

The Rise of Corporate Savings*

BY ROC ARMENTER

Over the past few decades, several developed economies have experienced large changes in how much households and firms save. In fact, a sharp increase in firms' savings behavior has changed the net position of the (nonfinancial) corporate sector vis-à-vis the rest of the economy. Why have firms in the business of producing goods or services become lenders? This is quite at odds with traditional models of corporate finance, which suggest that firms issue debt and equity to fund their operations and finance their investment projects. But successful firms appear to accumulate financial assets even when they are issuing equity, and these financial holdings are mainly in a very liquid form that pays a low return. This poses a conundrum, since holding financial assets while maintaining outstanding equity positions is expensive for the firm. In this article, Roc Armenter looks carefully at the data to learn which firms have been responsible for the rise in corporate savings and then briefly discusses the costs and benefits of equity relative to debt.

savings rate. In contrast, firms have become thriftier, retaining a larger fraction of corporate profits and channeling equity revenues into savings instruments traditionally associated with household finances, some as basic as checking or savings accounts.

Indeed, the sharp increase in firms' savings behavior has changed the net position of the (nonfinancial) corporate sector vis-à-vis the rest of the economy. The net position is defined as the difference between how much other sectors owe the corporate sector (financial assets) minus how much the corporate sector owes to other sectors (debt). In the 1970s and 1980s the corporate sector was a net debtor, borrowing between 15 and 20 percent of the value of its productive assets (for example, plants and equipment) from the rest of the economy. However, by the 2000s, the corporate sector had switched to being a net lender, and over the period 2003-2007, the sector was saving more than 5 percent of the value of its productive assets.

Over the past few decades, several developed economies have experienced large changes in how much households and firms save. For the U.S., net savings by the private sector (as a ratio to

gross national product) dropped from 10 percent in the 1970s to less than 4 percent at the beginning of the 2000s. The underlying changes in the saving behavior of households and firms separately are, perhaps, even more dramatic. Since the early 1980s, U.S. households have spent rather than saved an increasingly large fraction of their total income, driving down the personal

Why have firms in the business of producing goods or services become lenders? This is quite at odds with traditional models of corporate finance, which suggest that firms issue debt and equity to fund their operations and finance their investment projects. The firm's creditors or bondholders are promised a fixed return, although there is always the risk that the firm may go bankrupt and not be able to repay them. Shareholders receive dividends, which vary with the firm's performance, and they can exert control over a firm's management through the board of directors. An entrepreneur looking to start a business may rely on



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his or her own resources, bank loans, and perhaps some partners to provide additional equity. If the business is successful, it may look to expand aggressively and resort to private equity investors, such as venture capital firms, and acquire larger bank loans. Finally, the firm may go public, and its shares may be traded on the stock market, perhaps its bonds too.

Surprisingly, though, there is one more stage: Successful firms appear to accumulate financial assets even when they are issuing equity, and these financial holdings are mainly in a very liquid form that pays a low return. This poses a conundrum because there are several reasons why holding financial assets while maintaining outstanding equity positions is expensive for the firm. Unlike equity, financial assets provide a readily available, no-strings-attached, cheap source of funding. In addition, even if a firm does not have financial assets with which to fund its operations, it should prefer to use debt over equity. The benefits of debt over equity financing include the fact that interest payments on debt are tax deductible, while equity is subject to both corporate and dividend taxes. In addition, equity has significant flotation costs, can worsen corporate governance by bringing external ownership into the company, and may be associated with a negative signal regarding the quality of the firm.¹ Thus, from a cost perspective, firms should adhere to a hierarchy of financing sources: First, they should rely on internal funds; if external finance is needed, debt should be preferred to equity, which becomes

¹ Flotation costs are the costs associated with a new issuance of securities, which includes underwriting fees and compliance with regulations, among other costs. Note, though, that debt does introduce some potential costs of its own. For example, highly leveraged firms may pass over good investment opportunities because the possibility of liquidation decreases the return for the firm (called debt overhang).

a finance source of last resort. Indeed, the advantages of debt over equity are such that even the low level of debt in the 1970s is quite puzzling!

This article first looks carefully at the data to learn which firms have been responsible for the rise in corporate savings and then briefly discusses the costs and benefits of equity relative to debt. As discussed below, firms appear to rely on savings primarily to avoid having to tap into expensive financing sources for investment in times of distress. This behavior is similar to households that stash a “rainy

Even a highly levered firm will carry some financial assets in the form of cash on its balance sheet for operating purposes (e.g., timely payments and small, unexpected expenses).

day” fund for future contingencies like medical bills or job loss. In addition, changes in dividend taxation and regulation can help explain the evolution of the net position of the nonfinancial corporate sector over time.

THE FACTS

Let’s start with some definitions. The *net financial asset (NFA) position* of a firm is the difference between financial assets and debt. Even a highly levered firm will carry some financial assets in the form of cash on its balance sheet for operating purposes (e.g., timely payments and small, unexpected expenses). Conversely, a firm may have substantial cash holdings but still be indebted, since some of the loans outstanding may not be worth buying back or it may not be possible to do so. For our purposes here, *net financial position* accurately summarizes the financial standing of the firm.

When we compare firms of different sizes, as well as firms in different

decades, it is useful to scale the net financial asset position by the firms’ productive assets. These assets play a direct input role in the production of the firm, such as plant, equipment, property, and inventories, as well as the unamortized value of tangible assets.

Aggregate Data. We start by taking a look at the big picture. The Flow of Funds data, put together by the Federal Reserve Board, contain information about the flow and position of several asset classes for detailed sectors of the economy.² Using these data, we can look at the net position

for the nonfinancial corporate sector as a whole.³

Figure 1 shows the dynamics of the NFA to capital ratio during 1970–2007. The ratio for the economy as a whole was relatively stable at -0.15 during the 1970s and 1980s, experienced a dramatic run-up during the 1990s, and stabilized again at around 0.04 in the 2000s. These developments highlight the transition of the U.S. corporate sector from a net debtor into a net creditor at the turn of the century.

The increase in firms’ NFA posi-

² The Flow of Funds data are available at <http://www.federalreserve.gov/apps/fof/Default.aspx>.

³ We focus on the nonfinancial corporate sector, which excludes financial firms and farms. Note that we are calculating a net position for the sector as a whole. That is, to get the NFA position, we add up the asset positions all the firms in the sector have with the rest of the economy (households, government, the financial sector, or the rest of the world) and subtract the liability positions of all the firms in the sector. Positions among firms in the sector do not count toward the total NFA position.

tion was also accompanied by a rise in equity financing, such that the net worth (at market value) of the U.S. corporate sector as a share of its capital has increased from 0.85 in the 1970s and 1980s to 1.03 in the 2000s. Thus, the increase in the NFA position is not just a move away from external financing but an aggregate change in the composition of the corporate balance sheet.

Firm-Level Data. Unfortunately, the Flow of Funds does not make its underlying data available, and thus, we cannot learn more about which firms are behind the rise of corporate savings. For this, we turn to the Compustat data set.

This data set offers detailed information on the balance sheets of publicly traded firms.⁴ The latter are not a representative sample of all firms in the economy: Firms listed on stock markets tend to be larger, older, and more successful than firms that rely on private equity. However, for our purposes of examining NFA positions, this is not too large a drawback, since recent research suggests that private firms did not account for much of the increase in the NFA ratio over time.⁵

⁴ Compustat firms account for close to two-thirds of total U.S. private employment and 90 percent of total U.S. tangible assets. Compustat data are available for a fee from Capital IQ Compustat. In order to track the Flow of Funds data and avoid measurement error problems, we focus on U.S. firms only, and we exclude technology and financial firms, as well as regulated utilities. We also drop firms whose capital is below \$50,000 and those with negative equity and nonpositive sales.

⁵ The recent work by Huasheng Gao, Jarrad Harford, and Kai Li suggests that these firms may not have contributed much to the rise in the NFA to capital ratio in the U.S. corporate sector. Using a sample of U.S. public and private firms during 2000-2008, Gao, Harford, and Li show that, on average, private firms hold less than half as much cash as public firms do. While their work primarily concerns firms' cash holdings, rather than NFA positions, it is still informative, since, as we show later, an increase in cash holdings and other short-term investments contributed most to the increase in

We are also confident that sample selection issues are not important because we find that Compustat firms mimic the trends we uncovered in the

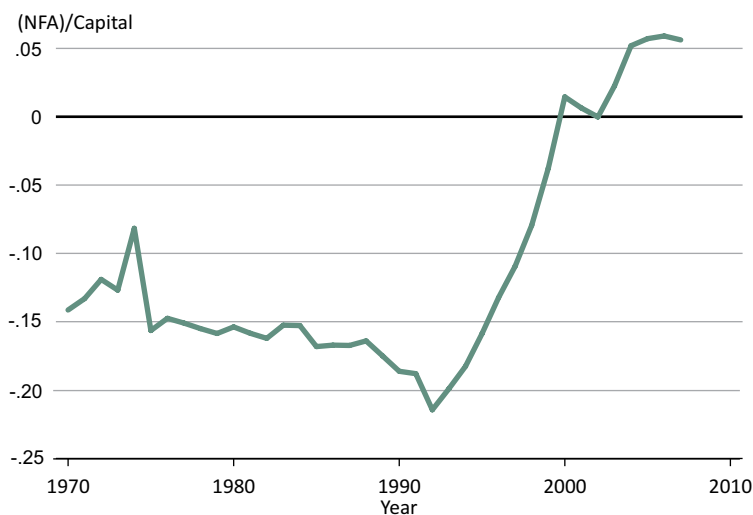
the NFA position. There is also some evidence that non-U.S. private firms carry only moderate amounts of liquid assets, as documented in the study by Mervi Niskanen and Tensie Steijvers.

aggregate data. Both the mean and the median NFA to capital ratios have been rising steadily over time. The mean turned positive in the mid-1990s, reaching about 12 percent in 2006-2007.

Figure 2 takes a closer look at the distributions of the NFA to capital ratio in the 1970s and 2000s. Several

FIGURE 1

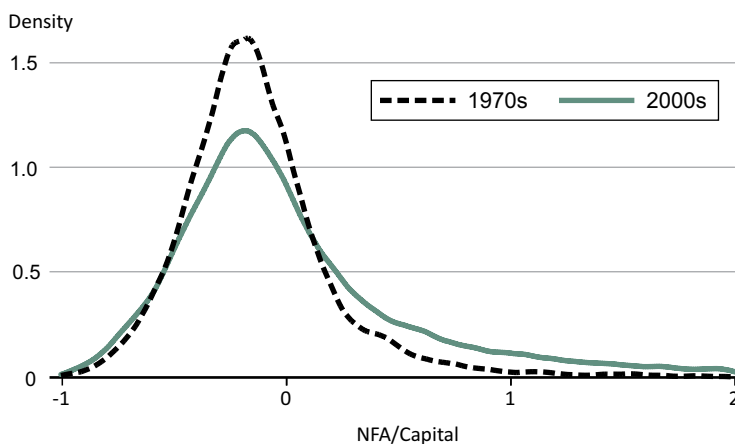
Corporate Net Financial Assets



Source: U.S. Flow of Funds

FIGURE 2

Corporate NFA/Capital



Source: Compustat

features stand out. First, there is a rightward shift in the distribution of the NFA to capital ratio in the 2000s relative to the 1970s, as we would expect from the mean and median data reported previously. Second, the share of firms with a positive NFA position has increased, from approximately 25 percent of firms in the 1970s to more than 40 percent in the 2000s. In particular, there is no evidence that the aggregate data are driven by a small fraction of firms: It is rather a widespread phenomenon. Finally, we do not see much of a change on the left tail of the distribution: Heavily indebted firms co-exist with firms with a positive NFA both in the 1970s and in the 2000s. Thus, it appears that the maximum amount of debt a firm can carry has not significantly changed over time.

Next, we investigate which assets are behind the rise in corporate savings. Figure 3 breaks down the financial assets of the firm into their components: cash (which also includes some very short-term investment, such as savings accounts), receivables (money due from customers), and other financial investments. The left-most bar shows the change in total assets as a percent of productive assets.

From Figure 3, it is easy to see that most of the rise in assets is due to larger cash and equivalent holdings of U.S. firms. Other asset categories have been going up as well, but at a much slower pace. Finally, accounts receivable have declined from about 28 percent of the median capital level in the 1970s to less than 20 percent in the 2000s. On the liability side, long-term debt and accounts payable have both fallen over time, while short-term debt showed a slight increase. Overall, these breakdowns suggest a shift in firms' balance sheets away from long-term assets and liabilities and toward their short-term counterparts.

