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U.S. Consumer Holdings and Use of $1 Bills

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Abstract:
We use new data from the 2012 Diary of Consumer Payment Choice (DCPC) to examine U.S. consumers' on-person holdings of the one-dollar ($1) bill. The adult U.S. consumer with median holdings carries two $1 bills, while the mean $1 bill holding is slightly below three. The data reveal wide variety in the number of $1 bills that U.S. consumers carry: some consumers hold large numbers of these bills; others hold none, even if they hold bills of other denominations. There appears to be some active management of $1 bill holdings: consumers with few or no $1 bills at the beginning of the day tend to acquire some, while consumers with many tend to have fewer at the end of the day. The costs and benefits to the consumer of carrying $1 bills have been largely ignored in the policy discussion of the costs of switching from dollar notes to dollar coins. As a first step toward understanding costs and benefits to consumers, we examine consumers' dollar bill holdings and use.

Keywords: money demand, currency denominations, $1 bill, Diary of Consumer Payment Choice

JEL codes: D14, E41

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Introduction

Whether to replace the $1 bill with $1 coins has recently received attention from both inside and outside the Treasury and the Federal Reserve.[1] While much of the attention has focused on the costs and benefits to the government of different currency arrangements, little attention has been paid so far to the costs and benefits to consumers. Part of the reason that consumers have generally been ignored in this discussion is that little work has been done examining how consumers use particular denominations or how many bills of different denominations they hold. This has not stopped the suggestions to "kill the bill," as the United States now stands largely alone among advanced economies in still issuing small-value notes.[2]

Using new data from the 2012 Diary of Consumer Payment Choice (DCPC), a collaborative study by the Federal Reserve Banks of Boston, Richmond, and San Francisco, this report examines the $1 bill holdings of consumers. The DCPC asks a representative sample of American adults about all of their purchases over a three-day period, how they made each purchase, and their entire portfolio of bill holdings of all denominations at the beginning of each day. The DCPC does not track coins but provides by far the richest view available into the payment choices and currency holdings of Americans age 18 years and older.

We find wide variety in the holdings of $1 bills: Some consumers hold many; others hold none, even if they hold bills of other denominations. On average, Americans hold 2.9 $1 bills in their wallets or purses. More important, the evidence suggests that consumers actively manage the number of these bills they carry: consumers with few or no $1 bills at the beginning of the day have a modest tendency to acquire some, while consumers with many have a stronger tendency to have fewer at the end of the day. The strength of the tendency to reduce the number of $1 bills increases as consumers hold more of these bills. For adult American consumers, the divide between gaining and losing $1 bills averages 2.25. On average, someone

[1] See U.S. Government Accountability Office 2011 and 2012 and the more recent work analyzing the costs and benefits more broadly by Lambert, Ferrari, and Wajert (2013). Advocates outside the Federal Reserve and the Treasury have also contributed (Klein 2013) and maintain a calculator of "lost savings" (http://www.dollarcoinalliance.org/).

[2] See, *The Economist*, "Kill the bill," March 16, 2013. http://www.economist.com/news/finance-and-economics/21573582-will-deficit-finally-spur-america-replace-dollar-bills-coins-kill-bill.

with more than 2.25 $1 bills will tend to spend or exchange them, reducing the number he or she carries. Consumers with two or fewer tend to acquire more.

Active management of holdings of an asset has been studied extensively in economics. A simple "buffer-stock" model (Deaton 1991), in which consumers are randomly presented with the ability to spend $1 bills and so occasionally find it costly to be without any, seems to fit the evidence. With a buffer-stock approach, the dividing line between gaining and losing these bills summarizes the preferences of consumers and the risks they take from lacking the correct change (Fulford 2013). The evidence that the mean target holding is a relatively low 2.25 $1 bills and that 36.5 percent of consumers in the sample hold none (and so have "stocked out"), suggests that many Americans do not find it particularly costly to be without these bills.

Literature

One-dollar bill holdings fall into the wider literature of money demand and the coexistence of cash with other assets. Briefly, cash pays no interest and depreciates through inflation. As a store of value it is dominated by other assets that do pay interest. Cash may be useful for paying for goods and services when other assets cannot be used, however, and so has a liquidity value. The early literature assumed that there were no comparably liquid assets and so sought to understand cash holdings by focusing on the costs and frequency of acquiring more (Baumol 1952; Tobin 1956). A more recent literature has examined the continuing use of cash when other forms of payment offer nearly the same liquidity. Telyukova and Wright (2008), for example, posit that consumers hold cash even when credit is often available because merchants may not always be able or willing to take credit. Telyukova (2013) estimates a similar model.

The recent literature has tended to focus only on total cash holdings and ignore the portfolio of bills that people carry. If bills are always exchangeable, so that a $100 bill can always become 100 $1 bills, then the only relevant decision for a consumer is what amount one's total cash holdings should be. There is ample evidence historically, however, that the set of denominations available does matter and has been an important problem in many economies.

