U.S. Consumers' Holdings and Use of $100 Bills

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Abstract:

Conventional wisdom asserts that $100 bills are often associated with crime and foreign cash holdings, leading some commentators to call for their elimination; in light of this view, it is useful to examine the legal, domestic use of cash. This report uses new data from the 2012 Diary of Consumer Payment Choice (DCPC) to evaluate consumer use of $100 bills as a means of payment. On a typical day in the United States, 5.2 percent of consumers have a $100 bill in their pocket, purse, or wallet. But only 22 percent of U.S. consumers have at least $100 in their wallet, pocket, or purse. Of these cash-intensive consumers, the main association with holding a $100 bill is the amount of cash carried. A consumer who carries $400 to $699 has a 64 percent probability of carrying at least one $100 bill.

Keywords: money demand, currency denominations, $100 bill, Diary of Consumer Payment Choice

JEL codes: D14, E41

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The demand for money is one of the most extensively studied topics in economics.[1] However, the demand for money in the form of currency (bills, notes, and coins) or "cash" is much less scrutinized, in part due to limited availability of data on cash management and currency in circulation outside banks. Very little attention has been given to the demand for, and use of, particular denominations of currency.[2]

As the payment system has shifted toward electronic alternatives, the call for a reduction in the use of cash—or even its elimination—has grown louder.[3] Eliminating physical currency could, in theory, alleviate the "zero lower bound" on interest rates when inflation is very low and provide monetary policy makers more options when economies are weak. And, aside from payment cards, electronic payments offer a potentially lower-cost medium of exchange.

Historically, perhaps the greatest concern about cash has been its association with criminal activity, which is often assumed to account for the vast majority of cash use. In this regard, the $100 bill—now the largest U.S. denomination—receives the most attention. Naturally, most anti-counterfeiting activity centers on $100 bills because the $100 bill gives counterfeiters the greatest "bang for the buck." Critics also point out that most $100 bills are shipped to foreign countries, perhaps for illegal purposes, and assume that most of the remaining $100 bills are used domestically by drug dealers, crime syndicates, and the like. Recently, Harvard economist Kenneth Rogoff called for the total elimination of $100 bills.[4] According to Rogoff (2014), the evidence suggests that, in most countries, more than 50 percent of currency is used to facilitate anonymous transactions for tax evasion or other illegal activities.

Before the U.S. government eliminates its largest denomination, it may be useful to examine the *legal domestic* use of $100 bills, especially among consumers. Until now,

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[1] Surveys of this voluminous literature include: Barnett, Fisher, and Serletis (1992); Ducaa and VanHoose (2004); Judd and Scadding (1982); Laidler (1993); Thompson (1993).

[2] Exceptions include Judson (2012) which estimates shares of U.S. currency inside and outside of the U.S.; Bouhdaoui, Bounie, and Van Hove (2011), which reviews the literature about denominational structure; Lee, Wallace, and Zhu (2005), which examines holdings of different denominations and the ability to use them in transactions; and Fulford, Greene, and Murdock (2014), which provides data on consumers' holdings of dollar bills.

[3] For example, see, Timothy Noah, "Ban the Benjamins!" Slate.com (December 9, 2010) and Matt Phillips, "$100 Bills Make Up 80% of All U.S. Currency—But Why?" theatlantic.com (November 21, 2012).

[4] Kenneth Rogoff. "Paper money is unfit for a world of high crime and low inflation." *Financial Times* (May 28, 2014).

surprisingly little has been known about consumer use of cash and its denominations. However, the 2012 Diary of Consumer Payment Choice (DCPC), a collaborative study by the Federal Reserve Banks of Boston, Richmond, and San Francisco, provides a unique snapshot of consumer spending in October 2012, including consumer cash behavior. Respondents were instructed to write down all their payments. While some reported transactions may be associated with criminal activity or tax evasion, we presume that most of these reported transactions, in particular, payments to retailers, were legal.[5]

The DCPC shows that consumers still use cash heavily as a means of payment. U.S. consumers age 18 and older carry an average of $56 on their person (pocket, purse, or wallet), and the median consumer carries $22. Cash is still the most common method of payment for consumers (40.3 percent of the number of payments per month), even though the dollar value of these payments is relatively low (14.2 percent of value per month) because the average cash payment is small ($20.73). Only 6.6 percent of reported cash payments by number of transactions (12.3 percent by value) were in categories that were not well defined or documented and, therefore, might be more likely to be associated with criminal or underground economic activity.

The DCPC gathers information on individual denominations, including the use of $100 bills carried in a pocket, purse, or wallet as a means of payment (medium of exchange).[6] (The Boston Fed's annual Survey of Consumer Payment Choice (SCPC, 2008–2014) also provides information about consumer cash held elsewhere, presumably as a store of value that may include $100 bills, but it does not track currency denominations.) This report summarizes three aspects of U.S. consumer demand for $100 bills, using the DCPC. First, it reports who has at least $100 in cash. Second, it examines which consumers carry a $100 bill and where consumers with one or more $100 bills most likely got them. Third, it describes, as well as the diary data

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[5] Categories that might be associated with criminal or underground economic activity were broadly defined for this analysis as payments reported in the following undocumented categories: payments to friends and family, to people who provide goods and services, to other people, "I don't know" responses, or category not reported.

[6] For an international comparison of consumer payment behavior using diary surveys, see Bagnall et al. (2014).

allow, how consumers use cash generally and how consumers with one or more $100 bills use them.

Historical background

In 1969, the $100 bill became the largest recirculating bill, when denominations from $500 to $10,000 were officially discontinued.[7] Figure 1 depicts the value of $100 over time. The nominal (face) value of a $100 bill does not have stable purchasing power over time because of inflation. After adjusting for inflation, the real value of a $100 bill had declined about six-fold to approximately $16 in 2012. This means that, in order to buy the same quantity of goods and services in 2012 as in 1969, consumers would need to hold more cash and potentially more $100 bills as well.

Value in Current Dollars of 1969 $100 Bill

Year	Value
1969	100.00
1976	68.15
1983	36.84
1990	28.08
1997	22.85
2004	19.42
2011	16.31
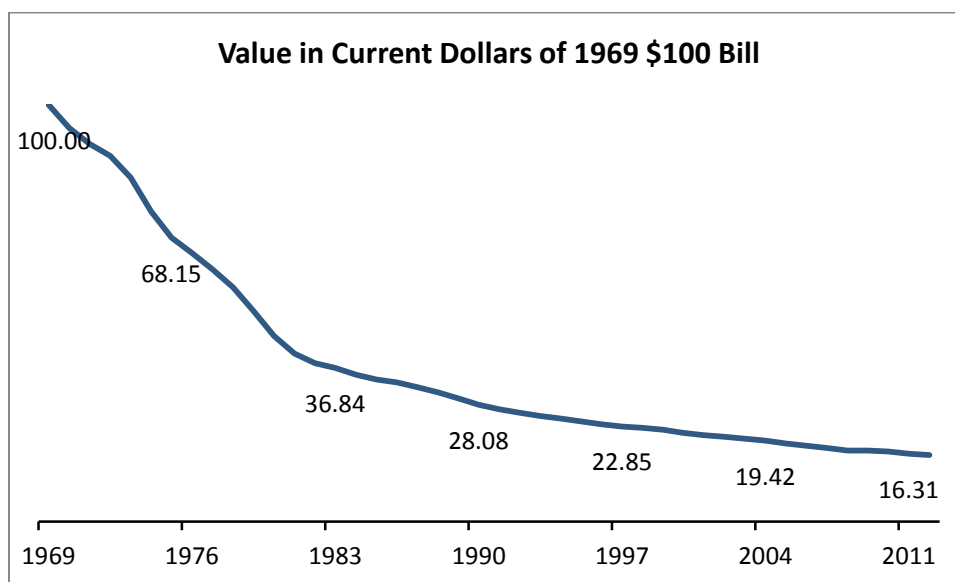
Source: Haver Analytics.