Next, we turn our attention to

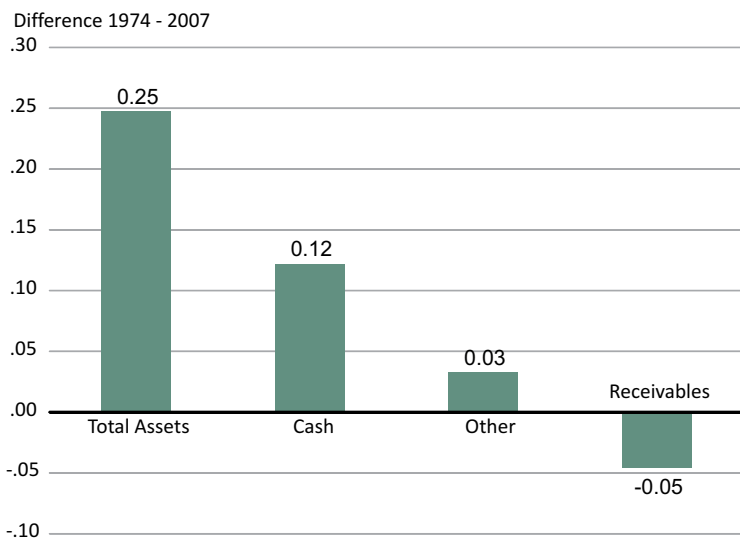
the question of which firms are driving the rise in corporate savings. Are the savings of larger or smaller firms changing the most? Are firms in different sectors displaying much different savings behavior? With regard to the first question, Figure 4 plots the level of the NFA to capital ratio for firms

with different numbers of employees, both for the 1970s and 2000s.⁶ Clearly,

⁶ We organize the number of employees by deciles. That is, the first observation corresponds to the average of the 10 percent of firms with the least number of employees, the second observation to the next 10 percent of firms as ranked by total employees.

FIGURE 3

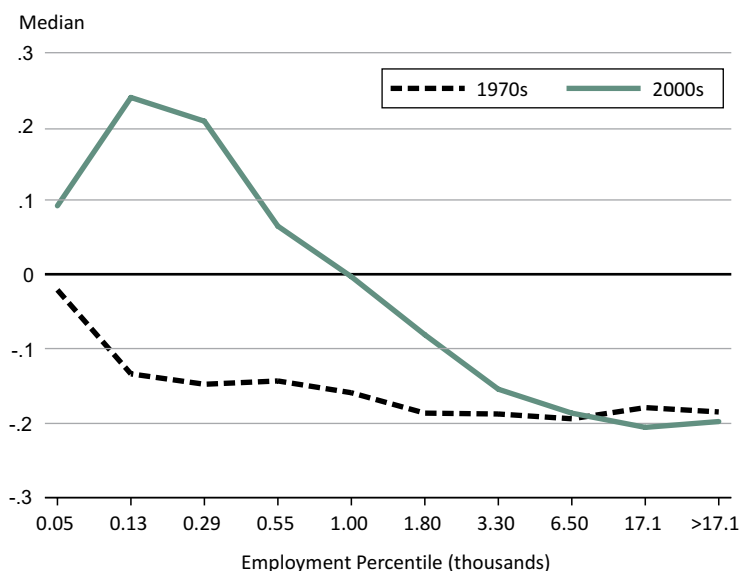
Financial Assets 1974 - 2007



Source: Flow of Funds

FIGURE 4

Corporate NFA/Capital



Source: Compustat

small and medium-size firms (that is, firms with a size up to the median employment level) have experienced the largest increase in the NFA to capital ratio.⁷ While NFA and employment don't show much association in the 1970s, the relationship is clearly decreasing in the 2000s.

Savings Across Industries. Finally, we turn to savings behavior across industries. Figure 5 plots the ratio of the median NFA to median capital ratio in six industries: agriculture and mining; manufacturing; trade, transportation, and warehousing; services; construction; and information technology and telecommunication services. Several notable features of the data

stand out. First, the increase in the NFA to capital ratio is characteristic of all industries, with the exception of construction, which shows a clear break in the series in the late 1980s. The technology sector, on the other hand, shows the most pronounced increase in NFA over our sample period. In fact, this sector turned into a net lender in the early 1990s and has continued to accumulate net financial assets ever since. Therefore, developments in the technology sector could have contributed to the run-up in aggregate NFA observed in the Flow of Funds series, especially in the 1990s. Second, there are some persistent differences in the level of the NFA to capital ratio across industries. For instance, firms in the trade, transportation, and warehousing industries have consistently had the lowest level of NFA to capital ratio during 1970-2007. The technology sector was characterized by the lowest level of NFA to capital ratio in the early 1970s, but as discussed above, this has clearly changed over the past 30 years. Finally, agriculture and mining, manufacturing, and services, all have very similar

levels and dynamics of NFA to capital ratios over our sample period: a slow but steady rise starting around 1980 and a leveling off in the 2000s.

THE THEORY

Can we explain why firms are interested in net lending and what has changed since the 1970s? To do so, it is useful to take not one but two steps back in time and revisit corporate finance theory since its inception.

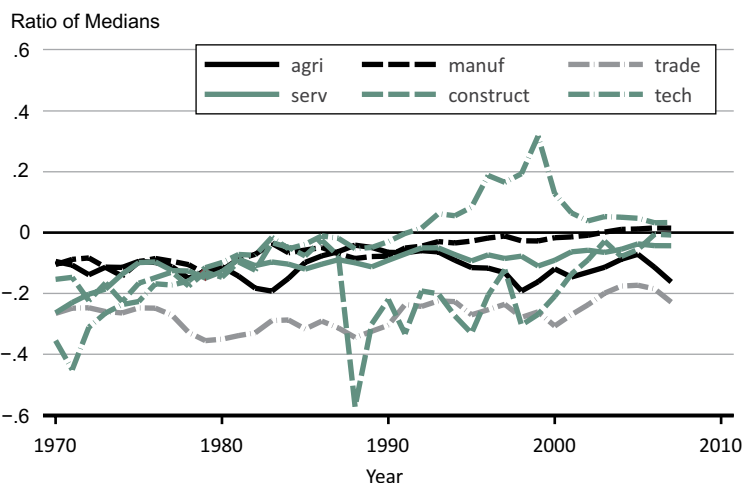
The first chapter of modern corporate finance was written by Franco Modigliani and Merton Miller in the early 1960s. They provided conditions such that the split between debt and equity was "irrelevant"; that is, the share of debt and equity with which a firm financed its operations did not change the market value of the firm. Merton Miller himself explained his theory by comparing the firm to a "gigantic tub of whole milk."⁸ The farmer can sell the whole milk as it is, or he can separate out the cream (debt), which sells at a higher price than the left-over skim milk (equity). If the prices of both cream and skim milk are competitive, that is, the price of cream exactly reflects the amount of whole milk needed, the cream plus the skim milk will always bring the same price as the whole milk, no matter how the farmer decides to split them.⁹

The Modigliani-Miller result is better understood as a benchmark, as there is plenty of evidence that the capital structure of a firm can affect its value. Economists carefully evaluate the costs and benefits of debt and equity relative to the competitive price, knowing that only deviations from the latter will determine the corporate finance strategy and the overall value of the firm. These deviations may arise

⁷ Is it size or age that matters? We also took a look at the NFA to capital ratio for entrant firms by decade. Our results indicate that entrants tend to have higher NFA to capital ratios relative to incumbents and that this tendency has become more pronounced over time. Most of the differential in NFA to capital ratios between incumbents and entrants is due to the latter's larger cash holdings and short-term investments. Over time, both cohorts have increased their holdings of cash and short-term investments, but entrants have done so at a significantly faster pace.

FIGURE 5

Corporate NFA/Capital



Source: Compustat

⁸ There is no reason the tub of whole milk needs to be "gigantic," but apparently Merton Miller had a taste for colorful descriptions.

⁹ The metaphor is taken from Miller's book.

from market distortions, adjustment costs, or other considerations internal to the firm.

The Pecking Order Theory.

While each finance source has its advantages and disadvantages, most researchers in corporate finance agree that internal funds are cheaper than external funds and, if the latter are needed, debt offers several advantages over equity — the so-called pecking order theory.¹⁰ First, the theory prescribes that a firm should rely on its own funds if possible. Internal funds are not free. Even though there are no external financiers to be compensated, internal funds have an opportunity cost because the firm will not receive the interest that the funds would accrue in the bank. However, these returns are low and are fully taxed, so internal funds are cheap. If no internal funds are available, the firm should resort to debt, according to the pecking order theory. The main advantage of debt is that interest payments can be expensed from corporate tax liabilities, what amounts to a subsidy in excess of 30 percent for most corporations. In addition, debtors have no direct control over the firm, and thus, debt avoids the conflicts of interest between managers and shareholders that plague equity.¹¹ The main disadvantage of debt is the threat of liquidation. If the firm cannot pay its debts, its creditors would force it to sell its assets, presumably at a discount, to cover its obliga-

¹⁰ See the article by Murray Frank and Vidhan Goyal for a review of the empirical evidence. See the book by Jean Tirole for a compendium of theories on corporate finance.

¹¹ Shareholders and managers may not agree on the relevant horizon and risk considerations for investment. For example, a manager may favor short-term returns or safer investments. However, debt is not free of corporate governance problems. In particular, debtors and shareholders may not agree either. As a result, debt may lead to underinvestment by the firm. For further reading, see the *Business Review* article by Mitchell Berlin.

tions. This may result in losses and thus lower the value of the firm.

Finally, equity appears to be the least attractive source of finance. Equity does not enjoy the tax advantages of debt, and it is subject to dividend and capital gains taxes, whose effective rates have traditionally been quite high. In addition, equity has significant flotation costs, can worsen ownership problems by bringing external ownership into the company, and may signal that the firm was unable to obtain credit from banks.

Thus, according to the pecking order theory, firms should adhere to a hierarchy of financing sources. They should rely on internal funds; if external finance is needed, debt should be preferred to equity, which becomes a finance source of last resort.

The main advantage of debt is that interest payments can be expensed from corporate tax liabilities, what amounts to a subsidy in excess of 30 percent for most corporations.

From the theory's perspective, a firm that simultaneously relies on equity and carries a large NFA position is a puzzle. Such a firm should use its internal funds to buy back equity from shareholders and effectively decrease the cost of its financing and hence increase its market value. Thus, the theory cannot explain the facts for the 2000s.

One reason may be because the pecking order theory misses a key advantage of equity: Equity allows the firm to suspend dividends if it is in financial distress. This is not true of debt, where suspension of interest payments can invoke bankruptcy and liquidation. Crucially, the firm must carry some cash in order to take advantage of the "insurance" aspect of equity, so that cheap internal funds are available

in the event of financial distress, when the firm is unlikely to be able to obtain new credit.

The key insight is that the value of finance is not always the same for a firm. In particular, if a firm suffers operational losses or faces a large investment project, an additional dollar of financial assets may be very valuable, since the firm may not be able to borrow anew. For a firm without financing needs, either due to the lack of investment opportunities or thanks to a large cash flow, an additional dollar is not so valuable. Note that the firm is comparing the value of each asset at future dates and across possible contingencies.

In this sense, the firm is hedging by carrying cash and simultaneously issuing equity. If the firm receives a

negative shock, e.g., an investment goes awry, it can suspend dividend payments and tap the internal funds it had saved — right when one additional dollar is very valuable. The reason is that the firm is unlikely to take out new loans in the event of a negative shock.¹² Note the contrast between equity and debt obligations, which cannot be suspended. So the firm with a large amount of debt would find itself in the difficult spot of having to finance its losses and service its debt payments.

¹² Firms actively rely on credit lines provided by banks. These credit lines, though, come with covenants that make it hard to use them when the firm is in distress. That is, credit lines are an umbrella that does not open when it rains. See the study by Amir Sufi for evidence.

Thus, the firm needs to account for its financial condition in the future in order to decide on the appropriate mix of equity and debt. Indeed, firms find it useful to accumulate cash and other liquid assets on hand to minimize the chances that they will face financial distress, yet they will still actively maintain outstanding equity because it serves as insurance. In my study with Viktoria Hnatkovska, we show that this simple idea can explain the observed distribution of NFA positions across firms in the 2000s. The study by Christopher Hennessy and Toni Whited and the one by Joao Gomes also show how the firm's concerns about future financial conditions are consistent with several observations in the corporate finance literature.