For example, in *The Big Problem of Small Change*, Sargent and Velde (2002) describe how economies that based their currencies on commodities such as gold often experienced severe shortages of very small denominations. One problem with commodity-based monetary systems is that the smallest physical size of coins based on gold, for example, was often too large in value for many transactions. These shortages caused severe hardships, particularly for peasants, who were often required to pay taxes in money rather than in kind.[3] The eventual formula that developed—that the small denominations would be purely tokens rather than derive value from their metal composition—presaged the creation of fiat money more generally and the theory of money in economics (Sargent and Velde 2002, pp. 6–7). Seeking to understand how such a system could result in shortages, Redish and Weber (2011) developed a model of a commodity money system to explain how shortages of small coins can come about. They point out that without a central exchange, there may be trades that do fail to take place because the buyer and seller lack appropriate change.

While the problem of shortages of small change has largely disappeared with the advent of fiat money and well-run central banks that can supply small denominations on demand as appropriate, the problem has not entirely disappeared. Italy, for example, suffered from a severe shortage of small coins during the 1970s that hampered trade. As has often been the case, a market for change was created and premiums developed. For example, one merchant reported paying a 10-percent commission to a priest in exchange for the small coins from the collection box (Toury 1975).

A small literature seeks to calculate the optimal denominational structure (whether there should be $1, $5, and $10 bills or $1, $3, and $9 bills, for example). The basic idea is to calculate what set of denominations would minimize the number of bills necessary for transactions. Bouhdaoui, Bounie, and Van Hove (2011) review the literature and suggest that the earlier optimal denominations literature did not consider completely the issue of the cost to the central

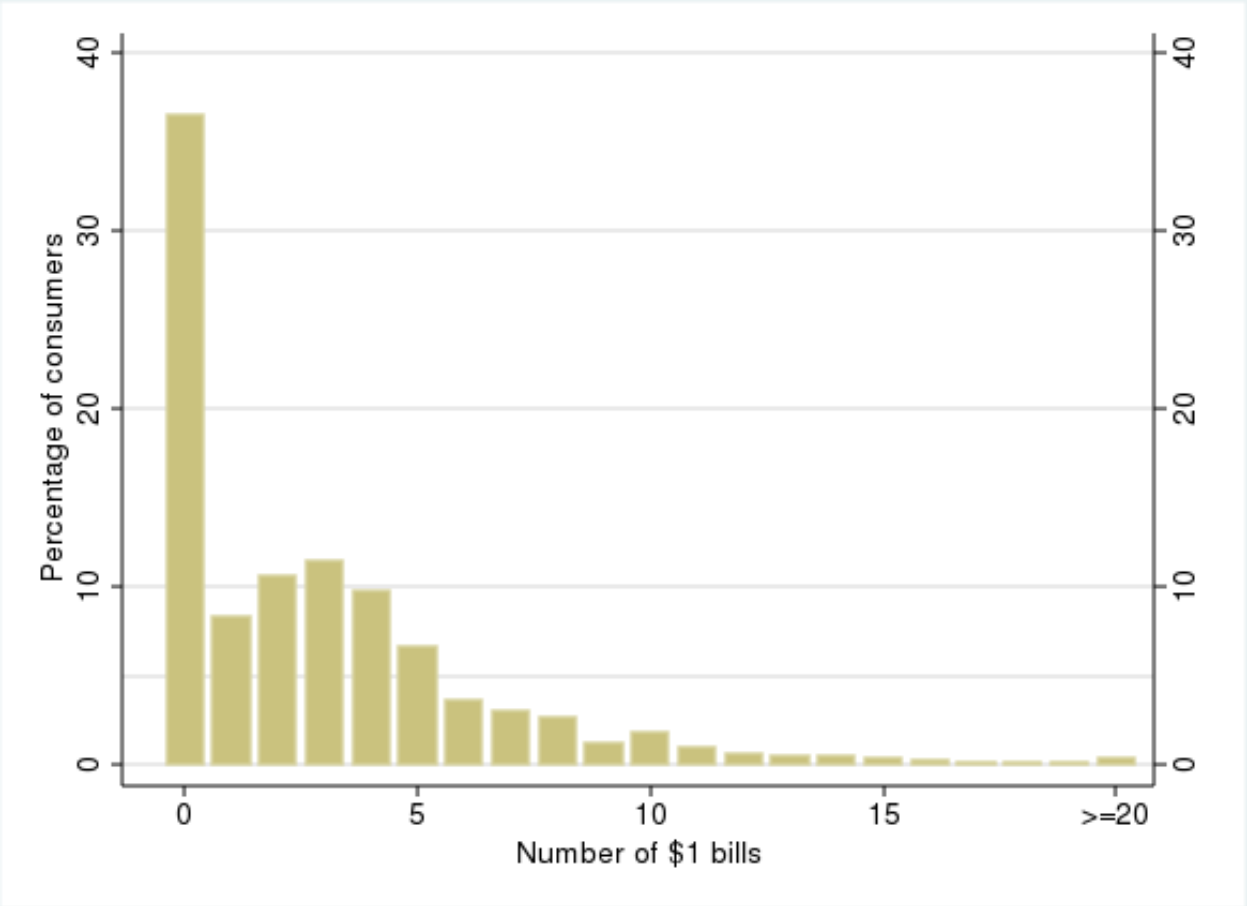
[3] See, for example, Maddicott (2006, pp. 332–333), who discusses the severe shortage of coins and the problems for peasants caused by taxation. Sargent and Velde (2002) discuss shortages in England, which banned the importation of smaller-value Flemish coins in 1299 (p. 133) and France where "a concern to avoid shortages of petty coins is apparent in 1322 and 1333" (p. 135). They also discuss a number of European attempts to satisfy the demand for small-value coins.