Figure 1: Value in current dollars of $100 in 1969.

Despite the increase in the use of noncash means of payment, currency in circulation (CIC) relative to gross domestic product (GDP) has been relatively stable over the past half century. As Figure 2 shows, the ratio has fluctuated between 3 percent to 4 percent (estimated domestic portion) and 4 percent to 6 percent (total). Over the past half century, the relative

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[7] Discontinued denominations do not recirculate when received by a Federal Reserve Bank. Discontinued denominations are legal tender but those that remain in circulation are most likely held by collectors. http://www.moneyfactory.gov/uscurrency/largedenominations.html

amount of currency decreased when interest rates trended upward and increased when interest rates trended downward. This negative relationship between currency and interest rates is evident among consumers even when short-term interest rates are essentially zero (Briglevics and Schuh 2013).

Currency in Circulation as a Percentage of Nominal Gross Domestic Product
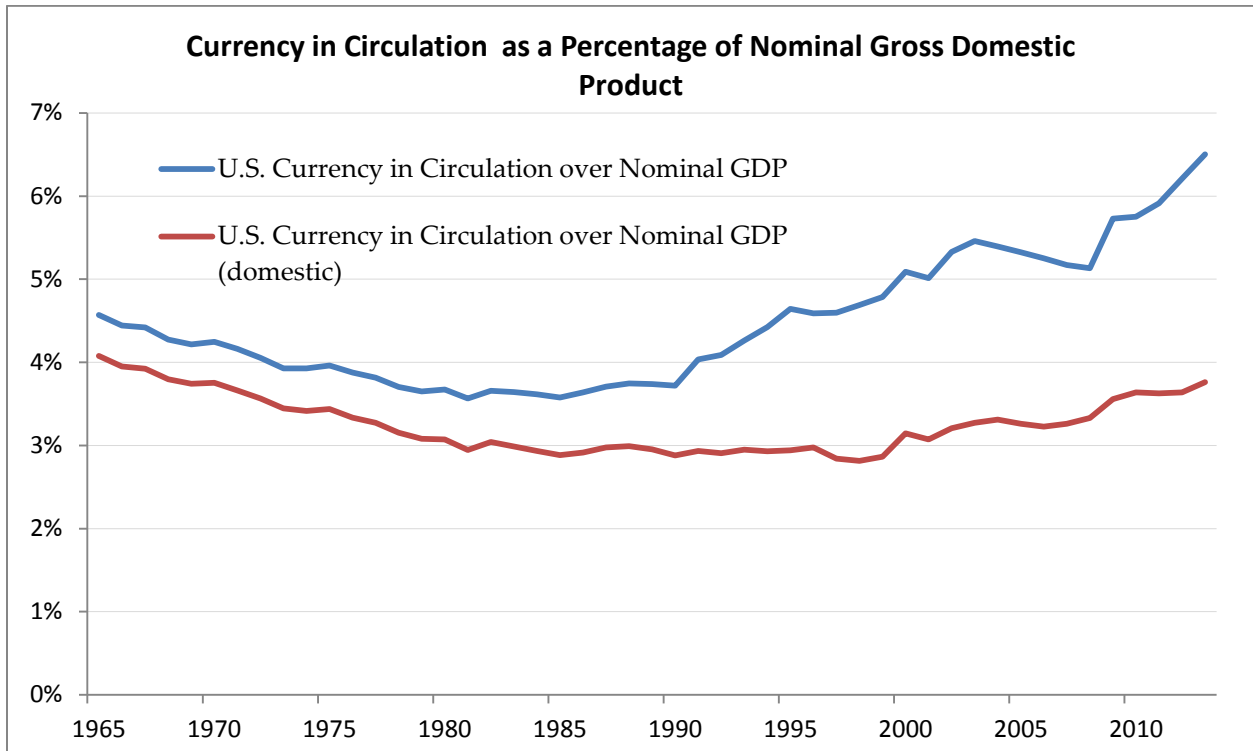
Sources: Bureau of Economic Analysis / Haver Analytics, Federal Reserve Board / Haver Analytics, authors' calculations.

Figure 2: Currency in circulation as a percentage of nominal gross domestic product, 1965–2013.

As Figure 3 shows, the value of all denominations in circulation has continued to increase since 1993, despite the increase in the use of noncash means of payment since that time. Overall demand for cash is expected to remain robust. A 2011 analysis projected that through 2020, "the value of the Fed's shipments of cash to the banking system [would] grow 1.7 percent per year" (Gerst and Wilson 2011b).

Over the last three decades, the value of 100s shipped by the Fed to depository institutions has increased dramatically relative to other denominations. This could be due in part to inflation, to the elimination of the larger denominations, and/or to an increase in

demand for U.S. currency outside the United States. Hundreds represented just about 10 percent of the value of cash shipped in January 1974, compared with 45 percent in 2010.[8] In 2013, the value of $100 bills in circulation was $925 billion—enough for every person in the United States (including children) to hold $3,000 in $100 bills.[9]
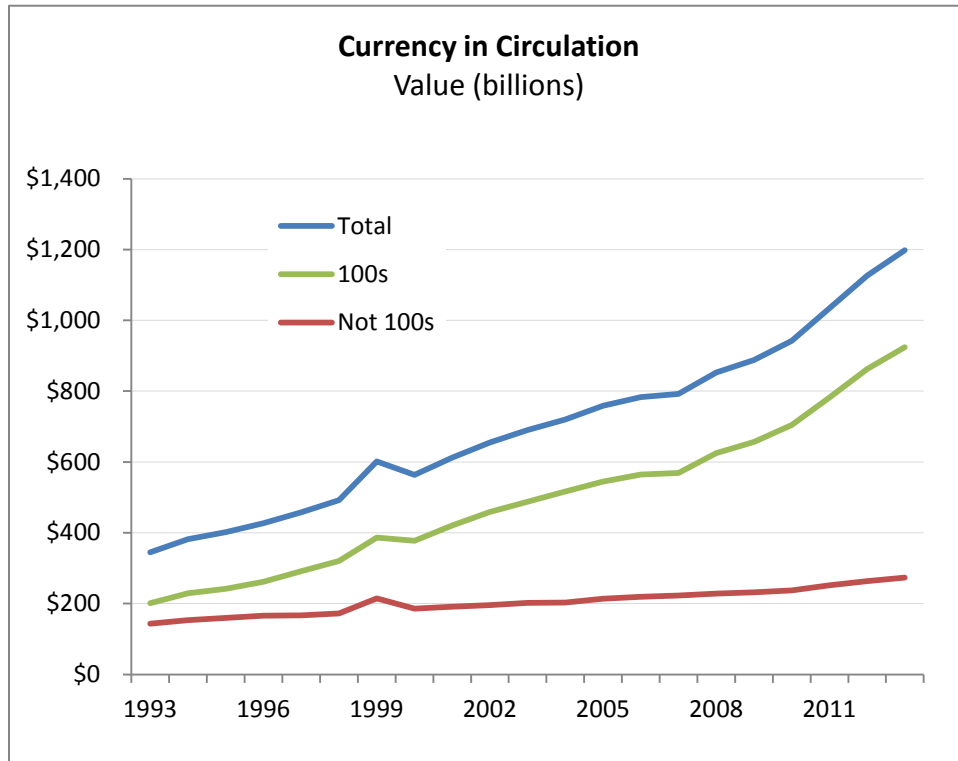
Currency in Circulation
Value (billions)

Figure 3: Currency in circulation, value by denomination. $100 bills versus other bills.