The theory can also explain why the corporate sector was a borrower in the 1970s but not in the 2000s. In particular, we find that the differences in

the tax treatment of equity versus debt can explain the data in both decades. Starting in the late 1970s, changes in the U.S. tax and regulatory system decreased the cost of equity. First and foremost, there were large changes in the relevant tax rates. James Poterba provides estimates of the effective tax rate on dividends and shows that they decreased by half from 1979 to the end of the 1980s, from 28 percent to about 15 percent. In addition, a series of regulatory changes made it possible for fiduciary institutions, like pension funds, to hold a larger share of their funds in equity. These institutions do not pay dividends, income, or capital gains taxes and thus have a large appetite for equity, bringing down its cost for firms.¹³

¹³ See Ellen McGrattan and Edward Prescott's study for a detailed discussion of regulatory changes for the U.S. and the U.K. and how they decreased the cost of equity.

Figure 6 plots the NFA position from the Flow of Funds data (as in Figure 1), together with the effective dividend tax rate computed by economists Ellen McGrattan and Edward Prescott. The figure shows how the dividend tax rate collapsed over the decade of the 1980s. The NFA position initially stayed stable but then started a steep climb and crossed into positive territory. The lag between the changes in tax rates and the NFA position is not surprising: Firms cannot reshuffle their balance sheets on the spot without incurring large adjustment costs. It is, thus, clear that the relative cost of equity in the 1970s was significantly higher due to more stringent taxation and regulations. The higher cost of equity is akin to a higher "insurance premium" from the firms' point of view. Firms value equity for its ability to provide financial relief whenever they find themselves in distress. However, since it was more costly, it was used more sparingly. Thus, firms relied more on debt, and the corporate sector as a whole had a negative NFA position.

CONCLUSION


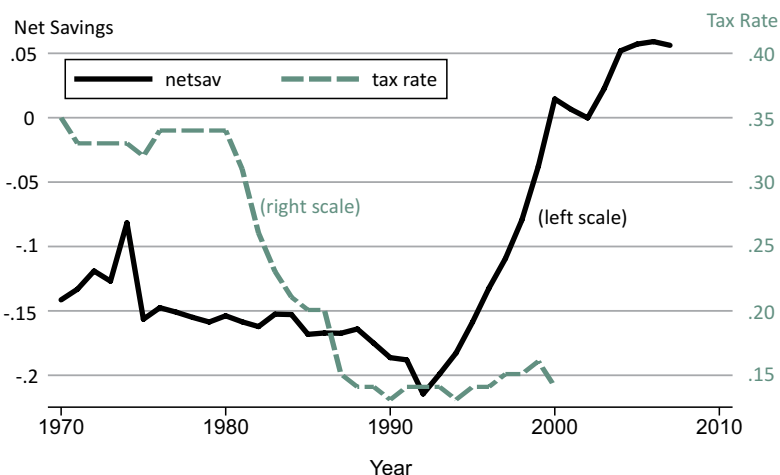
We have documented how firms have become, on the whole, net lenders to the rest of the economy. The change in saving behavior is quite uniform across sectors and seems particularly strong for newer, medium-size firms. We then discussed how to square this fact with the relative cost of equity versus debt. Equity, despite its tax disadvantages, offers insurance to firms in case of losses or distress, since it allows them to suspend dividend payments. The shift of the sector into net lending reflects the decrease in dividend and capital gains tax rates, which, in turn, reduced the fiscal advantages of debt. 

FIGURE 6

Corporate NFA/Capital and Taxes



Source: U.S. Flow of Funds and McGrattan and Prescott

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The Economics of Household Leveraging and Deleveraging*

BY WENLI LI AND SUSHEELA PATWARI

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ince the start of the financial crisis of 2007-09, a historically large number of household loans have become delinquent and residential houses have been foreclosed. This situation, coupled with households actively paying down their debt or cutting down on new borrowing, marked the beginning of household deleveraging. In this article, Wenli Li and Susheela Patwari discuss recent theoretical and empirical work by economists that sheds light on the process of leveraging and deleveraging and that helps to provide answers to a number of questions, such as: What determines when and how much a household borrows? What helps account for the widely noted increase in consumer debt levels in the run-up to the financial crisis? Finally, how has deleveraging progressed, and what are the implications for consumption and the broader economy?

One distinct feature of the deep recession that started in late 2007 is the unprecedented rise in household borrowing leading up to the crisis.



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Since then, a historically large number of household loans have become delinquent and residential houses have been foreclosed. This situation, coupled with households actively paying down their debt or cutting down on new borrowing, marked the beginning of household deleveraging.

Recent theoretical and empirical work by economists can shed light on the process of leveraging and deleveraging and help provide answers to a

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number of questions. What determines when and how much a household borrows? What helps account for the widely noted increase in consumer debt levels in the run-up to the financial crisis? Finally, how has deleveraging progressed, and what are the implications for consumption and the broad aggregate economy?

A SIMPLE THEORY OF HOUSEHOLD LEVERAGING AND DELEVERAGING

Borrowing over a Household's Lifetime. The single most important reason that a household borrows is to smooth its consumption over its lifetime. Households are generally perceived to be risk averse in the sense that they prefer consumption that is more or less stable over time to consumption that is high in some years (when household income turns out to be high) and low in others.

While the risk-averse household would prefer to consume a relatively constant amount over its lifetime, its income is anything but constant. The life-cycle income profile of a typical household is hump shaped. It starts low when the household is young and faces lower wages on average. As the household ages and accumulates more human capital through education and work experience, its income increases and peaks at around age 55. After that, the average income declines as the household retires or withdraws from the labor force either because it has accumulated enough assets or pension or because household members suffer from poor health. Consequently, for a household to consume a constant level that is consistent with its lifetime in-

come, it needs to borrow when young. A big fraction of household borrowing takes the form of installment loans such as student loans, car loans, and mortgages as the household tries to smooth large expenditures for education, cars, and houses.

In addition to these life-cycle considerations, households also borrow to cover unexpected income or expenditure shocks such as unemployment or sudden illness. Consider a family in which the husband loses his job temporarily due to company restructuring. During the job transition, the family, instead of cutting its consumption to match the reduced income, can maintain its previous consumption level by borrowing on credit cards or taking out home equity loans.

Besides consumption, households also borrow for investment purposes. Households may borrow to invest in the stock market or housing market by buying investment properties if they believe that stock prices or house prices will rise in the future.

Both Demand and Supply Factors Affect Household Borrowing. A household's demand for credit depends on its own estimates of its lifetime income, notably, the steepness of the income profile — its income starts low but rises fast in the first half of the life cycle — as well as wealth and asset prices. For example, a college-educated household with a steep income profile is likely to borrow more when members are young, because they expect income to rise significantly in the future. A household with the expectation of a sizable inheritance is also more likely to borrow to boost consumption while young. If households expect a sharp run-up in certain asset prices — maybe because asset prices have been rising — they will have more incentives to borrow to invest in those assets.

The volatility of household income, wealth, and asset prices also affects borrowing. A household whose

members are employed in a highly cyclical industry — for example, the auto industry — should typically borrow less than one whose members are employed in a less cyclical industry such as health care.

To see how volatility affects consumption, let's look at a simple example. Consider a household that lives for two periods facing an interest rate of 0. That is, to borrow \$1 in the first period, it must promise to repay \$1 in

A household's demand for credit depends on its own estimates of its lifetime income, notably, the steepness of the income profile — its income starts low but rises fast in the first half of the life cycle — as well as wealth and asset prices.

the second period. If the household's income is \$10 in the first period and \$50 in the second period for sure, then it will borrow \$20 in the first period so that it consumes \$30 in both periods, the consumption pattern preferred by risk-averse households. But now assume that the household's second period income is uncertain. That is, in the second period, the household receives \$10 half of the time and \$90 the other half of the time. Though the average income for the second period is still \$50, in the first period, the household will borrow less than \$10. If it borrows any amount over \$10, in the second period, with 50 percent probability, it won't even be able to repay the debt. Similarly, more volatile wealth and asset prices also make households borrow less.

Lenders' supply of credit depends on their funding costs — for example, a commercial bank funds itself with some mixture of deposits and market borrowings — and the expected profits from household lending compared with alternative investments. In turn, expected profits depend on the bor-

rower's risk of default and the amount the lender will recover in the event of default. A significant factor that affects both funding costs and expected profits is whether the loan will be securitized, that is, packaged with other loans and sold, in part or in full, to third parties. The funding costs of the securitized loans are those of the purchasers of the loans, rather than the lender's funding costs, and the lender's risk exposure is reduced when

the loan is sold to third parties. Lenders use information they gather from credit bureaus, such as credit scores that summarize borrowers' payment history, and statistical models to assess and price the risk of default.

Households Must Adjust Their Finances When the World Changes in an Unexpected Way. This simple model of household borrowing describes the household's behavior when its expectations about the future are confirmed: For example, an autoworker is not surprised when the plant shuts down for retooling. A bigger shock may put more strain on the household's finances, but a rational household in Detroit will choose its leverage knowing that household members will be temporarily laid off when auto sales drop during an economic downturn.

Households, however, do not always have perfect foresight about all future events. In other words, certain things outside households' expectations may occur. For example, households' preference for housing may change abruptly, a change that also

affects profits in the construction industry. Or lenders' attitude toward risk may change suddenly, which makes borrowing more expensive.¹ In these cases, the household will be forced to adjust its finances.

Following our previous example, if the breadwinner of the family does not find a job soon or finds a job with a significant pay cut because the industry he or she worked for shrinks due to unexpected demand shifts, the family will not be able to continue to service its existing debt unless it can borrow more. Suppose further that the household has borrowed against its house and that its mortgage obligation was 80 percent of the house value at the time of the borrowing. If the house's value drops by 20 percent, the household's home equity erodes completely. In turn, refinancing will be impossible, putting severe financial strain on the household.

Given these drastic changes in the household's prospects, the household will have to reduce its debt, a process commonly termed *deleveraging*. Deleveraging can occur in two ways: by households borrowing less and by households defaulting on existing debt. The choice of whether to borrow less or to default is closely linked to households' income and the value of their assets.²

Apart from the household's decision about how much debt it wishes to carry, in light of lower expected in-

¹ People have termed events like these "Wile E. Coyote" moments. A recurrent event in the Road Runner cartoons is the point at which Wile E. Coyote looks down after having run several steps off a cliff. According to the laws of cartoon physics, it is only when he realizes that nothing is supporting him that he falls.

² Here we talk about default as if it is a unilateral decision by the household. Actually, a common pattern is that the household first becomes delinquent on its debt payments. Whether or not the household has some hope of becoming current on the loan, the lender has some leeway about whether to write off a delinquent loan as uncollectible.

comes, low current income may simply make it infeasible for households to service their existing debt obligations. This is especially true for unemployed households with zero assets to sell or to use as collateral for loans. Even if they can make a loan payment, households with low current and future incomes may choose not to make the payment. For example, when asset values, in particular, house values, fall — especially when they are lower than the mortgage outstanding — households may choose to default. A low house value combined with low income and reduced access to credit makes households even more likely to default.

Using household-level data on mortgage loans, Patrick Bajari and his coauthors find that liquidity constraints (the inability to access credit) are as important as declining house prices in explaining the observed increase in subprime defaults over the past several years. Specifically, borrowers who are more likely to be liquidity constrained, such as borrowers with little or low loan documentation, low FICO scores, or high payment-to-income ratios, are more likely to default on their mortgages. Similarly, Ronel Elul and coauthors find that both negative home equity and illiquidity, which they measure by how near a household is to maxing out its credit cards, are significantly associated with mortgage default. Furthermore, the two factors interact with each other; the effect of illiquidity on default generally increases with high combined loan-to-value ratios.

Both borrowers and lenders will take into account the costs of default. For a defaulting household these include the difficulty of accessing credit in the future. For the lending bank, these include the cost of writing down nonperforming loans. When a bank writes off a loan, its regulatory capital declines; among other possibilities, this may force the bank to reduce its

lending to meet regulatory capital standards.

With this theory in mind, we can now talk about the process by which households first levered up so dramatically over the past two decades and then discuss the ongoing process of household deleveraging.