bank or treasury of providing many different denominations. Lee, Wallace, and Zhu (2005) endogenize the holdings of various denominations and the ability to use them in transactions.

The distribution of $1 bill holdings by consumers

On any given day, about 64 percent of U.S. adults 18 years of age and older start the day with at least one $1 bill in their pocket, wallet, or purse. The 2012 Diary of Consumer Payment Choice (DCPC), conducted by the Consumer Payments Research Center at the Federal Reserve Bank of Boston, asked a nationally representative sample of adults to write down what was on their person at the beginning of the first day and at the end of each day for three days. The DCPC also asked the individuals to record every transaction they made over these three days. In 2012, 2,468 respondents reported online every evening for the duration of the study. Respondents' participation was spread over the entire month of October 2012 (data release forthcoming at www.bostonfed.org). We focus only on cash carried on the individual's person rather than any bills kept on the property, for which data were not collected in the 2012 DCPC.[4]

[4] The Survey of Consumer Payment Choice also conducted by the Consumer Payments Research Center (available http://www.bostonfed.org/economic/cprc/SCPC/) does track cash held on property as well as on person, although it does not track denominations. According to the survey, in 2012 the mean cash holdings were $46 on person and $115 on property, excluding large cash holdings (Schuh and Stavins 2014).



Source: 2012 DCPC.
Note: The above figure was generated using survey weights.

Figure 1: Start of day distribution of $1 bills in consumers' wallets.

Among adults, the number of $1 bills held varies tremendously from person to person. Figure 1 shows the percentage of people who hold different numbers of $1 bills. While 36 percent started the day with no $1 bills, more people held three of these bills than held either one or two. Hardly anyone had more than 10 $1 bills in his or her wallet. The median on-person holding was around two $1 bills at any given time. Table 1 gives some overall statistics for the number of $1 bills that people hold. For comparison, the median holding is $27 in cash; the mean is larger ($62), since some people carry far more cash than the median amount.

Percentage of bills in the sample (DCPC) that were $1 bills	47.10	(–)
Percentage of bills carried by U.S. consumers that were $1 bills	45.16	(0.74)
Percentage of consumers...		
... who had any cash on person	80.50	(0.92)
... who started the day with a $1 bill	63.53	(1.05)
... who made a cash transaction	49.50	(0.86)
... who had no change in the number of $1 bills	61.83	(0.84)
... whose number of $1 bills increased	16.41	(0.55)
... whose number of $1 bills decreased	21.76	(0.59)
Number of $1 bills at the start of the day		
Average	2.92	(0.08)
Median	2.00	(—)
When consumers had an increase of $1 bills		
Average increase	3.07	(0.10)
Median increase	3.00	(—)
When consumers had a decrease of $1 bills		
Average decrease	3.11	(0.08)
Median decrease	2.00	(—)
Cash holdings on person ($ value)		
Average	62.00	(2.40)
Median	27.00	(—)
Number of Observations	7404	