By volume, hundreds in circulation also increased. Figure 4 shows that, over 20 years, the number of 100s as a percentage of circulating currency doubled. In 1993, 100s represented 12.9 percent of circulating currency; in 2013, 100s represented 26.6 percent of circulating currency.

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[8] Gerst and Wilson (2011a), p. 7.
[9] 316 million men women children per U.S. Census Bureau Quick Facts. Value of currency in circulation, Board of Governors of the Federal Reserve System.
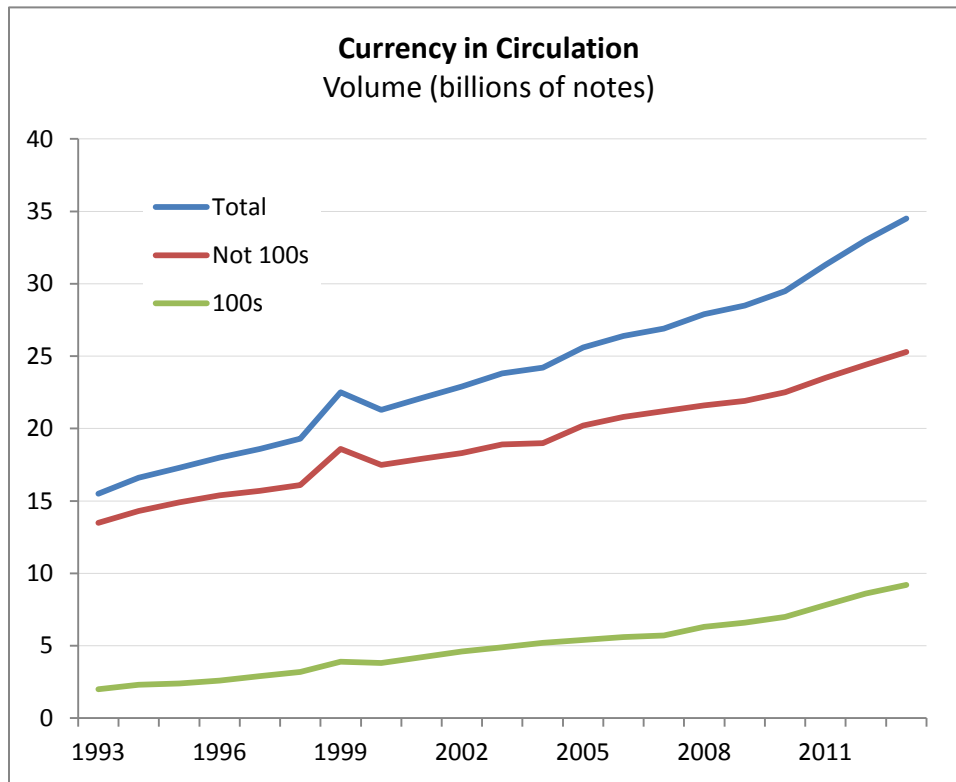
Currency in Circulation
Volume (billions of notes)

Figure 4: Currency in circulation, 1993–2013. 100s versus other denominations, billions of notes.

Of course, the average American does not hold this much cash. The total value of currency in circulation was $1,076 billion in October 2012, but adult consumers held about $115 billion (or about 11 percent).[10] Judson (2012) estimates that "about half of all U.S. currency, and about 65 percent of [100s], were held abroad as of the end of 2011, for a total value of about $500 billion."[11] The remainder of currency in circulation is held by governments, businesses, non-profit organizations, or elsewhere.

The nominal value of cash held by consumers more than tripled from 1984 to 2012, as shown in Table 1. During the same time, average cash holdings in real (inflation adjusted) terms increased by 27 percent. Median cash holdings as a percentage of personal disposable income, however, declined 21 percent. This decline partly reflects a trend shift in consumer

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[10] According to Schuh and Stavins (2014), total cash held by consumers on their person or property was $115 billion in October 2012 (or $464 per capita, based on the U.S. adult population estimate of 248 million from the U.S. Census Bureau).

[11] Judson 2012, page 12. Feige (2011) reports that estimates of the percentage of U.S. currency held abroad vary from 30 percent of value to 65 percent.

payment use from cash toward other payment methods.[12]   With consumers holding larger amounts of cash in nominal terms in 2012, one might expect the demand for $100 bills to be higher, too.

	1984	2012 SCPC*	Change
Nominal cash holdings, dollars (average)	53	174	+228 percent
Nominal cash holdings, dollars (median)	20	62	+210 percent
Real cash holdings, 2012 dollars (average)	117	174	+49 percent
Real cash holdings, 2012 dollars (median)	49	62	+27 percent
Average cash as a percentage of PDI/week/capita	21.6	18.2	-3.4 percentage points
Median cash as a percentage of PDI/week/capita	8.2	6.5	-1.7 percentage points
*Large-value holdings omitted, see Table 13, 2011–12 Survey of Consumer Payment Choice.			

Sources: 1984 Survey of Currency and Transaction Account Usage cited in Briglevics Schuh (2013); 2012 SCPC.

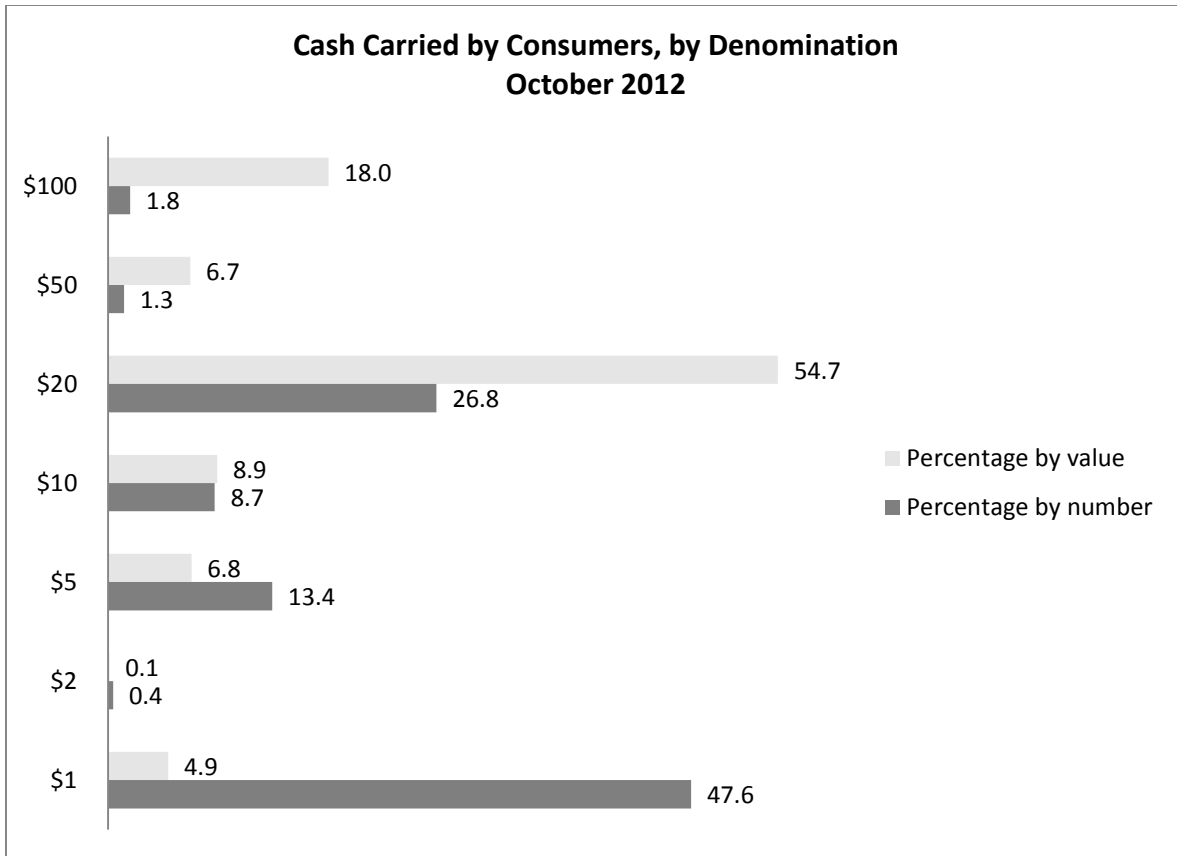**Table 1:** Consumer cash holdings, 1984 and 2012.

