) is the sum of the abnormal returns over the event period (k).

$$(3) \quad CAR_{it} = \sum ER_{it}$$

To determine whether the errors are significantly different than 0, the errors are standardized.

$$(4) \quad SER = (ER_{it}) / \{s_i^2 [1 + (1)/(N) + [R_{mt} - R_m]^2 / (R_{mt} - R_m)^2]\}^{.5}$$

where s_i^2 is the residual variance from equation 1, R_m is the average market return over the period estimated in equation 1, and N is the number of days in the estimation period. Summing the standardized errors provides the standardized cumulative residual which is distributed $T(N-2)$.

$$(5) \quad SCR_i = (SER_{it})k^{-.5}$$

SCR_i is the test statistic used for individual firms or for equally weighted industry portfolios. When the industry portfolios are aggregated, the test statistic is assumed to be distributed standard normal:

$$(6) \quad z = (ASCR)^{.5}$$

$$(7) \quad ASCR = (1/I) \sum_1^N (SCR_i)$$

The announcement day is the day the announcement of the merger appears in the Wall Street Journal. Frequently it is difficult to determine if the announcement occurred before trading stopped for the day; therefore, the two-day event window, which includes the day before and the day of the Wall Street Journal announcement, is used to capture the smallest event window that includes all announcements. We also included a three-day event window (one day before and one day after the announcement), and a 20-day event window (15 days before the announcement until five days after the announcement). We focus on the smallest event window because longer event windows are more likely to include factors that cause a portfolio of rivals in a particular

industry to diverge from the usual relationship with the market portfolio. Where relevant, we cite differences that occur with the larger event windows.

The average cumulative return is examined over all industries, as shown in Table 2. We split the sample two ways, into upstream and downstream rivals of the merging firm, and into rivals of the target and the acquiring firms. (Table 4 will provide a description of the upstream and downstream markets in each of the cases.)⁸

The downstream/upstream split examines whether foreclosure is more likely in downstream markets, as suggested by Salinger (1988; 1989). The target/acquirer split focuses on informational gains, which may differ between these two groups. If rivals of targets are more likely to be acquired as more bidders realize the potential gains of vertical integration, we may expect rivals in the target industry to be more likely to show positive gains.

The statistical results are inconsistent with the foreclosure hypothesis. For the two-day event window, only the rivals of the acquiring firm have negative residuals.⁹ Furthermore, none of the event windows is significant at the 5 percent level.

The evidence from stock price movements suggests that foreclosure is not the dominant effect of vertical mergers on unintegrated rivals. It is possible, however, that the negative effects of foreclosure on unintegrated rivals' stock prices are offset by a positive information effect. To examine

⁸As noted above, we focus on the unintegrated rivals because of the consistent result in theoretical work that they should be less profitable. We did examine integrated rivals and found no statistically significant effect on rival stock prices of a merger announcement.

⁹It is possible for the mean cumulative residual to be positive and the mean cumulative standardized residual to be negative if most residuals are positive with a few large negative outliers.

Table 2
Response of Stock Prices of Rival Firms to Announcement of Vertical Mergers

Days in Event Window	Measure	All Rivals	Downstream Rivals	Upstream Rivals	Target Rivals	Acquiring Rivals
2	Residual	.000	.001	.000	.003	-.002
	Z Statistic	-.079	.272	-.415	1.068	-1.067
3	Residual	.000	.002	-.002	.004	.003
	Z Statistic	.240	.807	-.529	1.240	-.791
20	Residual	.001	.004	-.002	.011	-.007
	Z Statistic	.208	.298	-.018	1.297	-.887

this possibility, we reviewed the announcement of the antitrust complaint that was designed to prevent foreclosure. As noted above, the announcement of the complaint will have little information content, so if foreclosure is a problem, the complaint announcement should cause the stock price of unintegrated rivals to rise. Table 3 shows the rivals' reaction to an announcement of an antitrust complaint. For the all unintegrated rivals (first column), the signs are negative but statistically insignificant for the three event windows examined. Similarly, when the sample is split between downstream and upstream rivals and between target and acquiring rivals, the signs are generally negative but insignificant. This evidence provides no support for the foreclosure hypothesis.