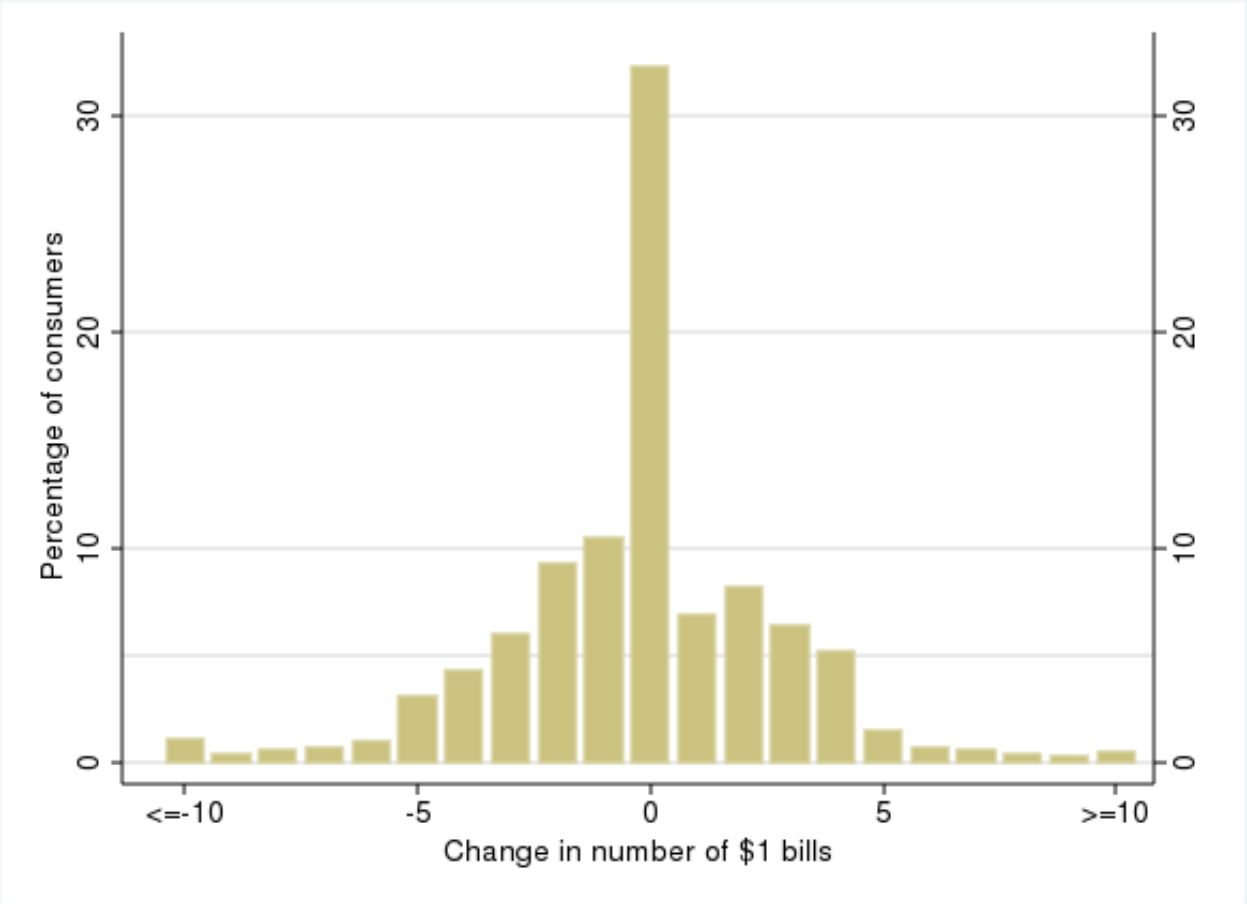
Source: 2012 DCPC.
Note: Standard errors are in parentheses. Means and standard errors were calculated with survey weights.

Table 1: Summary statistics.

How often do adult U.S. consumers use their $1 bills? Frequently, if they make a cash transaction. The DCPC suggests that around 50 percent of consumers make at least one cash transaction on any given day. Among people who made at least one cash transaction in a day, 68 percent had a different number of $1 bills in their wallet at the end of the day than at the beginning.[5] Figure 2 shows the percentage of people who gained or lost a $1 bill if they made a cash transaction that day. The median change in the number of $1 bills held on-person over the course of a day among consumers who made a cash transaction that day was zero, meaning that among such consumers, half had more $1 bills at the end of the day than at the beginning and half had fewer.

[5] This tends to undercount the number of $1 bills that changed hands in a given day. Some people have more than one transaction in a day and may both give and receive $1 bills. We can only measure directly the net change from the beginning of the day to the end of the day.

For the number of these bills held by the public to remain relatively constant, the number of bills coming in needs to approximately balance the number going out. Otherwise, the number of bills held will tend to go to zero or infinity over time. The survey confirms that the mean increase is nearly equal to the mean decrease (see Table 1).



Source: 2012 DCPC.
Note: The above figure was generated using survey weights.

Figure 2: Change in number of $1 bills during a day if a consumer made a cash transaction.