Despite the fact that as much as 65 percent of all $100 bills are held outside the United States,[13] $100 bills account for a nontrivial share of the cash carried by U.S. consumers, as shown in Figure 5. The DCPC asks consumers to report the mix of bills they carried in their wallet, pocket, or purse.[14] Although $100 bills accounted for only 1.8 percent of the number of bills carried by U.S. consumers, these $100 bills accounted for 18.0 percent of the value of cash these consumers carried. Moreover, the number of $100 bills carried by consumers was four times as large as the number of $2 bills they carried (0.4 percent of the number of bills). As noted above, these are $100 bills voluntarily reported by consumers and held on their person, presumably as a means of payment.

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[12] For example, Wang and Wolman (2014) used merchant transaction data from 2010 to 2013 to estimate that cash use at one discount retail store is falling at about 2.5 percentage points per year.

[13] Judson (2012).

[14] The Survey of Consumer Payment Choice asks consumers to report the amount carried on person (wallet, pocket, or purse) and also the amount held on property (home, auto). The Diary of Consumer Payment Choice asks only that consumers report the amount carried in wallet, pocket, or purse. In 2012, respondents to the SCPC reported carrying an average of $46 on person (outlier values omitted, median $25). Respondents to the DCPC reported carrying a similar average amount, $56 (median $22).

Cash Carried by Consumers, by Denomination
October 2012

Denomination	Percentage by value	Percentage by number
$100	18.0	1.8
$50	6.7	1.3
$20	54.7	26.8
$10	8.9	8.7
$5	6.8	13.4
$2	0.1	0.4
$1	4.9	47.6

Figure 5: Mix of consumer cash holdings by denomination in October 2012. Mean per day per consumer, percentage by value and number.

Who carries at least $100 in cash?

On any given day in October 2012, 5.2 percent of U.S. consumers carried at least one $100 bill in their pocket, purse, or wallet (on person). This statistic is somewhat incomplete because only consumers carrying at least $100 of cash (total of all denominations) could be carrying a $100 bill. As shown in Figure 6, cash holdings on person by U.S. consumers are skewed toward values much less than $100: 78 percent of consumers carried $99 or less, including 28 percent who carried $19 or less. A small proportion of consumers carry the largest amounts of cash in value. Only 22 percent of U.S. consumers carried $100 or more; just 8 percent carried $200 or more. Therefore, it is necessary to ask who carries $100 before asking who carries a $100 bill.

Frequency Distribution of Cash Holdings
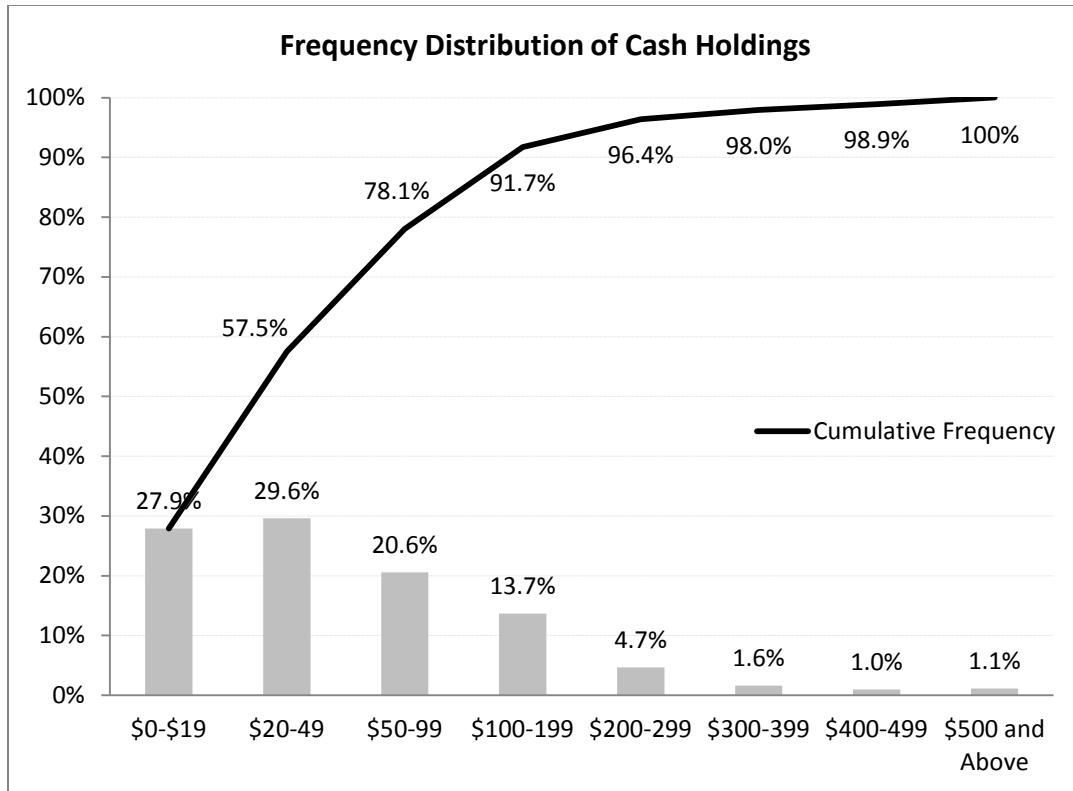
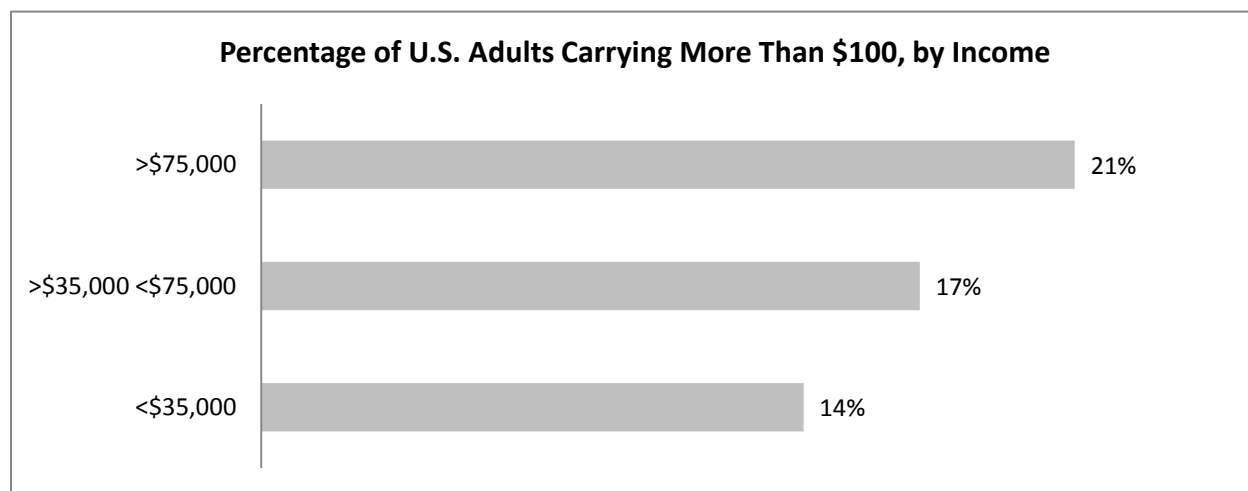**Figure 6:** U.S. consumers' cash in pocket, wallet, or purse, October 2012.