RECENT TRENDS IN HOUSEHOLD BORROWING: 1980-2008

Household leverage has been rising steadily starting in the early to mid-1980s and was at historic levels in the run-up to the crisis (Figure 1). At its peak in 2008, households held over \$2.5 trillion in consumer debt and close to \$11 trillion in mortgages. Relative to disposable personal income — total personal income minus total current personal taxes — consumer credit reached an all-time high of 25 percent in 2004 compared with an average of 21 percent between the first quarter of 1990 and the second quarter of 2010, and mortgages climbed up to close to 100 percent at the end of 2007 compared with an average of 72 percent between 1990 and 2010. Households have also devoted an increasing share of their disposable income to servicing the debt. Owing to the prolonged low interest rates during much of the 1990s and 2000s, however, the rise in the financial obligation ratio (FOR) — the ratio of debt payment to disposable income — is less dramatic.³

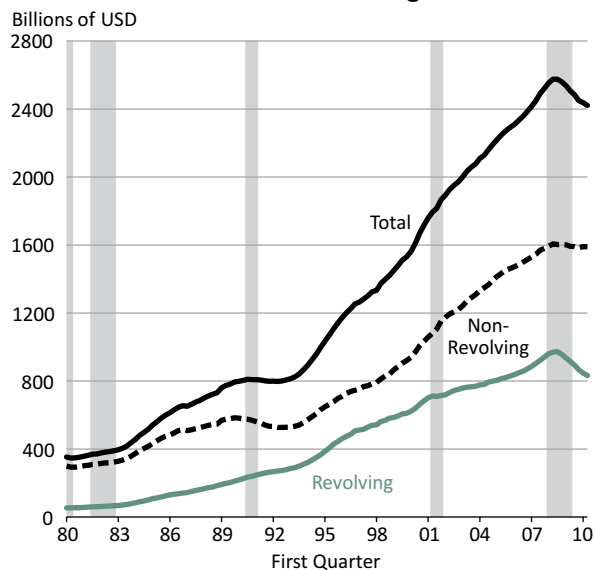
Both demand and supply factors fueled the rapid growth in household debt. The demand-side factors include changes in household demographics and income profiles. A rising income profile, that is, an expectation of higher future income, will certainly lead households to borrow and consume more in the present. Household

³ The types of debt included in the FOR are mortgage payments, credit cards, property taxes, and lease payments.

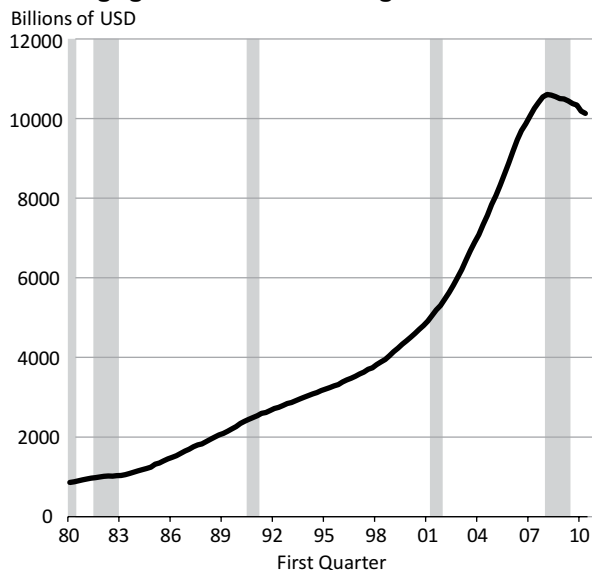
FIGURE 1

Household Leverage

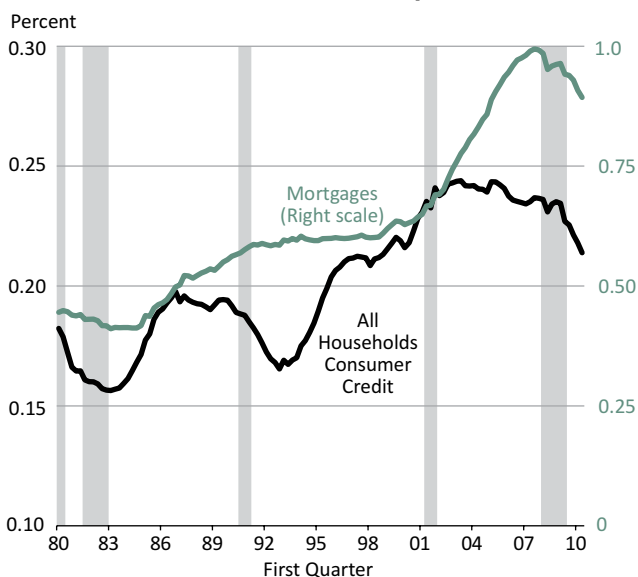
a. Consumer Credit Outstanding



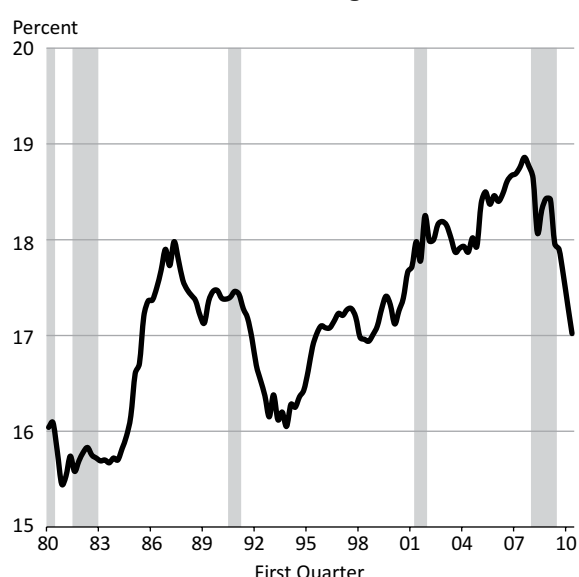
b. Mortgage Debt Outstanding



c. Ratio of Household Credit to Disposable Income



d. Household Financial Obligations Ratio



Source: Federal Reserve Board Flow of Funds Account

demographics such as education and age are important determinants of their income profile.

In their 2007 article, Karen Dynan and Donald Kohn discuss in detail the roles of changes in households' demographics in the rise of household indebtedness. For instance, households with a college or graduate degree generally have steeper life-cycle income paths

and therefore do more borrowing while young (think of student loans). The increase in the fraction of households with at least some college education would then push up debt accumulation.

Aside from actual changes in household demographics and income profiles, changes in household expectations of future income and price movement will also enable households

to borrow more even if these expectations may not be entirely rational. For instance, appreciation in house prices might make households feel wealthier than they actually are, even though these are not realized gains. As a result, they might borrow too much. Li's 2010 *Business Review* article with Fang Yang discussed the increasing trend of cash-out refinancing over the past

20 years. Alternatively, investors may mistakenly extrapolate a run-up in housing prices and take on too much debt to finance speculative housing investments. Andrew Haughwout and coauthors documented that the demand for mortgages by real estate investors played an important role in the recent housing boom.

Supply-side factors include low interest rates, lax lending standards, a proliferation of exotic mortgage products, and the growth of a global market for securitized loans. An extended period of low market interest rates in the early 2000s led to lower funding costs for banks and, in turn, lower mortgage rates. Financial innovations such as credit scoring and securitization reduced the costs of screening borrowers and funding loans. Other financial innovations made it easier for homeowners to borrow against their home equity. New mortgage products permitted borrowers to get around their income constraint. For example, the interest-only mortgage requires borrowers to make only interest payments, thereby making the mortgage payment more affordable during the interest-only period for those with limited income. For the two-year period preceding the financial crisis, Giovanni Dell’Ariccia and coauthors and Atif Mian and Amir Sufi provide evidence that the lack of transparency and lowered standards in markets for securitized loans helped to weaken underwriting standards and led to the surge in household mortgage borrowing.⁴

HOUSEHOLD DELEVERAGING: 2008-2011

The filing and subsequent bankruptcy of Lehman Brothers, the fourth

⁴ Benjamin Keys and his coauthors find that a decline in information production played an important role in the increase of subprime mortgage securitization and the subsequent default rates as securitization was most prominent in no-doc subprime mortgages.

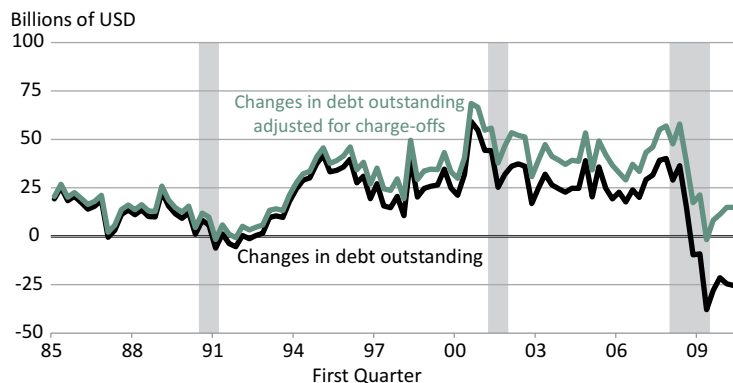
largest investment bank in the U.S., in September 2008 following the massive exodus of most of its clients, drastic losses in its stock, and devaluation of its assets by credit rating agencies marked the beginning of the unfolding of the late-2000s global financial crisis. The U.S. economy went into a deep recession. By the second quarter of 2011, house prices had come down by over 12 percent at the national level relative to the peak reached in the second quarter of 2006 and are back to their 2004 level. The unemployment rate remained at 9 percent. The median household income (inflation adjusted) in 2010, at \$49,445, slipped to its 1996 level.

It is too soon yet to predict how the economy will evolve following this strong negative shock. But following the deep recession and three years into what appears to be, at best, a very sluggish recovery, households have started the deleveraging process (Figure 2). Aggregate consumer debt and mortgage debt outstanding both peaked in the third quarter of 2008. By the second quarter of 2010, the aggregate consumer debt had declined from \$2.58 trillion to \$2.42 trillion and the aggregate mortgage debt outstanding had shrunk from \$10.55 trillion to \$10.13 trillion, a total decline of over \$500 billion according to the Board of Governors’ Flow of Funds account.

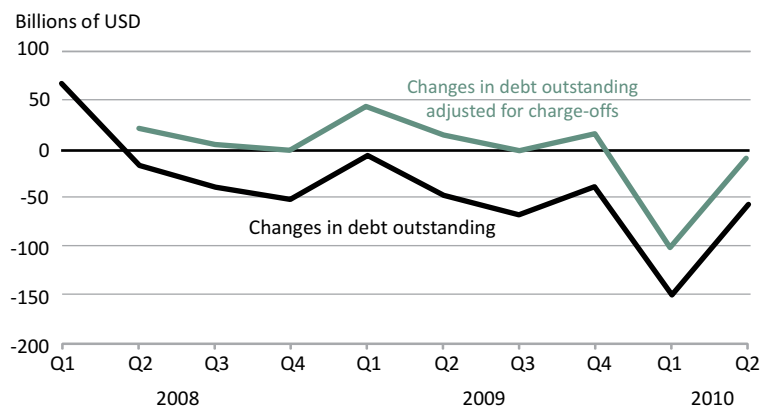
FIGURE 2

Household Deleveraging

a. Flow of Consumer Credit Outstanding Adjusted for Charge-Offs



b. Flow of Mortgage Debt Outstanding



Source: Federal Reserve Board Flow of Funds Account and Call Reports

The ratios of consumer debt and mortgage debt to disposable income have also declined, to 21 percent and 89 percent, respectively, in the second quarter of 2010.

Measuring Defaults and Pay-downs. The household balance-sheet deleveraging in the current cycle so far has come from both defaults and loan paydowns. These two different channels for deleveraging have different effects. First, the two channels affect lenders differently. Write-offs reduce banks' profits and capital and can lead to tightened lending standards going forward and therefore a slower recovery. Paydowns don't have this effect, although banks' expected profits are lowered because of the decline in loan demand. Second, different methods of deleveraging have different consumption implications. Reduced household leverage that accompanies default improves households' financial position and therefore can sustain consumption in the short run — an effect that Ronel Elul called the *financial decelerator* in his 2008 paper.