The lack of support for the foreclosure hypothesis may be a result of the aggressive stance towards vertical foreclosure taken in the 1960s and 1970s. If many weak cases are undertaken by the government, the extent of possible foreclosure may be biased against finding an effect when the data are averaged across all cases. Since the Krattenmaker and Salop (1986) and the Salinger (1988) models both require market power for anticompetitive

Table 3
 Response of Stock Prices of Rival Firms to Announcement of Complaint by
 Antitrust Authorities

Days in Event Window	Measure	All Rivals	Downstream Rivals	Upstream Rivals	Target Rivals	Acquiring Rivals
2	Residual	-.004	-.006	-.001	-.007	-.001
	Z Statistic	-1.163	-1.468	-.132	-1.926	.195
3	Residual	-.002	-.005	.003	-.006	.002
	Z Statistic	-.271	-.969	.640	-1.158	.700
20	Residual	-.001	-.006	.006	.005	-.006
	Z Statistic	.355	-.268	.806	.938	-.382

foreclosure, structural variables can help identify the most likely cases for market foreclosure. Table 4 provides lists of firms and products, as well as the two-day residual and several structural variables. The first structural variable is the four-firm concentration ratio for the 5-digit product class. The concentration ratio was taken from the Census of Manufactures volume immediately preceding the announcement date, unless otherwise noted. For non-manufacturing industries, no four-firm concentration ratio was available. For those cases involving manufacturing industries, the concentration ratios are quite high; in 13 of the 17 cases, the concentration ratios were at least 50 percent in either the upstream or the downstream market.

The second structural variable was a measure of economies of scale. Using methodology first used by Commanor and Wilson (1967), we calculate the average plant size among the largest plants accounting for 50 percent of the industry's output, scaled by total industry output. The industries where economies of scale are most important tend to be the most concentrated, but the overall correlation of 0.13 is low.

Table 4
Structural Variables in Vertical Merger Cases

Firm	A*	D=#	Two-Day Residual	Product	Announcement Date	Four-Firm Concentration Ratio-(%)	Economy of Scale	Absolute Capital (\$ Thousands)
Albertsons	1	1	-.010	retail grocery	1972			
Mountain	0	0	-.010	distribution	1972			
Allis	1	1	.024	sells tractors	1965			
Simplicity	0	0	.022	manuf. tractors	1965	42	.015	13,045
Aluminum	1	0	-.003	primary aluminum	1964	93	.043	55,923
National	0	1	-.005	fabricator alum.	1964	33	.002	656
Budd	1	0	-.008	truck parts	1973	64	.203	111,751
Gindy	0	1	.081	truck trailer	1973	46	.029	10,854
Caterpillar	1	1	-.003	diesel engines	1967	81	.037	19,109
Chicago	0	0	.014	compressors	1967	90 ^a	.011	4,892
Cooper	1	0	.011	compressors	1967	58	.011	4,892
Waukesha	0	1	.012	gas engines	1967	91	.014	38,567
Eaton	1	0	.004	engine parts	1969	63	.312	437
McQuaay	0	1	-.014	engine wholesale	1969			
Endicott	1	0	-.010	footwear manuf.	1965	25	.002	496
Nobil	0	1	.004	shoe retailer	1965			
Fruehauf	1	1	-.019	truck trailers	1973	46	.029	10,854
Kelsey-Haye	0	0	.015	truck parts	1973	64	.203	111,751
Gifford	1	0	-.004	cement hydrolic	1972	78 ^b	.006	13,885
Becker	0	1	.007	ready-mix cement	1972	30 ^b	.001	719
General	1	0	-.013	flour	1968	31	.010	4,703
Gorton	0	1	-.017	frozen fish	1968	32	.013	998
Inco	1	0	.076	nickel	1974	74	.045	14,957
ESB	0	1	.014	batteries	1974	58	.024	5,094
Chrysler	1	1	.005	trucks	1964	81	.007	59,044
Mack	0	0	-.007	diesel engines	1964	72	.037	19,454
Combustion	1	1	.002	sell nucl. fuel	1968			
United	0	0	-.001	prod. nucl. fuel	1968			