Using the DCPC data, we estimated an econometric model of the probability of a consumer carrying $100 or more.[15] Like most econometric models of money demand, the explanatory variables include income and wealth, the opportunity cost of holding cash (forgoing interest earned from a demand deposit account or accruing interest on revolving credit card debt), and the transaction cost of getting cash (approximated by the location of withdrawal). Other explanatory variables are included as well, such as cash spending behavior, payment card adoption, and more detailed demographic information. [16]

The model shows that the amount of money a person carries is correlated with income. Consumers with relatively higher income are statistically significantly more likely to carry $100

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[15] The model is analogous to the one in Briglevics and Schuh (2013), which uses data from the Survey of Consumer Payment Choice, except that the model here estimates the probability of having $100 or more rather than the dollar value of cash holdings. The latter is more typical in the money demand literature.
[16] Regression results are presented in Appendix B.

or more. Consumers who earn more than $75,000 per year are about 50 percent more likely to carry $100 in cash than consumers who earn less than $35,000 (Figure 7).

Percentage of U.S. Adults Carrying More Than $100, by Income

Income	Percentage
>$75,000	21%
>$35,000 <$75,000	17%
<$35,000	14%

Source: 2012 DCPC.

Figure 7: Percent of U.S. adults carrying more than $100, by income.

Consumers earning interest on demand deposits are slightly less likely to hold more than $100 in cash than those not earning interest. Similarly, but using a more complex econometric model, Briglevics and Schuh (2013) found that cash holdings and withdrawals are negatively correlated with interest rates, but only for consumers who do not carry revolving credit card debt.

Another opportunity cost of holding cash is incurring the cost of interest on credit card debt. A person who wants to carry more cash would have less money available to pay down credit card debt and, therefore, would pay more in interest. The analysis finds that people who do not pay their credit card balance in full at the end of the month—and thus carry revolving debt—are statistically significantly less likely to carry $100 or more, regardless of income. This finding suggests that consumers do evaluate the costs and benefits of other aspects of financial management when deciding to carry cash. In this case, however, there is not yet sufficient research to know whether this is because their funds are better used in paying down the credit card debt, because they are limiting their cash for budgeting purposes to avoid more debt, or for some other reason. Of course, the consumer may simply lack the funds to pay down the credit card balance or carry $100 or more.

The time elapsed since a consumer's previous cash withdrawal is a statistically and economically significant determinant of that consumer's holding $100 in cash. People carrying $100 or more were more likely to have withdrawn cash the preceding day. Respondents who withdrew cash on Monday were more likely to have $100 or more on Monday night, for example.

The cost of obtaining cash, as implied by the location of the withdrawal, is statistically and economically significant. People who receive cash back at a retail store are less likely to carry $100 or more than people who acquired cash in other ways (from a bank teller, check cashing store, or their employer), probably because many stores limit cash back to less than $100.

Not surprisingly, consumers who make a lot of cash payments are more likely to hold $100 or more in cash. Total cash purchases by dollar value in a day are positively correlated with holding $100 or more. However, without a more comprehensive model of payment choice (such as Briglevics and Schuh 2014), it is not possible to determine the direction of causality between holding cash and paying with cash.

Other factors (including income) being equal, consumers older than 55 are more likely than younger consumers to hold $100 or more. People who have a high school education or less are less likely to hold $100 or more. People who have a credit card are more likely to carry $100 or more. Other demographic factors are not statistically significant.

| Factors Positively Correlated with Carrying More Than $100 in Cash |
| --- |
| • Income |
| • Absence of revolving credit card debt |
| • Recent cash withdrawal |
| • Total dollar value of cash purchases |
| • Credit card adoption |
| • Older than 55 |
| • Education more than HS |

Source: Authors' calculations.

Table 2: Factors positively correlated with carrying more than $100 in cash.

Who carries a $100 bill?

Using the sample of consumers who carry $100 or more in cash, a second regression model identifies the determinants of the probability of carrying a $100 bill conditional on carrying $100 in cash. Naturally, the probability of carrying a $100 bill rises with the amount of cash holdings, even conditional on other variables. This result may reflect a desire by cash-rich consumers to economize on the number of bills of any denomination in their pocket, purse, or wallet.

Among consumers who carry $100 or more, about one in six (17.6 percent) carries at least one $100 bill. The probability of carrying a $100 bill rises as a consumer's total cash on person increases, as shown in Figure 8. For consumers carrying between $400 and $699, the probability of carrying $100 bill is more than 60 percent. The probability jumps to 94 percent when cash holdings exceed $700. In addition, as cash on person increases, consumers carry more $100 bills (Figure 9).
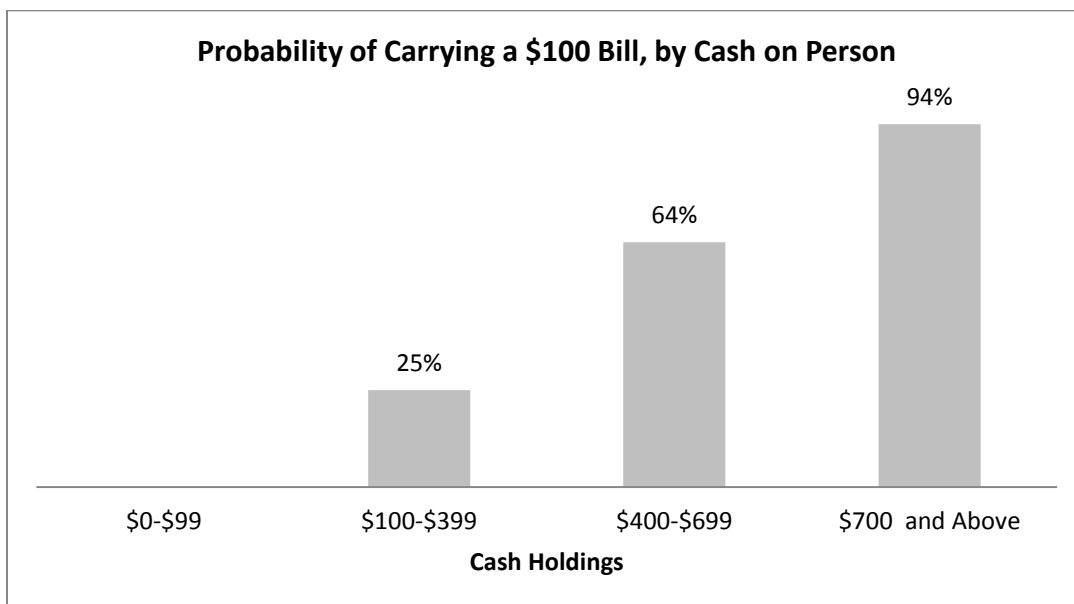
Source: 2012 DCPC.