Figure 2 provides evidence from the Flow of Funds, which provides data on aggregate borrowing and default.⁵ The black line is net household borrowing (gross household borrowing minus debt repayment), while the green line is net household borrowing, excluding loans charged off by lenders. The difference between the black and the green lines represents the amount of debt discharged by lenders. The declining green lines suggest that households are indeed borrowing less than

⁵ For consumer credit, we use the charge-off rates obtained from the Call Reports. A bank charges off a loan when it is deemed uncollectible; that is, the loan is in default and it will not be repaid. In regard to mortgage debt, the Call Reports also provide us with charge-off rates for those loans held by commercial banks. The charge-off rates for loans held by other institutions are provided to us by the Flow of Funds section of the Board of Governors. We thank James Kennedy at the Board of Governors for providing us with these statistics.

before. The difference between the two lines indicates that loans charged off by lenders are also substantial. In particular, consumer loans charged off by banks have been much higher than their historical levels. For mortgages, quarterly charged-off loans have been close to \$50 billion for the past three years. To summarize, according to the aggregate data, between the second quarter of 2008 and the second quarter of 2010, about \$265 billion in consumer debt and \$441 billion in residential mortgages were discharged by lenders.

An alternative data source provides more detailed information about loan defaults and charge-offs by households. We use a 1 percent random sam-

ple of the Federal Reserve Bank of New York's (FRBNY) consumer credit panel data.⁶ The FRBNY consumer credit panel consists of credit report data for a panel of individuals and households from 1999 to 2009.⁷ The credit bureau data show a trend similar to that of the aggregate data in household deleveraging on both mortgages and consumer credit as reported in Figure 3.

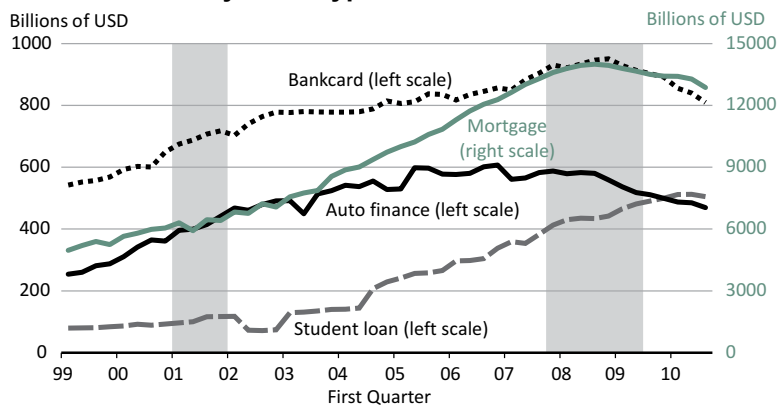
⁶ A sample is considered random if it has the same distribution as the population it is drawn from. Since the data set is very large, we can use 1 percent of the observations and still get precise estimates.

⁷ The credit reports are from Equifax, one of the three largest consumer credit bureaus in the U.S. All observations are quarterly.

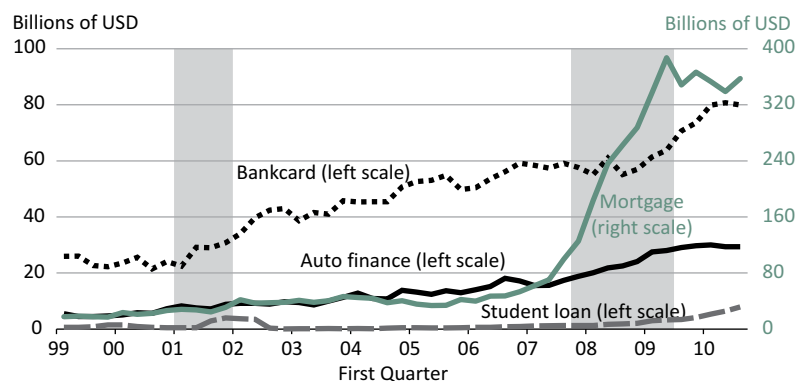
FIGURE 3

**Total Balance by Loan Type
Excluding Loans in Collection or Bankruptcy**

a. Total Balance by Loan Type



b. Total Balance of Severely Derogatory Loans



Source: FRBNY Consumer Credit Panel

According to the credit bureau data, total balances (excluding debt charged off when households file for bankruptcy) came down for bankcard debt, auto loans, and mortgages from their respective peaks, while student loans merely leveled off. Relative to their respective balances in the first quarter of 2008, auto loans had the biggest decline (19 percent), followed by bankcard debt (13 percent) and mortgages (8 percent). Student loans, by contrast, had their first decline only in the third quarter of 2010. It is worth noting that unlike other loans, student loans can be discharged in bankruptcy only under very rare circumstances such as extreme hardship (for example,

permanent disability).

We do not have the exact loan amount that is forgiven under bankruptcy. However, judging from the balance of severely derogatory loans — loans that are in collection or charge-offs — default is an important part of household deleveraging in bankcards, mortgages, and auto finance, but much more so in bankcards and mortgages (Figure 3, panel b).⁸ By the second quarter of 2010, about \$120 billion in consumer debt (bankcard plus auto

⁸ In general, only part of the severely derogatory loans will end up in bankruptcy. There are, however, cases in which borrowers have filed for bankruptcy after being only 60 days delinquent

plus student loans) and \$320 billion in mortgages were severely derogatory.

Supply and demand both appear to be playing important roles in households' deleveraging so far (Figure 4). There was clear evidence of supply constraints. Banks tightened lending standards for all types of consumer loans. Credit card approval rates also declined across all spectrums of credit scores. Average credit limits for revolving accounts have fallen since mid-2008, after a run-up over the previous five years. As a result, credit utilization rates went up. Consumer demand for credit also weakened (Figure 5). Banks have reported reduced consumer demand since the onset of the crisis. Consumer inquiries for new loans came down starting in the fourth quarter of 2007. In the second quarter of 2010, our last data point, inquiries per consumer were at one per quarter compared with about 1.5 prior to the crisis. The number of new accounts opened also decreased from 0.5 per consumer per quarter, a number that had prevailed through the previous 10 years, to about 0.3 as of the second quarter of 2010.⁹

What's Next? How much longer household deleveraging is going to last is the \$64,000 question. Given that housing debt still weighs heavily on households, deleveraging crucially depends on the recovery of the housing market (house-price appreciation). Household income is another driving force. Having said that, to the extent that we believe that the early 2000s (say, 2002) is what the long-run steady state will look like, then judging from the ratio of household credit to disposable income, American consumers are already over halfway there.

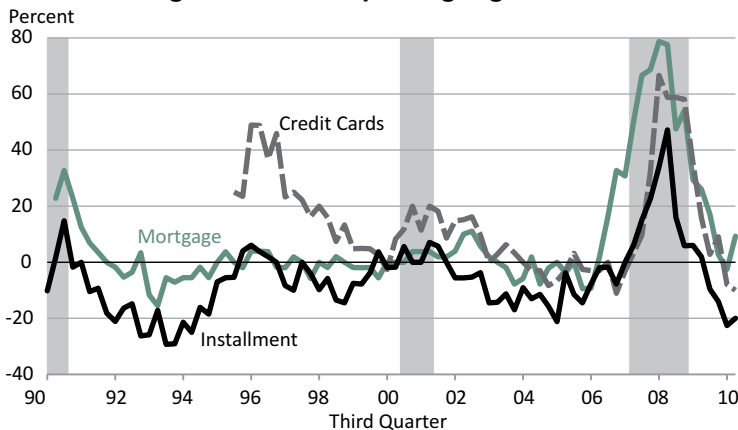
on some of their debt.

⁹ Some of the changes in inquiries may reflect supply effects. For example, customers may not inquire if they believe that banks are unlikely to grant a loan. This is just one of the difficulties of disentangling supply effects from demand effects.

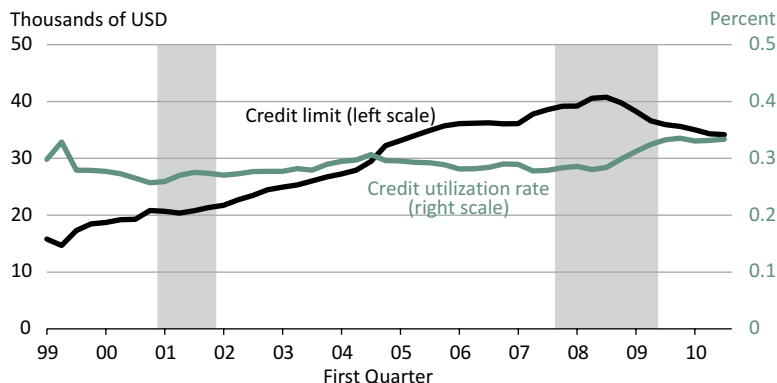
FIGURE 4

Household Deleveraging — Supply

a. Net Percentage of Banks Reporting Tightened Standards



b. Average Credit Limit and Credit Utilization Rates on Revolving Accounts Within the Last Six Months



Source: Senior Loan Officer Survey and FRBNY Consumer Credit Panel

CONCLUSION

Until 2008, U.S. households were accumulating debt at a rapid pace, allowing consumption growth to outstrip

that of income. The economic environment has since turned south, with housing values dropping dramatically. The sharp rise in unemployment rates

has also led to substantial reductions in income. Default rates have gone up. And households are also actively tightening their belts by cutting down on borrowing.


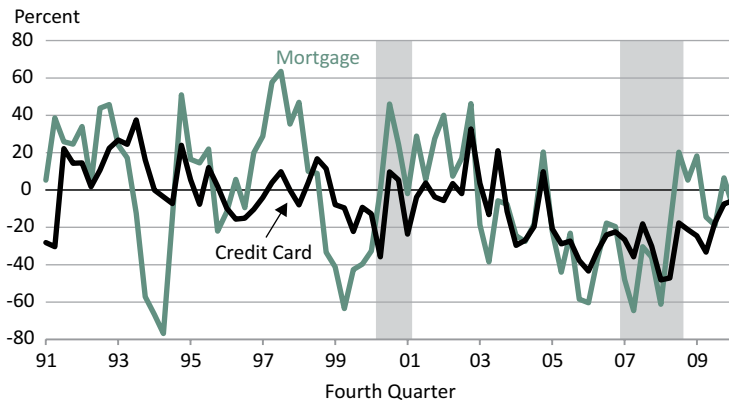
By understanding the factors underlying household leverage, we can gain insight into the factors underlying the deleveraging process. Households borrow to keep their consumption more or less stable even though their income fluctuates both with the age of the household and with fluctuations in the economy. When households expect income and asset values to go up as they did in the late 1990s to mid-2000s, they increase their borrowing. When these expectations do not pan out, as in the current episode, their high leverage puts them in a precarious situation. Households have to adjust both their assets and their consumption in order to be consistent with the revised expectations about the future growth of the economy. In the short run, a default may allow a household to forgo debt payments and shift funds to consumption. In the longer run, however, households will have to actively reduce their borrowing to a level consistent with their income and asset prospects. Only then will the economy reach a sustainable path for future growth. 

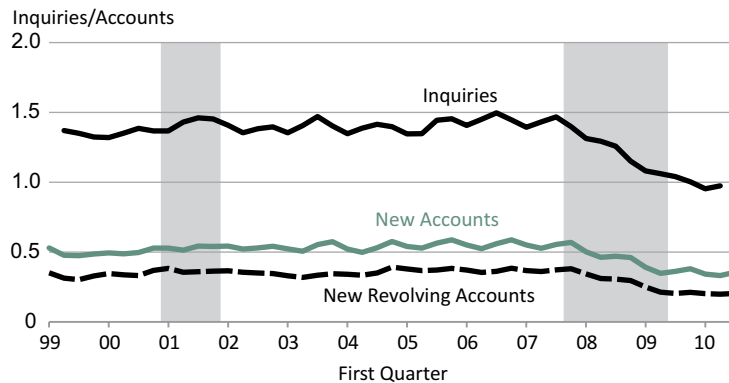
FIGURE 5

Household Deleveraging — Demand

a. Net Percentage of Banks Reporting Increased Demand



b. Average Number of Inquiries and New Accounts During the Last Six Months



Source: Senior Loan Officer Survey and FRBNY Consumer Credit Panel

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Geography, History, Economies of Density, and the Location of Cities*

BY JEFFREY LIN

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conomists believe that people choose to live and work at sites that have productive or amenity value such as a river, harbor, or some other natural resource. Another factor

that may determine the location of a city is the benefits derived from density itself: *agglomeration economies*.

Although these complementary explanations both have something useful to say about the locations and sizes of cities, they also have important limitations. While natural features seem important, it is difficult to point to one or even several that are valuable enough to explain a very large metropolitan area. And if there are large economies of density, then *any* location could be the potential site for a city, since density itself provides a reason for further concentration. If you were to replay the settlement of some large expanse of land, perhaps cities in this alternative history would be of different sizes and locations. This “path dependence” or “history dependence” is a potentially important theoretical implication of models featuring economies of density.

In this article, Jeff Lin helps shed light on why cities are located where they are.