While there is a strong reason for the mean increase and decrease to be the same, this does not necessarily imply that people gain and lose $1 bills symmetrically. Figure 2 suggests that the pattern of gaining $1 bills is different from the pattern of losing them. It seems that people who have made a cash transaction during a day tend to gain $1 bills in larger numbers and lose them in smaller numbers. The median gain over the course of a day is three $1 bills, while the median loss is two. From the figure, it is clear that more people gained one, two, or

three $1 bills than gained other numbers of $1 bills, and more people lost $1 bills one-by-one or two at a time than lost greater numbers in one day. The most likely change is to lose only one $1 bill. Hardly anyone gains more than four $1 bills during a day, while it seems that people are quite willing to dump five or even 10 $1 bills during the day. The figure also shows that more people who made at least one transaction during a day lost one or two $1 bills than gained any single number of $1 bills. Of course, neither gaining $1 bills nor spending or exchanging them is entirely up to the consumer; ultimately, merchants decide how they will make change, and they may or may not honor a consumer's preference. Overall, the gains and losses balance out. Nonetheless, the difference suggests that the process governing gains is different from the process governing losses.

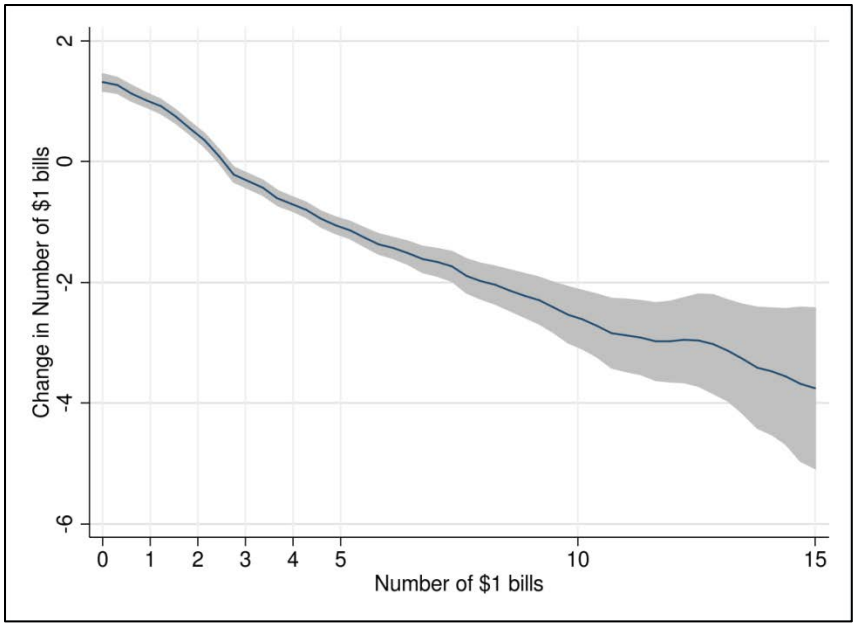
We explore these relationships more precisely in Appendix Tables A1, A2, and A3. These tables show the transition matrices of $1 bill holdings from one day to the next day. The diagonals show the fraction of adults who held the same number of $1 bills at the beginning as at the end of a day. Table A1 shows the transition matrix for all consumers, Table A2 only for consumers with cash holdings at the beginning of the day, and Table A3 for consumers who made at least one cash purchase of less than $10 during the day. As in Figure 3, conditional on starting out with two or fewer $1 bills, more consumers are likely to accumulate than to decumulate these bills. Conditional on starting out with three or more dollars, consumers are more likely to decumulate dollars. Perhaps surprisingly, there is a relatively strong tendency to go to zero $1 bills and stay there (see entries in the first column of the appendix tables, excluding the first row). Even for consumers who hold some cash, 71 percent of the consumers who started the day with no $1 bills ended the day with none, while only 55 percent of those who started with one or two $1 bills had exactly that many at the end of the day.

There seems to be something special about zero $1 bills. For consumers who made a cash purchase of under $10, the fraction of consumers on the diagonal (who had exactly the same number of $1 bills at the beginning as at the end of the day) is not much larger than the fraction off the diagonals. So, consumers who made small purchases with cash were very likely to gain or lose some $1 bills. Except for zero. For those consumers who made a cash purchase

but started with no $1 bills, 40 percent still had zero $ bills at the end of the day. One explanation may be that some people were using coins, which the DCPC does not track.

Consumer management of bill holdings

Why does the number of $1 bills people carry in their wallets vary across individuals? Chance may play a role. The accumulation of past shocks in the ability to spend cash and the combination of other bills in a consumer's wallet play a role in the number of $1 bills in the consumer's wallet on any given day. What we mean by chance and past shocks is that if we were to ask a consumer at random—exactly as the DCPC does—how many $1 bills she was carrying, many different factors would be important. She may have just made a $6 purchase with a $20 bill and received a $10 bill and four $1 bills. She may like to have ones because she gives some to the homeless man she sometimes encounters on the way to work. She may be planning to put two $1 bills under her son's pillow, since his loose tooth will fall out soon and she wants to have the correct change when it happens. All these factors, many of which occur unexpectedly, contribute to how many $1 bills she holds at any point in time. A different survey respondent might have very different accumulated holdings of $1 bills because she anticipates different opportunities to spend and receive such bills.