Figure 8: Probability of carrying a $100 bill, by cash on person.

**Number of $100 Bills Held
by Total Cash Amount**
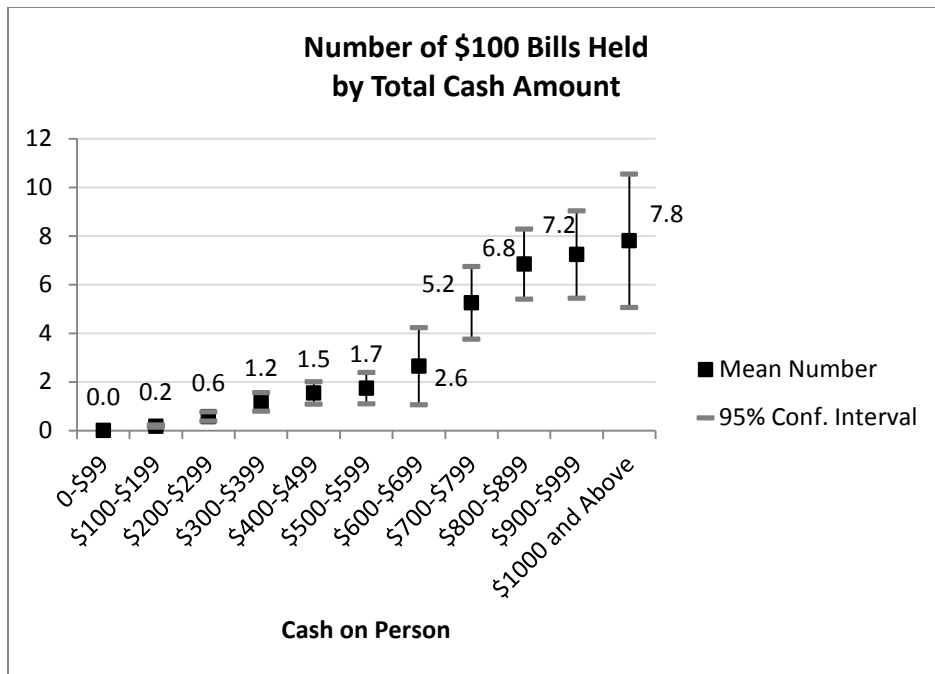
Figure 9: Number of $100 bills held, by total cash on person.

Unlike the choice to carry $100 or more in cash, few other variables explain consumers' carrying of $100 bills. Consumers could get $100 bills because they seek them out, or they could get them inadvertently in the course of their daily transactions. For example, a consumer could ask a bank teller to provide a particular mix of bills, including 100s, or the teller could determine the mix of bills. When they withdraw cash, few consumers withdraw more than $100. When consumers withdrew cash in October 2012, 29 percent withdrew $100 or more. Consumers who primarily withdraw their cash from ATMs are less likely to have a $100 bill; few ATMs dispense $100 bills.

The DCPC asks respondents to report their cash holdings by denomination at the beginning and end of the day. Therefore, if a respondent were to get cash and make cash payments over the course of one day, it would be possible for a $100 bill or bills to be withdrawn and used to make a payment without being reported in the beginning- or end-of-day cash holdings by denomination. Therefore, we estimate a lower bound of the probability

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by counting the observations that include both withdrawal during the day and an increased number of $100 bills at the end of the day.[17]

While income is an important factor in determining who carries at least $100 in cash, it does not appear to be related to whether or not a person carries a $100 bill. If they are carrying at least $100 and all other factors are equal, women are more likely than men to carry a $100 bill or bills and people younger than 25 are more likely than people 25 years old or older to carry a $100 bill or bills. No other demographic characteristics are helpful in explaining the probability of holding a $100 bill by a consumer who carries at least $100.

People who do not earn interest on their checking accounts are more likely to carry a $100 bill than people who do earn such interest, conditional on holding a given amount of money. This result is difficult to explain without a full economic model because the opportunity cost of holding a $100 bill is the same as the opportunity cost of holding $100 in multiple, mixed bills. However, people with no interest on checking may be able to economize more on (costly) trips to withdraw cash from a bank or ATM by carrying larger stocks of cash, and hence $100 bills, especially if they know that they will not need the $100 bill for a longer time.

In terms of consumer preference, consumers who rate cash as relatively more secure than credit cards are more likely than other consumers to be carrying a $100 bill.

Factors Positively Correlated with Carrying a $100 Bill, Conditional on Carrying $100
- Carrying more than $200 in cash   - Recent cash withdrawal from teller[18]   - Female   - Younger than 25

Source: Authors' calculations.

Table 3: Conditional on carrying $100, factors positively correlated with carrying a $100 bill.

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[17] If multiple withdrawals happened in a day and the consumer could have obtained $100 bills through more than one withdrawal, we ignore that day (two days' observations were dropped).

[18] "Teller" is the omitted variable in the regression equation.

How do consumers use their $100 bills?

A consumer who carries a $100 bill may use the bill to make a payment or may keep it in his or her wallet, pocket, or purse. When we look at consumers' mix of denominations at the beginning and end of the three-day diary reporting period, we see that a consumer who began the reporting period with one or more $100 bills had a 75 percent probability of holding at least one $100 bill at the end of the first day, a 61 percent probability at the end of the second day, and a 58 percent probability at the end of the third day.
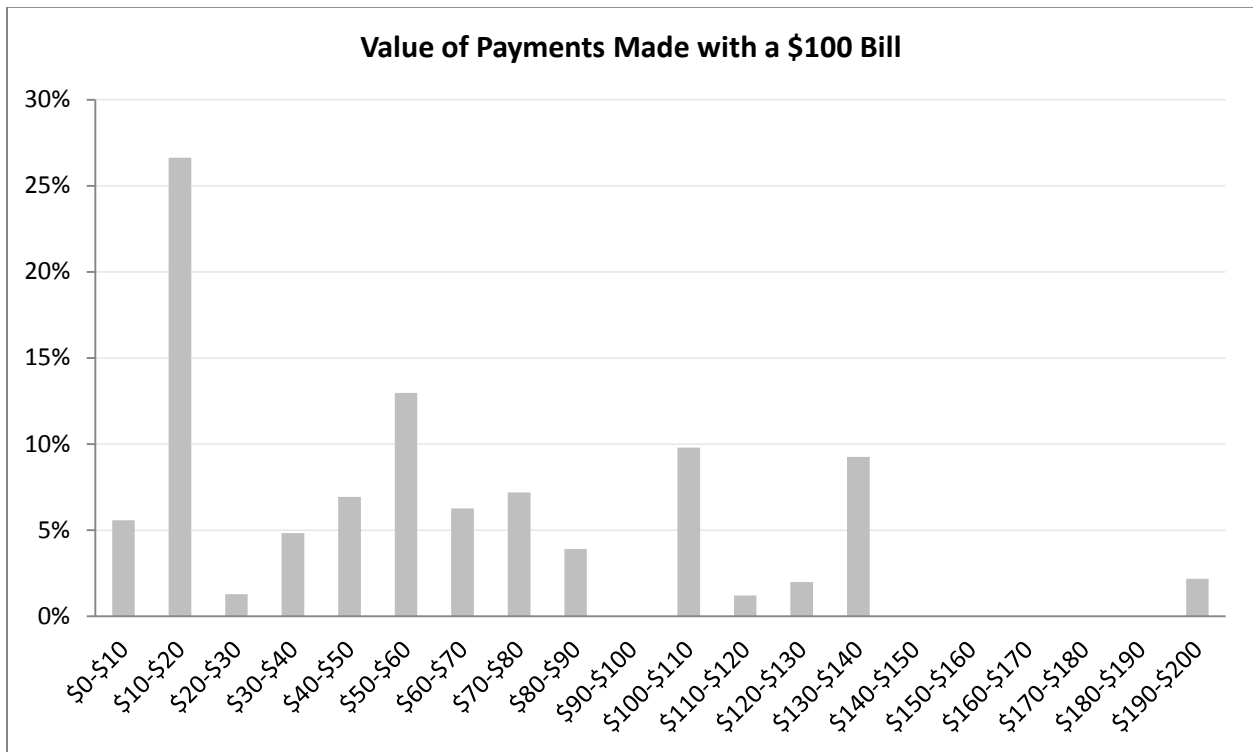
One explanation for the choice to hold large bills might be that the consumer is using the $100 bill as a store of value, in lieu of depositing the $100 into a bank account. The regression analysis found, however, that people without a bank account were no more likely to be carrying a $100 bill than people with a bank account.