What determines the location of cities? Sometimes, we can clearly identify instances when city locations were

chosen to achieve specific development or political goals, in remote or sparsely populated areas. For example, the site of Canberra, Australia’s capital city, was selected in the early 20th century as a compromise between rival cities Sydney and Melbourne. For many older cities, we can make only educated guesses about their origins. In general, economists believe that people choose

to concentrate at sites that have some productive or amenity value. A river, a harbor, or some other natural resource nearby might encourage settlement. There is also the role of local institutions — for example, well-defined property rights — that might make some places more attractive. If these kinds of local features aren’t available everywhere, economic activity will be attracted to locations that are superior in resources and institutions.

Another factor that may determine the location of cities is the benefits derived from density itself — so-called agglomeration economies. Living or working in close proximity to businesses or other people can make workers more productive. For example, similar businesses might cluster together in order to have access to cheaper specialized inputs. Jerry Carlino’s 2001 and 2009 *Business Review* articles and my own from 2011 discuss several potential sources of these agglomeration economies. (Of course, the effect of agglomeration economies on the location of cities does not preclude the influence of natural amenities.)

These complementary explanations both have something useful to say about the locations and relative sizes of cities. Of course, great agglomerations today are located near rivers, oceans, or other prominent features of the natural landscape. And many people who live in densely populated areas experience clear benefits from proximity to customers, employers, and producers.

What is perhaps less clear is how to judge the contributions of locational “fundamentals” and agglomeration economies — or more generally,



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*The views expressed here are those of the author and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

economies of density — independently. Note that both natural fundamentals and economies of density have important limitations as stories for understanding the geographic distribution of economic activity. While natural features seem important, it is difficult to point to one or even several natural features that are valuable enough to explain a very large metropolitan area. For example, in Philadelphia, is proximity to the Delaware and Schuylkill rivers alone really so valuable as to encourage millions of people to crowd together on their banks? Similarly, on their own, stories featuring economies of density are also limited. If there are large economies of density, people will want to locate near existing concentrations of population, but these stories are silent on how a city comes to be in a particular location in the first place. Why is the greatest agglomeration in the Third Federal Reserve District¹ near the confluence of the Delaware and Schuylkill rivers and not, say, further upstream on the Schuylkill or closer to the Atlantic Ocean?

Furthermore, if there really are large economies of density — that is, density itself provides incentive for people to concentrate, in a virtuous circle — it's possible that *any* location could be the potential site for a city. All that is required for a large agglomeration is a smaller agglomeration or, in a sense, a city “seed.” Intuitively, if you were to rewind history and replay the settlement of some large expanse of land, perhaps cities in this alternative history would be of different sizes and locations. Economists sometimes call this “path dependence” or “history dependence” — that is, present-day or long-run outcomes can depend on a series of historical events or shocks — and it is a potentially important, and

¹ The Third District covers eastern Pennsylvania, southern New Jersey, and Delaware.

unique, theoretical implication of models featuring economies of density.

EVIDENCE ON GEOGRAPHY FROM WAR AND DISEASE

In two papers, economists Donald Davis and David Weinstein reported a historical example paralleling this thought experiment. They analyzed settlement patterns in Japan before and after widespread Allied bombings during World War II. They interpreted these devastating bombings, and the resulting destruction of homes, capital, and lives, as akin to “starting history over” — many new location decisions were to be made in the vastly changed human geography of postwar Japan. However, contrary to their expectations, they found that the locations and relative sizes of Japanese cities remained unchanged from the prewar period — even Hiroshima and Nagasaki returned to their prewar growth trends

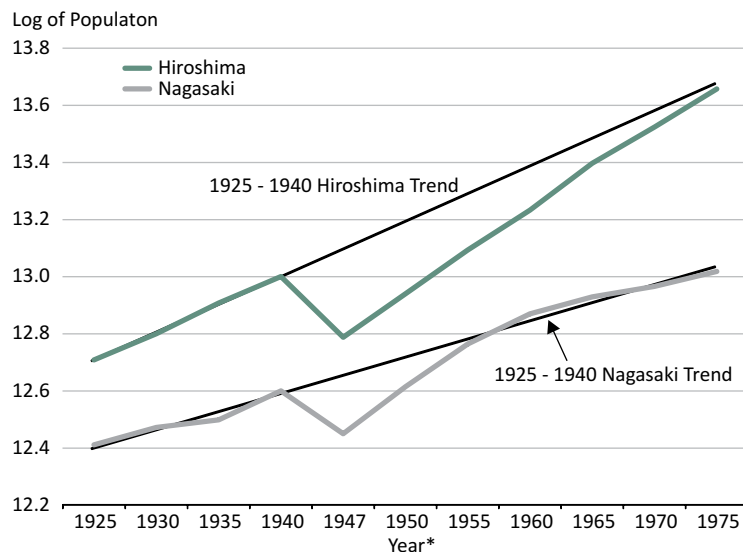
within 20 years (Figure 1). Similarly, a 2006 working paper by economists Patricia Beeson and Werner Troesken found that epidemics of yellow fever in Philadelphia in the 17th and 18th centuries had no long-run effects. Despite severe epidemics in 1699, 1792–1793, and 1797–1799, each of which killed about 8 to 10 percent of the city's population, Philadelphia, after each episode, returned quickly to its preexisting population growth trend.²

The tendency for Japanese cities to quickly revert to preexisting trends suggests that there was very little history dependence following the shocks of World War II. Otherwise, Davis and

² Papers by Steven Brakman, Harry Garretsen, and Marc Schramm; Paul F. Paskoff; and Edward Miguel and Gérard Roland show similar results for cities following war-related destruction in Germany after World War II, the U.S. South after the Civil War, and Vietnam after the Vietnam War.

FIGURE 1

Populations of Hiroshima and Nagasaki Returned to Trend Growth Quickly



* Data for 1945 were unavailable, so the authors used data for 1947.

Source: Davis and Weinstein (2002), used with permission

Weinstein might have found different patterns of concentration in postwar Japan; perhaps cities that had experienced relatively less destruction would have grown faster. Instead, the authors' preferred interpretation was that natural features are probably very important for understanding the locations and sizes of cities, with economies of density perhaps playing a secondary role. Their research left open an important question: If economies of density really do play an important role in determining location patterns, why didn't they observe any changes in the geographic distribution of activities following the massive destruction of World War II?

INTEGRATING EXPLANATIONS BASED ON NATURAL FEATURES AND ECONOMIES OF DENSITY

A satisfying understanding of the locations and sizes of cities probably includes *both* economies of density and natural features. However, finding evidence on the relative contributions of locational fundamentals and economies of density can be challenging. First, there are many natural features (e.g., rivers, forests, minerals, climate, etc.), and we may not have been able to include the value of all of these features. This leads to an "unobservable variables" problem: Although there may be a preferred explanation for a particular agglomeration, there lurks the possibility that some unobserved factor is the true reason for concentration at that site.

Furthermore, the natural features that first attracted people and businesses to a location very often continue to have value, even today. Consider long-lasting features like access to an ocean port or nice weather. These things continue to attract economic activity to particular locations to the present day and provide value to households who live there. Their con-

tinued value can confound attempts to attribute today's spatial distribution of population to economies of density.

In a previous *Business Review* article, Satyajit Chatterjee discussed one way to better understand the relative roles of natural features and agglomeration economies. His strategy was to construct an economic model

A satisfying understanding of the locations and sizes of cities probably includes *both* economies of density and natural features. However, finding evidence on the relative contributions of locational fundamentals and economies of density can be challenging.

that included *both* natural features and agglomeration economies. Then, he used this model to match the observed distribution of employment across U.S. counties and metropolitan areas. This exercise implied certain values for key parameters of the model. Having matched the *actual* geographic distribution of employment with this model, he then simulated a counterfactual geographic distribution of employment *without* agglomeration economies; that is, he assumed that the benefits to density were zero, but the other parameters were the same as before. Chatterjee found that, in the simulated economy, the distribution of economic activity without agglomeration economies was very similar to the observed distribution. His work supports the idea that some factor *besides* agglomeration economies is important for understanding the distribution of economic activity, although his method is silent on what the factor or factors might be.

EVIDENCE ON HISTORY DEPENDENCE AND INDUSTRY LOCATION FROM GERMANY

Economists Stephen Redding, Daniel Sturm, and Nikolaus Wolf

have also explored these issues in two papers. They examined the effects of Germany's division and reunification on its economic geography. In their 2011 paper, Redding, Sturm, and Wolf found that the division of Germany led to a shift in the location of air hub traffic from Berlin, where it had been concentrated, to Frankfurt. Following

reunification, they found no evidence of a shift back to Berlin. They interpreted this evidence in the following way: The division of Germany after World War II made continued hub operations in Berlin less profitable because that city became more isolated relative to other cities in the new West Germany. Frankfurt became relatively more attractive and subsequently became the preeminent air hub. Finally, reunification made Berlin less isolated and therefore a more attractive location for hub activities relative to its Cold War value. However, the authors found no evidence of a return of air traffic to Berlin; in fact, hub traffic continued to rise in Frankfurt and decline in Berlin following reunification. Thus, a historical shock had a permanent effect on the distribution of economic activity.

The authors interpreted this as evidence of history dependence. While these facts suggest the importance of economies of density (versus natural fundamentals), there remains the possibility that the division of Germany also created some unobservable, persistent change in the attractiveness of Berlin (or Frankfurt) as a

hub, so that following reunification, Berlin's value was not high enough to serve as a viable hub, no matter what the alternative historical sequence of events. (Alternatively, perhaps some event after German division greatly increased Frankfurt's value as an air traffic hub.) Much of Redding, Sturm, and Wolf's paper focuses on ruling out changes in locational fundamentals. In fact, probably the strongest case for history dependence (and against this criticism) is that hub traffic has not returned to Berlin, despite its being by far the largest city in Germany. Still, there is some ambiguity to interpreting these facts.

EVIDENCE ON HISTORY DEPENDENCE FROM PORTAGE SITES IN THE U.S.

Having better knowledge about some fundamental natural feature that affected economic geography and the change in its value over time might provide better evidence of history dependence. In addition, perhaps it would be interesting to examine population in general, rather than a specific (but interesting) industry like airline services. In a recent working paper, Hoyt Bleakley and I attempt to provide this kind of evidence. We examine historic *portage sites* in the U.S. South, Mid-Atlantic, and Midwest.

Portage is the carrying of a boat or its cargo over land between navigable waterways or to avoid a navigational obstacle such as rapids or falls. Portages are the places where this activity occurs. During the settlement of North America, when long-distance shipping was mostly waterborne, portages were a focal point for commerce. Traders were obliged to stop because of the natural obstacle to navigation; in turn, these sites offered easy opportunities for exchange and commerce. While these opportunities were valued historically, they became obsolete long ago. Thanks to changes in transportation

technology (e.g., railroads, trucks), traders no longer walk canoes around rapids. Similarly, some falls were sources of waterpower during early industrialization, and these advantages also declined with the advent of other, cheaper power sources. (Electrification, by allowing for transmission of power over long distances, uncoupled the location of manufacturing from the location of power generation.) Notably, despite the obsolescence of canoe transport and water wheels, concentrations of economic activity continue to exist at many of these sites.

Historical Portages and the Economic Geography of the Third District. Historical portage sites affected the economic geography of the Third District in early America and continue to do so even today (selected historical portages are shown in Figure 2 as green points). Several places in the Third District are portage-descended cities, including Trenton, Philadelphia,

and Wilmington.

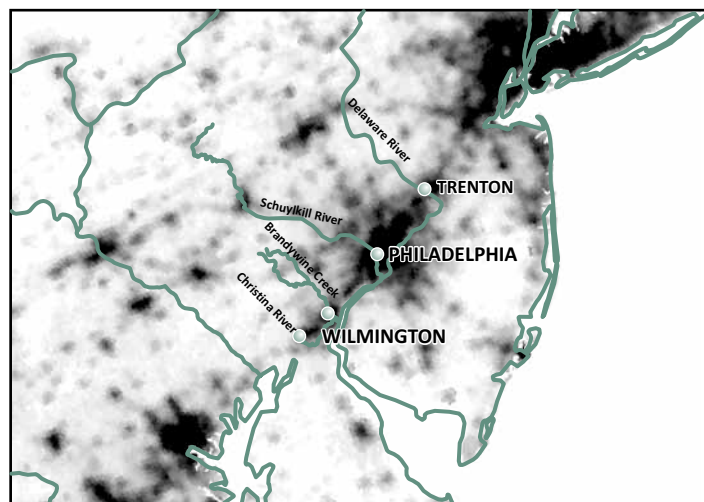
For example, the Schuylkill River was a major water transportation route in early America, and the falls of the Schuylkill (near the present-day section of East Falls in Philadelphia) first attracted Delaware and Iroquois Indian activity prior to European settlement.³ (Later, William Penn directed his surveyors to find a site on the Delaware River where it was "most navigable, high, dry, and healthy; that is, where most ships may best ride, of deepest draught of water, if possible to load or unload at the bank or key side, without boating or lightering of it. *It would do well if the river coming into that creek be navigable, at least for boats, up into the country.*"⁴ Thus, a key feature

³ See p. 11 of the book by Thomas Scharf and Thompson Westcott.