Source: 2012 DCPC.
Notes: The line was fitted using a kernel-weighted local polynomial regression with the Epanechnikov kernel function. The shaded area represents a 95 percent confidence interval. Survey weights were used.

Figure 3: Change in the number of $1 bills by the number of $1 bills in wallet at start of day.

While chance encounters with the ability to spend or receive $1 bills may be important, we show that they cannot be the entire story. Since current $1 bill holdings are a stock, if a consumer gains and loses bills from that stock with equal frequency, then these holdings will follow a random walk (bounded by zero). Put a different way, our forecast of $1 bill holdings at the end of the day should be the same as the $1 bill holdings at the beginning of the day if consumers are equally likely to gain as to lose a $1 bill, independent of the number of $1 bills they hold right now.[6]

Instead it seems that those who start the day with more $1 bills tend to have fewer at the end of the day than they had at the beginning. Figure 3 shows the nonparametric relationship between the number of $1 bills held and the change in $1 bills held. People who start with more $1 bills lose more of these on average. People who start a day with fewer than around 2.25 $1 bills tend to gain these during the course of the day.

[6] The economics literature has studied extensively this stochastic property, known as a martingale, in which the current value is the best forecast of the future, most often in the context of consumption. See Deaton (1992) for a summary.

To gain some insight into why people might want to increase or decrease the number of $1 bills they hold, it is useful to consider the costs and benefits of carrying these bills. First, the marginal costs of carrying $1 bills: Bills make a person's wallet thicker and a surfeit of singles makes it harder to find other denominations. Bills carried around in a wallet, as opposed to being stored at home or in the bank, might get lost or stolen. Bills earn no interest, while savings in a bank generally do earn interest, and bills lose value through inflation.

Second, the marginal benefits of carrying $1 bills: Consumers are more likely to have exact change when they need it. For small transactions or at small merchants, a consumer may need to have change to make a transaction. For example, vending machines may not give change for a $20 bill and some merchants may not accept large denominations, particularly given that the DCPC found that the median value of a cash transaction is just $10.10 (average value $20.07). Table 2 shows where consumers make cash transactions. By far the largest category is for food and personal care, 60 percent of cash transactions. Of cash transactions for food and personal care, 52 percent are for less than $10.

	Percentage of Cash Transactions	
	All	Value $\leq$ $10
Food and Personal Care Supplies	60.20	68.31
Auto and Vehicle Related	10.45	8.35
General Merchandise	9.28	7.98
Entertainment and Transportation	6.18	5.61
Housing Related	1.30	0.30
Medical, Education, Personal Services	2.92	1.71
Financial, Professional, Miscellaneous Services	1.17	1.01
Government and Nonprofit	1.98	1.99
Gifts and Transfers to People	5.41	3.94
Unknown Merchant Type	1.11	0.81

Source: 2012 DCPC.
Note: Percentages were calculated with survey weights.

Table 2: Cash use at merchants plus gifts and transfers.

In addition, consumers may want to avoid using a credit or debit card for some transactions. So using some cash, including $1 bills, for small transactions may be valuable.

Furthermore, there are transactions, such as paying an allowance to children or giving tips at restaurants, where it may be difficult to get change. Such frictions do not have to be large to make it valuable to carry at least some $1 bills despite the (relatively minor) costs.

So consumers must trade off the marginal costs and marginal benefits of holding more $1 bills, all while paying for things and receiving change that increases or decreases the number of $1 bills they hold. One might expect that the marginal value of holding another $1 bill for change declines the more such bills one holds, particularly once the number of these bills passes five, the next widely available denomination. Two or three $1 bills are likely to be the most change that will be useful on a given day. The marginal costs are likely to be constant or increasing, however. For example, consider the cost of theft. The risk of losing a $1 bill is approximately the same no matter how many $1 bills the consumer carries. The risk of carrying more may even be slightly higher if thieves are attracted to thick wallets. The marginal costs of losses from theft are therefore constant or increasing, since each dollar is just as likely to be lost as the one before it. Combining decreasing marginal benefits and increasing marginal costs suggests that the net marginal value of holding an additional $1 bill is decreasing. In an environment where there is uncertainty about when and where holding $1 bills will be useful, this creates a precautionary reason to hold a few $1 bills.

This approach to carrying $1 bills suggests that a buffer-stock model of individual $1 bill holdings might apply.[7] With decreasing marginal utility of holding each extra $1 bill, but potentially large marginal costs of not holding any $1 bills, people with too many of these bills will tend to decrease the number of $1 bills they carry over time. Those who have "stocked out" and hold no $1 bills will tend to accumulate some. The target—the number of $1 bills where the costs and benefits of holding $1 bills just balance—is a useful summary of the precautionary preferences implied by decreasing marginal utility (Fulford 2013). If the target is large, then people are worried about not having enough $1 bills on hand. If the target is small, then people find the costs of holding these bills fairly large and they deplete their holdings fairly rapidly.