In 2012, cash was the most popular way to pay (by number of transactions). Consumers made 40 percent of payments in cash. By value, however, cash payments overall accounted for just 14 percent of payments. This relatively small percentage by value shows that most cash payments are small. By number of transactions, 1.2 percent of all payments were cash payments for more than $100. Cash payments greater than $100 accounted for 5.0 percent by value (DCPC).

Overall, while people who carried a $100 bill made larger-dollar-value cash payments on average than others, these payments were still far short of $100. The average cash payment by people who carried a $100 bill was about $32, compared with $21 for people who carried more than $100 in cash but no $100 bill.

Looking at the payments of people who carried $100 bills, consumers do not seem to be reserving their $100 bills for large payments. Using the 2012 DCPC data, we can identify some, but not all, payments that were made using a $100 bill. If the consumer made one cash payment in a day and made no cash deposits of more than $100, and if the number of $100 bills decreased

by at least one, we can infer that the $100 bill was used for a particular transaction.[19] Thirty-two transactions met these conditions. Among this subset of payments made with a $100 bill, the average payment was for less than $100. That is, consumers received change when they paid with a $100 bill. Of payments we were able to identify as made with a $100 bill, 78 percent (25 of 32 observations) were for less than $100 and one-third were for less than $20 (Figure 10). For payments, the desires of merchants (reluctance to make change, wariness of counterfeits) may also play a role in consumers' ability to use their $100 bills.

Value of Payments Made with a $100 Bill

Source: 2012 DCPC.

Figure 10: Value of purchases made using a $100 bill.

Another explanation for the choice to hold 100s is that consumers who carry a lot of cash find them easier to carry than a fat wad of 20s, 10s, or lower denominations. As illustrated above in Figure 9, the number of $100 bills people carry increases with the total amount of cash they carry. Fulford et al. (forthcoming) finds that consumers who begin the day with many dollar bills tend to have fewer at the end of the day. Just as it appears that consumers only want

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[19] For consumers who made more than one cash payment in a day, however, our data do not tell us which payment was made with the $100 bill.

to carry a certain amount of $1 bills (around two or three), consumers who carry a lot of cash may want to avoid carrying a large number of 20s. Also supporting this consideration is the finding that people who prefer to pay with cash as opposed to debit cards have a higher probability of carrying $100 bills (Table 4).

Payment Preference	Percentage Carrying $100 Bill
Cash	11.8
Debit Card	4.5

Source: 2012 DCPC.

Table 4: Percentage of consumers carrying one or more $100 bills, by payment preference.

When we compare people who carry one or more $100 bills with people who carry $100 or more in mixed bills, people with hundreds do not show a marked preference for cash payments over those with only smaller denominations. People who carry more than $100 (in whatever combination, whether including or excluding $100 bills) do make a greater percentage of payments in cash by number of transactions, compared with people who carry less than $100.

Summary

This report documents consumer experiences with $100 bills, presumably for law-abiding purposes, in 2012. The following results stand out:

- More than one in five U.S. consumers carries more than $100 in cash in his or her pocket, purse, or wallet, and the more cash the consumer carries the more likely he or she is to carry $100 bills. Consumers may store $100 bills on their property as well, but data are not available on this aspect of consumer cash use.

- People who carry $100 bills tend to hold them for a while. On any given day, between 75 percent and 80 percent of respondents to the 2012 DCPC who carried a $100 bill held on to it. There does not appear to be evidence that consumers try to get rid of $100 bills.

- By number of transactions, consumers with $100 bills do not make relatively more payments in cash than consumers with more than $100 in mixed bills, as reported in the 2012 DCPC. Thus, $100 bills do not appear to be more special than other currency

denominations as a means of payment; rather, some consumers appear to have a stronger preference than other consumers for $100 bills.

- By value of cash payment, people who carry $100 bills make larger-value cash payments than people who carry more than $100 in mixed bills. Thus, $100 bills appear to help some consumers who want to pay in cash make larger cash payments more conveniently.

- Nevertheless, most cash payments are for less than $100, so people are receiving change from their $100 bills. And for payments of $100 or more, 15.8 percent of payments for purchases were paid in cash, while just 3 percent of payments for bills were paid in cash. So, based on these data, it appears that most consumer payments of $100 or more are made using noncash means of payment. Thus, the need for a denomination as large as a $100 bill appears to be modest in the big picture of consumer payments.

Taken together, these results suggest that cash-intensive consumers place some value on carrying $100 bills for reasons that merit further investigation. Therefore, the largest U.S. currency denomination in circulation today may have value as a means of payment and may be worth retaining in circulation, at least in the United States. Despite the $100 bill's decline in purchasing power since 1969, U.S. consumers do not appear to be demonstrating a need for larger denominations.

The results of the DCPC are offered with the intent of contributing to more insightful and productive public discussions about $100 bills, denominations, and currency.

Appendix: Data description

The data used in this analysis are taken from the 2012 Diary of Consumer Payment Choice (DCPC), which measures payment activity of U.S. consumers (Bennett, Schuh, and Schwartz forthcoming). The DCPC collects data on the dollar value, payment instrument used, and type of expense (consumer expenditure category) of each purchase and bill payment, to complement the information in The 2011–2012 Surveys of Consumer Payment Choice (Schuh and Stavins 2014). In addition to detail about their transactions, respondents were asked to

specify the exact mix of currency denominations in their pocket, wallet, or purse. For the 2012 DCPC, 2,468 respondents recorded their transactions over a three-day period per respondent. Respondents report online every evening during the duration of the study. Respondents were spread over the month of October 2012 (data release forthcoming at www.bostonfed.org).