⁴ See the article by John Reys, p. 29, emphasis mine.

FIGURE 2

Selected Historical Fall-Line Portages in the Third District



Background is nighttime lights layer from National Geophysical Data Center (2003); Version 2 DMSP-OLS Nighttime Lights Series, Boulder, CO; [http://www.ngdc/noaa.gov/](http://www.ngdc.noaa.gov/). DMSP data collected by U.S. Air Force Weather Agency.

that Penn sought for his city, Philadelphia, was access to and trade with the interior of Pennsylvania. Penn's commission set out for Pennsylvania in the early summer of 1682 with these instructions for finding a suitable site for Philadelphia. There is some evidence that the commission initially selected a more southerly site in present-day Chester County.⁵ It's plausible that recognizing the value of better navigation and waterpower along the Schuylkill, Penn's surveyors rejected the Chester County site in favor of the present-day site near the falls of the Schuylkill River.

Swedish, Dutch, and later English settlers took advantage of both the trading opportunities and waterpower at the falls of the Schuylkill. Farmers used the Schuylkill to transport goods and exchange grew near the falls. In 1706, farmers in Lower Merion asked for a road to the landing place just below the falls to better facilitate trade.⁶ As early as 1686, water mills were erected to take advantage of the falls.⁷ And Donald Davis, who owned a mill near the falls, said in 1749 that the site of the falls was "very convenient for water carriage, both for bringing loads to the mill, and rafting timber to Philadelphia, it being by the river Schuylkill."⁸ Thus, early Philadelphia benefitted from its location near the falls of the Schuylkill and was able to attract both commerce and industry.

The site of present-day Trenton is at the falls of the Delaware River and its head of navigation, that is, the point at which navigation is no longer possible. It was inhabited by the Sanhican tribe of the Lenape Indian nation as early as 1400. The first Europeans

settled there in 1679. William Trent, a Philadelphia merchant, recognized the value of the falls and bought 800 acres near them; he then began developing the area, including a stone mill. "Trent's energy and financial backing launched the settlement, which he called Trent's Town, into a period of steady growth. Its position at the head of sloop navigation made the town a shipping point for grain and other products of the area, and a depot for merchandise between New York and Philadelphia."⁹

The first permanent European settlement in Delaware — by Swedes in 1638 — was near the confluence of the Delaware and Christina rivers and the falls of the Brandywine Creek, the present-day site of Wilmington. The falls of the Brandywine and several smaller nearby rivers provided waterpower for early mills and attracted industrial activity. The first mill on the Brandywine opened in 1687. By the 1790s, the flour mills near Wilmington and the falls of the Brandywine were the largest in the U.S.¹⁰

THE PERSISTENCE OF PORTAGE CITIES AFTER THE OBSOLESCENCE OF PORTAGE

Of course, in our District many portage cities are close enough to the ocean to continue to serve as port cities. In that sense, some natural advantage survives to this day. However, the Schuylkill, Christina, and Brandywine rivers serve little commercial traffic today. Similarly, the waterpower produced at these falls today is negligible, compared with power from other sources.

In my study with Hoyt Bleakley, we consider many other portage sites where the disappearance of the origi-

nal advantages is even clearer. In spite of the obsolescence of these original natural advantages, these portage sites are often still the location of major agglomerations today. In our study, we pay particular attention to rivers that intersect the *fall line*, a geomorphological feature dividing the Piedmont and the coastal plain. The fall line describes the last set of falls or rapids found along a river before it empties into the Atlantic Ocean or the Gulf of Mexico. Many historical portages, at intersections between the fall line and major rivers, are sites of major cities today (Figure 3).

An advantage of examining fall-line portages is that nearby locations are often very similar, in terms of other natural advantages. On land, the transition from the coastal plain to the Piedmont is quite gradual. This smoothness allows us to use comparison areas — places along the same river — that, except for an initial portage advantage, share features similar to these historical portage sites. For example, we can compare Philadelphia with other locations along the Schuylkill. This similarity also helps to rule out the existence of features co-located with portage that might continue to have value today. We also control for other observable differences, such as topography and climate. Thus, the main comparison is between sites that seem nearly identical *except for* the initial difference in value due to portage.

We found that not only are present-day populations concentrated at portage sites (relative to similar locations), these differences have shown no tendency to diminish over a long period of time — over a century after portage-related advantages became obsolete. Figure 4 shows the difference between population densities at portage sites and comparison sites for each decade relative to 1850. We also control for other observable differences. What the graph shows is that the dif-

⁵ See p. 594 in the book by Samuel Hazard.

⁶ See the article by Charles Barker, p. 345.

⁷ See the article by Edwin Iwanicki, p. 326.

⁸ See Barker, p. 345.

⁹ See the Federal Writers' Project, p. 400.

¹⁰ See the book by John Munroe, p. 58.

ferences in density have actually gotten larger over time. (In a separate analysis, we also compared portage cities to other cities of comparable density in 1850. There is no tendency for portage cities to decline relative to these cities as portage's value declined.)

Thus, even though initial differences in value due to portage have declined to zero, there is no tendency

for populations to equalize across these comparison locations. If fundamentals were the only force that mattered, we would expect, over the long run, that these differences would attenuate toward zero. However, the evidence suggests otherwise. Thus, a historical difference, now obsolete, strongly and permanently affected the pattern of development across a wide swath of the

U.S. We view this as strong evidence for path dependence in the location of economic activity.¹¹

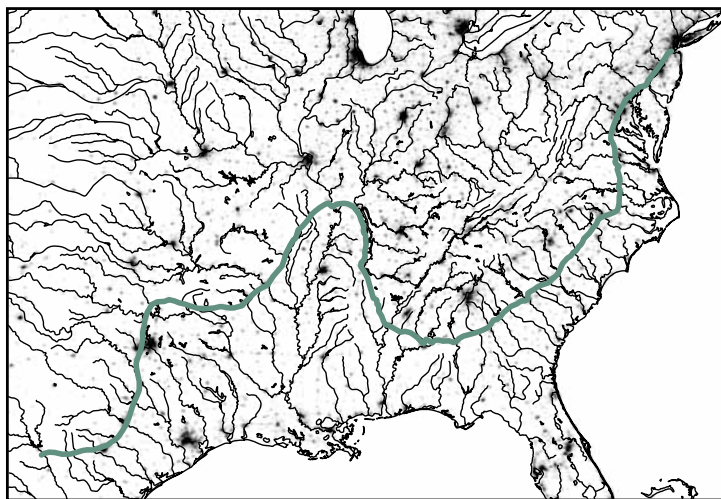
So why didn't Davis and Weinstein find permanent responses to the bombings of World War II in their study of Japan? A comparison with the studies of Germany and the fall line in the U.S. suggests a few hypotheses. Perhaps the magnitude of the shock associated with the Allied bombings of Japan was transitory, that is, not "large" enough to have permanent effects. Roads, lot divisions, and many other forms of capital survived the bombings and may have provided anchors for redevelopment. Also, the division of Germany lasted a half-century and, at the time, was likely to have been perceived as permanent or near permanent. Similarly, many portage sites in the U.S. were in active use and provided value for many decades or even a century or more. A plausible explanation is that these latter two episodes were larger shocks to the economic geography of the respective regions, which accounts for the difference in results.

Another possibility relates to the large amount of geographic variation in Japan. Japan's islands contain rugged mountainous areas and a few flat coastal plains. These large differences can actually suppress the effects of history. Intuitively, if only a few locations in a larger region are suitable for economic activity, it seems likely that, no matter the sequence of historical events, people would continue to

¹¹ If we were to replay the history of the U.S., it seems likely that a similar sequence of location decisions might have taken place near fall-line portages, given the existence of these physical obstacles to water navigation. However, a broader definition of path dependence, in which the location of economic activity depends on the past sequence of events and not necessarily locational fundamentals, seems applicable to the history of portage cities. In this view, portages are like accidents of *geography* that affected the historical location of population, which, in turn, affected the location of cities today.

FIGURE 3

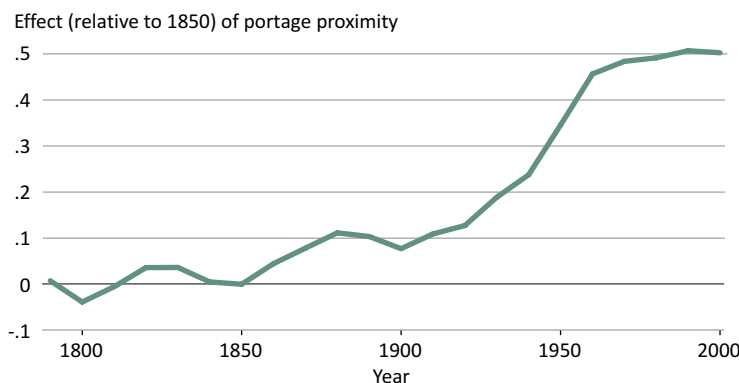
Fall Line, Rivers, and Population Density Today



Source: Adapted from Bleakley and Lin, Figure A.1

FIGURE 4

Population Density Differences Over Time, Portage vs. Nonportage Sites




Source: Adapted from Bleakley and Lin, Figure 5

settle in the same places. By analogy, as a thought experiment, if we were to replay the history of settlement in California (a very heterogeneous region), it seems likely that in our alternative history, the views of the Pacific coast, the harbors in San Francisco and San Diego, the soil quality in the Central Valley, and the sunshine in the Los Angeles basin would result in similar kinds of economic activity locating in similar places.

In contrast, in our study of portages, we are examining an area of the world that is relatively homogeneous:

The U.S. South, Midwest, and Mid-Atlantic are all relatively featureless plains, or, at least, the terrain and other natural features change slowly over space. Compared with Japan, a sample area that minimizes changes in natural features seems like a more ideal laboratory for testing for the presence of path dependence in the location of cities.

Recent research in economic geography suggests that, in different contexts, geography, history, and economies of density can each be major contributors to the distribution of economic activity. If geography mat-

ters a lot, as in Japan, then history and economies of density are unlikely to be major explanations for the distribution of people and businesses. If economies of density are strong, as with airport hub activities, then perhaps geographic fundamentals matter little and historical chance plays a larger role. And if geographical variation means little, as in the U.S. South and Midwest, then history seems to play a large and persistent role in determining the location of economic activity. 

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Changes in the Use of Electronic Means of Payment: 1995-2010

An Update Using the Recently Released 2010 Survey of Consumer Finances*

LORETTA J. MESTER

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his article updates the information published in an article by Loretta Mester in the March/April 2000 *Business Review* and last updated in the Third Quarter 2009 issue.

In “The Changing Nature of the Payments System: Should New Players Mean New Rules?” (*Business Review*, Federal Reserve Bank of Philadelphia, March/April 2000), I presented some data from the 1995 Federal Reserve Survey of Consumer Finances on the use of electronic banking. This survey of more than 4,000 households, which is designed to be representative of all households in the U.S., is redone every three years.¹ The Federal Reserve recently released the results from the 2010 survey. Attached are updates of the statistics indicating how the usages of various means of electronic payment have changed between 1995 and 2010.

¹ In 2010, more than 6,000 families were surveyed. For more information on the survey, see Jesse Bricker, et al., “Changes in U.S. Family Finances from 2007 to 2010: Evidence from the Survey of Consumer Finances,” *Federal Reserve Bulletin*, 98 (June 2012), available at <http://www.federalreserve.gov/pubs/bulletin/2012/pdf/scf12.pdf>.



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www.philadelphiafed.org/research-and-data/publications/.