Table 4 - continued
Structural Variables in Vertical Merger Cases

Firm	A=*	D=#	Two-Day Residual	Product	Announcement Date	Four-Firm Concentration Ratio-(%)	Economy of Scale	Absolute Capital (\$ Thousands)
Occidental	1	0	-.007	resins	1978	25	.032	69,975
Mead	0	1	-.018	paper mill	1978	25	.035	88,752
OKC	1	0	.005	cement hydrolic	1969	87 ^b	.006	15,725
Janke	0	1	.014	ready-mix cement	1969	34 ^b	.001	785
Firestone	1	0	-.001	tire manufacturer	1965	72	.030	42,063
Abel	0	1	-.007	tire retailer	1965			
White Cons.	1	1	-.015	farm machinery	1970	45	.018	24,298
White Motor	0	0	-.007	diesel engines	1970	81	.036	24,471
Illinois C.	1	0	.004	brake parts	1971	63	.014	87,360
Midas	0	1	-.019	brake repair	1971			

* acquirer = 1, target = 0

downstream = 1, upstream = 0

^a Concentration ratio taken from case

^b Concentration ratio taken from "Economic Report on Mergers and Vertical Integration in the Cement Industry," Federal Trade Commission, 1967. The concentration ratios are for the regions specified in the case, since cement is a regional market.

The third structural variable is absolute capital requirements. Again following methodology first used by Commanor and Wilson (1967), we multiply the average output level of the plants estimated to be of minimum efficient scale times the ratio of depreciable assets to the value of shipments, taken from the Annual Survey of Manufactures the year prior to the announcement date. While the correlation between absolute capital and concentration is low (0.14), the correlation between economies of scale and absolute capital is 0.37.

We also tried to use an advertising/sales ratio from the Internal Revenue Service Source Book. Only four industries had an advertising/sales ratio greater than 1 percent, presumably because most of the products in our sample are not consumer goods. Because the values were so low as to be unlikely to serve as a barrier to entry, and because it made no difference in any of the statistical tests, we have omitted this variable.

Table 5 reports the results of regressing the two-day cumulative residuals on our three structural variables. We also add two dummy variables; a dummy variable that is 1 for the acquirer industry and 0 for the target industry, and a dummy variable that is 1 for downstream and 0 for upstream industries. The theoretical models of Salinger (1988) and Ordoover, Saloner and Salop (1990) have foreclosure occurring in the downstream market. Consistent with these models, the downstream dummy should be negative. Concentration ratios, economies of scale, and absolute capital should all be negative, as more concentrated industries (and greater barriers to entry) result in greater negative returns for unintegrated rivals. The results do not provide much support for foreclosure. None of the variables

Table 5
 Regressions of Two-Day Cumulative Residual on
 Structural Variables

Constant	.002 (.100)
Acquirer dummy	-.010 (-1.034)
Downstream dummy	-.002 (-.214)
Concentration ratio	.000 (1.019)
Economies of scale	.021 (.295)
Absolute capital	-.000 (-.836)

Observations = 29

$R^2 = .10$

t-statistic in parentheses

are significantly different from 0 at the 5 percent confidence level, and the coefficient on economies of scale has the wrong sign.