[7] Deaton (1991).

The target number of $1 bills among consumers in the DCPC is between two and three according to Figure 3. The target is the point where the line crosses zero, that is, the number of $1 bills at which decreases in the number of these bills are about the same as increases and so the average change in $1 bills is zero. Appendix Table A4 shows regression results that help to place this breakpoint more exactly. On average, those with more than 2.25 $1 bills tended to decrease their holdings, while those below this point tended to increase them. For every extra $1 bill a consumer holds, the number of bills he or she is likely to lose over the day increases by 0.26 (this is the regression equivalent of the slope in Figure 3).[8]

The increasingly negative change in the number of $1 bills during a day as the number of $1 bills held increases, as shown in Figure 3, occurs mainly because those with many $1 bills spend more of them. Consumers with fewer than three $1 bills gain these bills more frequently than those with three or more $1 bills, but the difference is small (the difference between them is 0.27 $1 bills per day). Instead, the tendency to spend down additional $1 bills seems to drive much of the negative relationship. The weak tendency to acquire additional ones is consistent with consumers' placing relatively little value on the liquidity of having a $1 bill on their person, but instead increasingly choosing to spend the $1 bills they do receive.

Interestingly, the relationship between $1 bills and the change in $1 bills appears to be independent of the total amount of cash carried. When we include the total dollar value of cash holdings, it does not explain the change in $1 bills at all. Using log cash holdings does help to explain changes in $1 bill holdings. The effect is small, however. Someone who carries around 100 dollars in bills will gain, on average, approximately 0.21 more $1 bills than someone who starts the day with just 10 dollars. This effect of carrying more total cash is immaterial compared with the effect of carrying around just one more $1 bill. Moreover, including or excluding total

[8] We calculate the target from the regression results by finding the number of bills at which the expected change in dollar bills is zero. So, given the regression estimates of a and b from $E[B_{t+1} - B_t] = a + bB_t$ where B_t, is the number of dollar bills, we solve for$a + bB_t = 0$, which is $B_t = -a/b$ or the x-intercept. Since the solution is a ratio of two coefficients, it is not a standard regression result, and a standard error is not generally meaningful since the ratio will not generally have symmetric confidence intervals. (The easiest way to see this is to note that when the denominator is close to zero, the ratio can be very large, so a confidence interval will need to include possibly large negative values.) In the table we show bootstrapped 95 percent confidence intervals by sampling from the survey and rerunning the regressions. These intervals give a high confidence that the target is around 2.25.

cash holdings leaves the relationship between the starting number of $1 bills and the change in $1 bills, as well as the target, nearly unchanged. These results suggest that the liquidity value of $1 bills in providing correct change is distinct from the value that carrying cash as a liquid store of wealth offers. Put differently, it suggests that the way people gain and lose $1 bills is not strongly related to the total amount of cash they choose to carry. This result is consistent with the explanation that a $1 bill provides a particular kind of transaction liquidity, but does not provide much utility as a store of value. Supporting this observation is the fact that while the median value of cash holdings in October 2012 was $27, Figure 1 shows that it is extremely rare for a consumer to hold 10 or more $1 bills.

The target number of $1 bills helps us to understand the competing risks and preferences for holding such bills. A relatively low number suggests that while people do want $1 bills and find them useful (or at least, not too costly), their desired holdings are not particularly large. The desired holdings may even be zero, or close to it, for many people. The buffer-stock approach suggests that consumers hit by random transaction shocks that generate $1 bills will sometimes accumulate more than three, but will then spend them. Consumers will sometimes use all of their $1 bills, but in day-to-day transactions they will tend to acquire more until they reach about three $1 bills, at which point they will start spending them down again. Figure 1 shows that many consumers carry no $1 bills at all. The fact that many consumers are willing to hold zero $1 bills suggests that the expected marginal cost of not having any is typically fairly small, since otherwise the consumer would make a greater effort to avoid being without $1 bills.

A precautionary or buffer-stock model with decreasing marginal utility has an additional prediction that helps to make sense of the data. The target where increases are as likely as decreases should be less than the mean holdings. The reason for the difference is that the marginal benefits of having some $1 bills are larger than the marginal costs of holding too many. People may care about not having enough $1 bills, but they care only a little about having too many. So the tendency to accumulate these bills when a consumer has too few is

much stronger than the tendency to spend down $1 bills when there are too many (see Fulford 2013 for a discussion of this point in relation to overall savings).

This prediction helps to explain why the mean $1 bill holding is 2.9, above the estimated target of 2.25. As Figure 2 shows, consumers tend to lose $1 bills frequently, but in small amounts; the modal decrease is one $1 bill, and one or two $1 bills together represent by far the amount most commonly lost. On the other hand, consumers gain $1 bills in larger increments; the modal increase is two of these bills. Decreases of one or two of these bills represent about 20 percent of the distribution; gains of one or two bills represent about 16 percent.