Appendix A
Table 1A. Descriptive Statistics

		Percentage carrying ≥ $100 in cash	Percentage carrying $100 bill
Gender	Male	20.4	5.2
	Female	16.8	5.5
Age group	18–34	13.0	3.7
	35–44	15.0	4.5
	45–54	19.2	5.9
	55 and above	23.7	6.5
Race	White/Caucasian	19.3	5.7
	Hispanic or Latino	15.6	4.5
	African-American, American Indian, other	15.2	4.9
Education	Below undergraduate	16.5	5.4
	Undergraduate	19.4	5.7
	Graduate	22.4	5.1
Family income	Less than $25,000	12.8	4.5
	$25,000–$49,999	15.9	5.7
	$50,000–$74,999	17.1	4.7
	$75,000–$99,999	25.4	5.1
	$100,000 or more	24.4	6.5
Current job status	Working now	16.6	5.0
	Temporarily laid off, on sick or other leave	25.8	8.9
	Unemployed and looking for work	12.9	4.8
	Retired	27.1	6.9
	Homemaker	17.6	5.0
Marital status	Married or living with partner	20.2	5.6
	Other	15.3	5.0
Number of household members (including the respondent)	1	21.4	5.8
	2	15.2	4.9
	3	14.8	4.3
	4	15.4	6.4
	5	15.0	4.5
	6 and more	19.0	5.6
Born in the U.S.	Yes	17.9	5.2
	No	22.1	7.2
Have checking account	Yes	18.3	5.3
	No	19.1	5.9
Have debit card	Yes	16.4	4.7
	No	24.9	7.6
Have credit card	Yes	20.4	5.9
	No	14.4	4.4
Have prepaid card	Yes	18.9	7.1
	No	18.3	5.1

Source: 2012 DCPC.

Appendix B
Regression Results

Table B1 shows the regression results for consumers' likelihood of holding no less than $100 cash in hand, or that of holding a $100 bill, by relevant characteristics. Columns (1) and (2) list the regression coefficients and standard errors, respectively, of the likelihood of holding no less than $100 cash, and columns (3) and (4) list the coefficients and standard errors of the likelihood of holding the $100 bill.

Probit models are used by assuming random effects here, as we are investigating a weighted sample that is representative of the U.S. consumer population older than 18. From this table, we see that the likelihood of holding more than $100 cash is positively correlated with the consumer's total dollar value of cash purchases (logcashpurchase) and its standard deviation (sdcashpurchase). Higher income is also associated with a higher probability of holding more than $100 cash and vice versa. While none of these factors have a significant effect on the holding of a $100 bill, we do see that the larger the amount of cash held by a consumer, the greater the chance that he or she is carrying at least one $100 bill. No causality has been assumed or is asserted here. Sources of withdrawal may also matter, as shown in the table. We looked at various cases, including ATM, retail stores, a bank teller, a family member or friend (variable family), and others. We also include a list of demographic attributes, such as the dummy variable indicating whether the consumer was born outside the United States or whether s/he is retired.

Table 1B. Regression Results

		Holding ≥$100		Holding $100 Bill (Conditional on Holding ≥$100)	
		Coef.	s.e.	Coef.	s.e.
Cash holding	$100–$199			-0.131***	(0.043)
	>=$500			0.279***	(0.075)
Cash purchase	Total amount	0.0002***	(0.000)	-0.001*	(0.000)
	Average amount	0.0003	(0.000)	0.001	(0.001)
	Standard deviation	-0.001***	(0.000)	0.003*	(0.001)
	Withdrew cash	0.021***	(0.004)	-0.049	(0.035)
Location of cash withdrawals	ATM	0.007	(0.007)	-0.171**	(0.087)
	Retail	-0.018*	(0.010)	-0.018	(0.052)
	Family	-0.007	(0.008)	-0.021	(0.033)
	Check cashing store	0.027	(0.019)	-0.103	(0.087)
	Employer	0.031***	(0.011)	-0.094	(0.069)
	Refund	-0.006	(0.014)	-0.029	(0.070)
	Other	-0.013	(0.010)	0.054	(0.060)
Source of cash withdrawals	Checking account	0.013*	(0.007)		
	Savings account	0.017	(0.012)		
	Wage	0.029***	(0.009)		
	Check	-0.008	(0.029)		
	Prepaid card	-0.101**	(0.042)		
	Person	0.012	(0.009)		
	Other	0.020*	(0.011)		
	Debit card adopter	-0.013**	(0.007)	-0.006	(0.029)
	Credit card adopter	0.014**	(0.006)	0.032	(0.047)
	Unbanked	0.018	(0.012)	0.057	(0.073)
	Credit card revolver	-0.014***	(0.005)	0.031	(0.054)
Interest rate	0	-0.004	(0.004)	0.083***	(0.028)
	>0.2%	-0.013*	(0.007)	0.084	(0.066)
	Don't know	-0.008	(0.006)	-0.058	(0.047)

		Holding ≥$100		Holding $100 Bill	
				(Conditional on Holding ≥$100)	
Relative assessment	Acceptance: Cash-Check	0.001	(0.005)	0.056	(0.041)
	Cost: Cash-Check	0.016**	(0.007)	0.021	(0.040)
	Convenience: Cash-Check	-0.011**	(0.005)	-0.131**	(0.065)
	Security: Cash-Check	0.001	(0.005)	0.000	(0.032)
	Setup: Cash-Check	-0.004	(0.007)	0.003	(0.055)
	Records: Cash-Check	-0.002	(0.007)	-0.043	(0.042)
	Acceptance: Cash-Debit	-0.005	(0.009)	0.007	(0.061)
	Cost: Cash-Debit	-0.002	(0.006)	-0.026	(0.033)
	Convenience: Cash-Debit	0.020**	(0.009)	-0.046	(0.047)
	Security: Cash-Debit	-0.002	(0.005)	-0.080**	(0.040)
	Setup: Cash-Debit	-0.014*	(0.009)	0.021	(0.043)
	Records: Cash-Debit	0.009	(0.008)	-0.007	(0.057)
	Acceptance: Cash-Credit	0.005	(0.009)	-0.041	(0.059)
	Cost: Cash-Credit	-0.007*	(0.004)	0.042*	(0.023)
	Convenience: Cash-Credit	-0.004	(0.007)	0.153**	(0.069)
	Security: Cash-Credit	0.003	(0.005)	0.085***	(0.032)
	Setup: Cash-Credit	0.008	(0.006)	-0.055	(0.042)
	Records: Cash-Credit	-0.010	(0.009)	-0.002	(0.068)
Age	Under 25	-0.016	(0.012)	0.268***	(0.102)
	25–34	-0.006	(0.006)	0.027	(0.040)
	45–54	0.004	(0.006)	-0.025	(0.038)
	55–64	0.012*	(0.006)	0.000	(0.037)
	Over 65	0.008	(0.008)	-0.076	(0.062)
Education	Less than high school	-0.015	(0.011)	0.100	(0.084)
	High school	-0.009*	(0.006)	0.051	(0.033)
	College	-0.001	(0.005)	-0.020	(0.032)
	Post graduate	-0.002	(0.005)	-0.075*	(0.043)
	Married	-0.001	(0.004)	-0.013	(0.024)
	Latino	-0.004	(0.005)	-0.076	(0.059)
	White	0.013**	(0.005)	-0.025	(0.032)
	Male	0.003	(0.004)	-0.038*	(0.022)
Income	Less than $25k	-0.016**	(0.007)	0.098*	(0.056)
	$25k–$49k	-0.004	(0.005)	0.032	(0.034)
	$75k–$99k	0.017***	(0.007)	-0.079*	(0.047)
	$100k–$124k	0.002	(0.007)	0.009	(0.060)
	Greater than $125k	0.020***	(0.008)	-0.031	(0.041)

		Holding ≥$100		Holding $100 Bill	
				(Conditional on Holding ≥$100)	
Employment status	Temporarily laid off	0.025	(0.015)	-0.036	(0.069)
	Unemployed	-0.003	(0.007)	-0.094	(0.064)
	Retired	0.011*	(0.007)	-0.045	(0.040)
	Homemaker	-0.002	(0.006)	-0.040	(0.059)
	Born in the U.S.	-0.014**	(0.007)	-0.063	(0.039)

Source: 2012 DCPC.

Note: Regression results of holding no less than $100 in cash or holding a $100 bill, by relevant characteristics.

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