While over the entire sample the structural variables provide no support for the foreclosure hypothesis, it is possible that in the most concentrated industries significant foreclosure occurred. Table 6 provides the two-day cumulative residuals for cases where both the upstream and the downstream markets had four-firm concentration ratios greater than 50 percent. In both upstream and downstream markets, three of the four cases have a positive coefficient and none of the coefficients are significant at the 5 percent confidence level. Thus, even in the most concentrated industries the evidence is inconsistent with foreclosure.

Table 6
 Response of Stock Prices of Rival Firms to Announcements of Vertical Mergers
 in Highly Concentrated Industries

DOWNSTREAM			UPSTREAM		
Downstream Firm	Four-Firm Concentration Ratio	Two-Day Residual	Upstream Firm	Four-Firm Concentration Ratio	Two-Day Residual
Caterpillar	81	-.003	Chicago	90	.014
Waukesha	91	.012	Cooper	58	.011
ESB	58	.014	Inco	74	.076
Chrysler	81	.005	Mack	72	-.007

Our finding indicates that vertical mergers contested in the past did not have significant foreclosure of unintegrated rivals. However, the absence of effects in industries with high concentration ratios and substantial barriers to entry, factors considered in Department of Justice guidelines for vertical mergers, has implications for future antitrust policies. Before more activist policy against vertical mergers is resumed, more work needs to be done to determine if the theoretical models have any empirical relevance.

V. Conclusion

Recent theoretical models show that foreclosure from vertical mergers can result in higher costs for unintegrated competitors and higher prices for consumers. A necessary but not a sufficient condition for anticompetitive foreclosure is that unintegrated rivals will be less profitable. In a sample selected from all vertical mergers challenged by the Justice Department and the Federal Trade Commission between 1963 and 1982, we find no evidence of anticompetitive foreclosure.

The failure to find significant foreclosure may be due, in part, to the aggressive prosecution of vertical merger cases during this period. If

mergers with potential foreclosure issues were avoided because of the threat of litigation, we might not find any foreclosure in contested cases. Assuming that the strongest cases were contested, our evidence indicates that few if any vertical mergers during this period had anticompetitive effects.

Among those cases that were contested, several had very high four-firm concentration levels at the 5-digit level of classification. These cases provide no support for foreclosure. Similarly, cases with high barriers to entry, such as economies of scale and absolute capital requirements, provide no evidence of foreclosure.

The results reported in this paper do not preclude economic foreclosure as a possibility; however, during the period examined, the Justice Department and the Federal Trade Commission did not identify cases where foreclosure was a problem. As long as cases where economic foreclosure occurs are difficult to identify, the enforcement agencies' current neglect of vertical merger cases is well founded. For theoretical models of anticompetitive mergers to be useful to policymakers, they must provide methods of identifying cases that should be contested.

Appendix

The purpose of this Appendix is to illustrate that a necessary condition for anticompetitive foreclosure is that unintegrated rivals are less profitable after the merger. We use a simple Cournot model consistent with Salinger's model (1988) and assume that the input and the final product are produced under constant marginal cost conditions, and that after the merger the integrated firm no longer sells inputs to its unintegrated rivals in the downstream market. We assume that the firm vertically integrating (firm 1) and the n unintegrated rivals have linear demand and linear fixed coefficient cost curves in the downstream market. For simplicity, we assume the n unintegrated rivals are identical so that the rivals have identical costs, though this assumption can be relaxed without altering the results.

$$(8) \quad P = A - B(q_1 + \sum_{i=2}^{n+1} q_i)$$

$$(9) \quad C_1 = a_1 q_1, \quad C_i = a_2 q_i \quad i=2, \dots, n+1$$

where:

P = price of final product

C_1 = total cost for firm 1

C_i = total cost for firm i

q_1 = quantity of goods sold by firm vertically integrating

q_i = quantity of goods sold by unintegrated firm i

a_1 = marginal cost of firm vertically integrating

a_2 = marginal cost of unintegrated rivals.