Conclusion

Small denominations play a special role in a payments ecosystem because they facilitate exchange for small goods and services. This report examines the $1 bill holdings of adults in the United States using the DCPC. The average number of $1 bills held is 2.9. This estimate provides information about what consumers actually do. Simply knowing the number of $1 bills in circulation is not useful for understanding consumers' actions, since many of these bills are held by merchants.

While it seems likely that the amount representing total holdings of cash (and other payment options) is a more central question for most people than the denominations of the bills they hold, we do find evidence of active management of $1 bill holdings. For adults, the average divide between increasing the number of $1 bills they hold and decreasing these holdings is 2.25. Because the DCPC does not track coins, we cannot directly track whether consumers are substituting dollar coins or other coins for bills. Additional survey data would be required to track consumers' use of coins.

The DCPC enables us to answer the simple question of how many $1 bills the average American adult carries. This is a first step toward understanding the costs of switching to dollar coins from the consumer perspective. Using these data, the buffer stock model seems to fit the data reasonably well and also fits a plausible, intuitive rationale explaining consumers' behavior with respect to their on-person holdings of $1 bills.

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Appendix

		Day t+1						
		0	**1**	**2**	**3**	**4**	**5**	**6+**
Day t	**0**	0.80	0.03	0.04	0.05	0.04	0.01	0.02
	1	0.20	0.55	0.06	0.08	0.05	0.03	0.03
	2	0.16	0.09	0.55	0.05	0.07	0.03	0.04
	3	0.14	0.08	0.09	0.54	0.08	0.02	0.05
	4	0.14	0.06	0.08	0.09	0.53	0.03	0.08
	5	0.17	0.02	0.06	0.07	0.06	0.50	0.11
	6+	0.06	0.02	0.04	0.06	0.07	0.06	0.68

Source: 2012 DCPC.
Note: Results were calculated with survey weights.

Table A1: Transition matrix for all adult U.S. consumers.

		Day t+1						
		0	**1**	**2**	**3**	**4**	**5**	**6+**
Day t	**0**	0.71	0.04	0.07	0.07	0.07	0.01	0.02
	1	0.20	0.55	0.06	0.08	0.05	0.03	0.03
	2	0.16	0.09	0.55	0.05	0.07	0.03	0.04
	3	0.14	0.08	0.09	0.54	0.08	0.02	0.05
	4	0.14	0.06	0.08	0.09	0.53	0.03	0.08
	5	0.17	0.02	0.06	0.07	0.06	0.50	0.11
	6+	0.06	0.02	0.04	0.06	0.07	0.06	0.68

Source: 2012 DCPC.
Note: Results were calculated with survey weights.

Table A2: Transition matrix for adult U.S. consumers who held cash at the start of day *t*.

		Day t+1						
		0	**1**	**2**	**3**	**4**	**5**	**6+**
Day t	**0**	0.40	0.10	0.12	0.14	0.17	0.03	0.03
	1	0.32	0.16	0.13	0.18	0.10	0.07	0.05
	2	0.25	0.18	0.17	0.11	0.14	0.05	0.09
	3	0.20	0.16	0.17	0.17	0.15	0.05	0.09
	4	0.20	0.13	0.13	0.18	0.17	0.06	0.13
	5	0.19	0.02	0.15	0.13	0.15	0.15	0.21
	6+	0.07	0.04	0.06	0.12	0.11	0.10	0.51

Source: 2012 DCPC.
Note: Results were calculated with survey weights.

Table A3: Transition matrix for adult U.S. consumers who made at least one cash purchase for less than $10 on day *t*.

	(1)	(2)	(3)	(4)
Number of $1 Bills	-0.2670***	-0.2683***	-0.2945***	-0.2799***
	(0.0144)	(0.0141)	(0.0163)	(0.0204)
Total Cash in Wallet		0.0002		
		(0.0003)		
ln(Total Cash + 1)			0.1051***	0.0940***
			(0.0190)	(0.0277)
Constant	0.5995***	0.5932***	0.3669***	0.3519***
	(0.0404)	(0.0424)	(0.0448)	(0.0432)
X-axis Intercept	2.246	2.249	2.297	2.247
	[2.091, 2.400]	[2.093, 2.404]	[2.150, 2.445]	[1.984, 2.510]
Observations	7,319	7,319	7,319	5,158

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: 2012 DCPC.

Notes: Standard errors are in parentheses. 95 percent confidence intervals are in brackets. Columns 1–3 used the sample of consumer-days that started the day with fewer than 16 $1-bills. Column 4 used the sample of consumer-days that started the day with fewer than 16 $1-bills and held less than the mean total cash holdings ($62). Results were calculated with survey weights.

Table A4: Regression results (dependent variable: change in $1 bill holdings).