Assume that π_1 is the profit from the downstream operations of the firm vertically integrating and π_i is the profit in the downstream market for its unintegrated competitors.

$$(10) \quad \pi_1 = Aq_1 - B\left(q_1 + \sum_{j=2}^{n+1} q_j\right)q_1 - a_1q_1$$

$$(11) \quad \pi_i = Aq_i - B\left(q_1 + \sum_{j=2}^{n+1} q_j\right)q_i - a_2q_i$$

In equation 12, the reaction functions of firm 1 and the unintegrated firms are derived from the first order conditions. In equation 13, the equilibrium quantities for firm 1 and the unintegrated firms, which are a function of the demand parameters and each firm's marginal cost, are obtained by equating the reaction functions.

$$(12) \quad \begin{aligned} q_1 &= [(A - a_1)/(2B)] - (1/2nq) \\ q_i &= [(A - a_2)/(2B)] - [(1/2)(q_1 + (n-1)q)] \end{aligned}$$

$$(13) \quad \begin{aligned} q_1 &= [(A - (n+1)a_1) + (na_2)] / [(n+2)B] \\ q_i &= (A - 2a_2 + a_1) / [(n+2)B] \end{aligned}$$

Substituting the values for q_1 and q_i in equation 13 into equation 8, we solve for the price in the downstream market, which can be written as

$$(14) \quad P = (A + a_1 + na_2) / (n+2)$$

In Salinger's model a vertical merger has two effects. One, competition in the unintegrated segment of the input market decreases because the merged firm neither buys from nor sells to the unintegrated downstream firms, causing the price of the input to unintegrated firms in the downstream market to rise. And two, the marginal cost of the merged firm in the downstream market falls because it can avoid the monopoly rents charged in the upstream market. The lower marginal cost allows the merged firm to lower its price in the downstream market and expand its output, thus reducing the derived demand for the unintegrated rivals in the upstream market. When the effect of the decrease in competition dominates the decrease in the derived demand, the price of the input to the unintegrated segment of the downstream market increases. When this effect exceeds the reduction in the integrated firm's cost, the price of the final product increases and the consumers are made worse off.

The implication of Salinger's model is that a vertical merger will lead to economic foreclosure when the following three conditions are met. One, the marginal cost to the unintegrated rival in the downstream market (a_2) increases. Two, the marginal cost to the integrated rival (a_1) decreases. And three, the decrease in the final product marginal cost for the integrated firm is less than the increase in the final product marginal cost for the unintegrated firm (i.e., $-da_1 < da_2$).

The effects of an increase in the marginal cost of the unintegrated rival (a_2) in the downstream market are:

$$\begin{aligned}
 (dq_1)/(da_2) &= n/[(n+2)B], \\
 (dq_1)/(da_2) &= (-2)/[(n+2)B], \\
 (dP)/(da_2) &= [n(n+2)]
 \end{aligned}$$

(15)

Since the increase in the final product marginal cost to the unintegrated firm reduces its output, and since the final product price increases less than the increase in marginal cost (i.e., $dp/da_2 < 1$), the profits of the unintegrated rival in the downstream market will fall. The effects of the decrease in marginal cost of the integrated firm (a_1) on unintegrated rivals are:

$$\begin{aligned}
 (dq_1)/(da_1) &= [-(n+1)]/[(n+2)B], \\
 (dq_1)/(da_1) &= 1/[(n+2)B], \\
 (dP)/(da_1) &= 1/(n+2)
 \end{aligned}$$

(16)

Again, the unintegrated rival in the downstream market is less profitable, since the lower marginal cost for the integrated firm decreases both the price and the quantity of goods sold by the unintegrated rival. Thus, a decrease in a_1 results in lower profits:

$$(d\pi)/(da_1) = (q_1 B + P - a_2)/[(n+2)B] > 0$$

(17)

Therefore, both the increase in a_2 and the decrease in a_1 result in lower profits for unintegrated firms in the downstream market.

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