As seen in Exhibit 1 and in the accompanying charts, usage of electronic forms of payment, including ATMs, debit cards, automatic bill paying, and smart cards, has risen from about 78 percent of households in 1995 to almost 94 percent of households in 2010. Debit card use, which about doubled between 1995 and 1998, has been steadily increasing (although at a slower pace) since then and now stands at over 78 percent of all households. Increases were seen in all categories by age, income, and education. In 2010, there was a particularly strong increase in debit card usage by those over 60 years old and those in the low-income group.

Use of direct deposit increased modestly except for those in the low-income group, where there was a slight decline, and for those with a college degree, where there was essentially no change. In contrast to the 2007 survey in which it declined, automatic bill paying grew modestly across all categories in 2010, and the percentage of households now using it is more than double what it was in 1995. Over 80

* The views expressed here are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

percent of households have an ATM card, with the largest growth in 2010 seen in the low-income group. There was little change in the percentage of households that use some type of computer software to manage their money: The percentage stood about 18 percent in 2010. Respondents under 60 years old, those with higher income, and those with college degrees are more likely to use a computer for money management.

As seen in Exhibit 2 and the accompanying charts, in 2010, while households that do business with at least one financial institution continued to increase usage of automated methods of conducting this business, 85 percent of households continued to report that one of the main ways they deal with at least one of their financial institutions is in person. In the 2007 survey there had been a sizable increase in the percentage of households that use the telephone as one of the main ways of conducting business with at least one of their financial institutions; this percentage remained at over 60 percent in the 2010 survey. Although not shown in the table, there was little change in either voice or touchtone usage.

Overall use of electronic means of doing business — either ATM, phone, fax, direct deposit and payment, other electronic transfer, and/or computer — continued to increase between 2007 and 2010. In 2010, nearly 95 percent of households used an electronic method as one of their main ways of conducting business, and differences

by income, education, and age continued to become less pronounced. However, differences in the popularity of ATM/debit card usage across age groups remain: Almost 90 percent of those under 30 years old use ATM/debit cards as one of their main ways of conducting business, while around 60 percent of those over 60 years old use them. Still, this was a 10-percentage-point increase in usage by those over 60 since 2007,

and that share has almost quadrupled since 1995.

As was true in 2007, the largest growth in 2010 was seen in the percentage of households that use a computer, the Internet, or an online service as a main way to do business. In 2010, over 60 percent of households used these as a main method to conduct business, up from around 50 percent in 2007 and less than 4 percent in

1995. Youth, high income, and a college degree continue to be associated with a higher incidence of computer banking. While the computer remains a less popular means of doing business with financial institutions compared with some other methods, its popularity has caught up to that of using the phone and is now exceeding use of the mail, which saw the largest decline in 2010, to about 52 percent.

Exhibit 1, Part 1**Percent of U.S. Households That Use Each Instrument: Survey of Consumer Finances, 1995, 1998, 2001, 2004, 2007, and 2010^a**

	ATM ^b						Debit Card						Direct Deposit						
	1995	1998	2001	2004	2007	2010	1995	1998	2001	2004	2007	2010	1995	1998	2001	2004	2007	2010	
All Households	62.5%	67.4%	69.8%	74.4%	79.7%	83.4%	17.6%	33.8%	47.0%	59.3%	67.0%	78.4%	46.7%	60.5%	67.3%	71.2%	74.9%	75.9%	
By Age																			
Under 30 years old	72.3%	75.6%	78.1%	83.0%	84.8%	88.7%	24.4%	45.0%	60.6%	74.4%	78.3%	88.5%	31.0%	45.2%	48.8%	54.0%	61.3%	63.2%	
Between 30 and 60 years old	68.6%	76.1%	76.8%	82.3%	85.9%	88.4%	19.7%	38.6%	53.4%	67.6%	74.9%	84.1%	42.8%	58.0%	64.8%	68.2%	72.6%	73.4%	
Over 60 years old	44.2%	41.9%	48.9%	51.6%	63.5%	70.6%	9.6%	16.0%	24.6%	32.5%	43.9%	62.3%	63.3%	74.8%	83.2%	87.0%	86.4%	86.7%	
By Income^c																			
Low income	38.5%	45.9%	46.8%	53.0%	58.8%	67.5%	7.0%	19.7%	29.2%	41.2%	48.1%	64.5%	32.5%	44.3%	51.9%	54.8%	60.5%	58.7%	
Moderate income	61.5%	64.4%	67.4%	73.4%	78.5%	82.4%	16.0%	31.6%	46.3%	57.4%	68.0%	78.3%	42.9%	58.8%	63.1%	64.0%	68.5%	72.3%	
Middle income	70.9%	72.0%	75.2%	78.3%	87.5%	87.4%	20.5%	36.6%	50.0%	64.3%	75.0%	83.5%	48.3%	66.1%	65.7%	73.2%	76.8%	79.8%	
Upper income	77.2%	82.3%	83.7%	86.5%	91.0%	93.2%	25.1%	43.8%	57.8%	69.3%	75.8%	86.0%	58.3%	70.4%	80.2%	83.6%	86.6%	88.2%	
By Education																			
No college degree	54.7%	60.1%	63.7%	67.4%	74.0%	78.1%	14.3%	29.2%	42.3%	54.9%	63.7%	75.0%	40.3%	54.4%	61.8%	64.3%	68.9%	70.4%	
College degree	80.4%	82.1%	81.6%	86.4%	90.3%	92.3%	25.2%	43.1%	56.2%	67.0%	72.9%	84.2%	61.0%	72.6%	78.0%	83.2%	85.9%	85.2%	

^aThe percentages reported are based on the population-weighted figures using the revised Kennickell-Woodburn consistent weights for each year. (For further discussion see the Survey of Consumer Finances code books at <http://www.federalreserve.gov/econresdata/scf/scfindex.htm>.) This exhibit reports percentages for all households.

^bThe question on ATMs asked whether any member of the household had an ATM card and not whether the member used it. The other questions asked about usage. Note that previous updates of this report included statistics on smart cards. That question was dropped after the 2001 survey.

^cLow income is defined as less than 50 percent of the median household income; moderate income is 50 to 80 percent of the median; middle income is 80 to 120 percent of the median; and upper income is greater than 120 percent of the median. Each survey refers to income in the previous year. Median income in current dollars was \$32,264 in 1994; \$37,005 in 1997; \$41,990 in 2000; \$43,318 in 2003; \$48,201 in 2006; and \$49,777 in 2009.

Source: 1995, 1998, 2001, 2004, 2007, 2010 Survey of Consumer Finances data as of July 3, 2012, Federal Reserve System, and author's calculations.

Exhibit 1, Part 2**Percent of U.S. Households That Use Each Instrument: Survey of Consumer Finances, 1995, 1998, 2001, 2004, 2007, and 2010^a**

	Automatic Bill Paying						Software ^b				Any of the Methods: ATM, Debit Card, Smart Card, Direct Deposit, Automatic Bill Paying, or Software					
	1995	1998	2001	2004	2007	2010	2001	2004	2007	2010	1995	1998	2001	2004	2007	2010
All Households	21.8%	36.0%	40.3%	47.4%	45.5%	48.3%	18.0%	19.3%	19.1%	18.5%	77.7%	85.5%	88.9%	90.7%	91.8%	93.7%
By Age																
Under 30 years old	17.7%	30.5%	32.1%	36.5%	35.7%	42.9%	17.0%	20.4%	21.4%	22.3%	76.3%	80.2%	83.8%	87.6%	88.6%	92.2%
Between 30 and 60 years old	24.4%	38.6%	44.1%	50.3%	48.8%	49.8%	22.0%	21.9%	21.6%	20.3%	78.7%	87.5%	89.9%	90.9%	92.4%	93.9%
Over 60 years old	18.2%	33.0%	35.9%	46.5%	42.9%	47.5%	9.0%	12.8%	12.3%	13.0%	76.1%	83.7%	89.4%	92.0%	92.1%	94.0%
By Income^c																
Low income	9.7%	17.1%	18.2%	24.6%	23.8%	29.4%	6.1%	6.8%	7.7%	9.0%	56.7%	69.3%	74.3%	78.0%	79.7%	84.6%
Moderate income	17.5%	30.5%	35.1%	40.5%	37.8%	42.3%	10.7%	11.1%	10.7%	11.2%	78.4%	87.2%	88.6%	88.7%	91.1%	93.4%
Middle income	23.4%	42.8%	45.1%	52.8%	50.2%	52.9%	16.3%	17.8%	18.8%	17.0%	85.1%	89.4%	92.5%	95.5%	96.4%	96.7%
Upper income	32.1%	49.3%	55.2%	62.4%	61.6%	62.5%	29.9%	31.4%	30.5%	29.4%	89.6%	94.9%	97.1%	97.5%	98.4%	98.9%
By Education																
No college degree	18.1%	30.2%	33.7%	39.5%	38.0%	40.8%	10.9%	12.4%	11.9%	11.2%	71.4%	80.7%	85.1%	86.6%	88.4%	90.9%
College degree	30.1%	47.7%	53.2%	61.1%	59.3%	61.0%	31.8%	31.3%	32.2%	30.7%	91.8%	95.1%	96.4%	98.0%	98.2%	98.4%

^aThe percentages reported are based on the population-weighted figures using the revised Kennickell-Woodburn consistent weights for each year. (For further discussion see the Survey of Consumer Finances codebooks at <http://www.federalreserve.gov/econresdata/scf/scfindex.htm>.) This exhibit reports percentages for all households.

^bThe question on software asked whether the respondent or spouse/partner uses any type of computer software to help in managing their money.

^cLow income is defined as less than 50 percent of the median household income; moderate income is 50 to 80 percent of the median; middle income is 80 to 120 percent of the median; and upper income is greater than 120 percent of the median. Each survey refers to income in the previous year. Median income in current dollars was \$32,264 in 1994; \$37,005 in 1997; \$41,990 in 2000; \$43,318 in 2003; \$48,201 in 2006; and \$49,777 in 2009.

Source: 1995, 1998, 2001, 2004, 2007, 2010 Survey of Consumer Finances data as of July 3, 2012, Federal Reserve System, and author's calculations.

Exhibit 2, Part 1**Percent of U.S. Households with at Least One Financial Institution Using Each Method
Among the Main Ways of Conducting Business with at Least One of Their Financial Institutions^a**

	In Person						Mail						ATM/Debit Card ^b					
	1995	1998	2001	2004	2007	2010	1995	1998	2001	2004	2007	2010	1995	1998	2001	2004	2007	2010
All Households	85.5%	79.5%	77.2%	77.4%	84.9%	84.9%	56.5%	54.1%	50.4%	50.5%	58.9%	52.1%	33.8%	52.6%	56.7%	64.4%	73.6%	77.5%
By Age																		
Under 30 years old	77.0%	73.7%	71.5%	72.9%	79.3%	80.1%	58.2%	51.9%	50.5%	44.5%	52.4%	45.4%	53.0%	68.8%	72.6%	79.3%	86.2%	89.8%
Between 30 and 60 years old	86.8%	81.8%	78.6%	77.3%	84.8%	84.6%	62.1%	60.4%	56.6%	56.8%	62.7%	54.0%	37.7%	61.5%	65.0%	72.0%	82.2%	83.3%
Over 60 years old	86.7%	77.2%	76.8%	79.6%	87.7%	87.6%	44.0%	39.9%	36.0%	39.2%	53.5%	51.0%	16.2%	22.3%	29.8%	39.9%	49.5%	60.4%
By Income^c																		
Low income	81.2%	70.3%	68.2%	71.2%	80.9%	81.1%	32.8%	33.4%	24.7%	28.9%	40.4%	39.5%	19.6%	34.7%	35.6%	46.6%	53.9%	63.7%
Moderate income	85.9%	80.4%	76.9%	75.0%	83.0%	83.6%	48.5%	46.9%	42.0%	42.8%	52.5%	47.8%	29.6%	47.8%	50.5%	62.3%	71.4%	74.9%
Middle income	85.7%	81.4%	78.6%	77.8%	86.4%	87.0%	56.9%	56.4%	58.4%	56.4%	63.0%	56.7%	37.7%	54.1%	60.7%	65.9%	80.5%	80.6%
Upper income	87.7%	84.1%	81.8%	81.5%	87.4%	87.1%	74.3%	69.1%	64.9%	63.0%	70.9%	60.1%	42.3%	65.2%	69.6%	74.4%	83.3%	86.0%
By Education																		
No college degree	85.8%	79.2%	75.1%	76.9%	84.0%	84.3%	49.4%	48.2%	43.5%	44.3%	53.8%	47.8%	27.4%	45.1%	50.1%	59.2%	69.0%	74.2%
College degree	84.8%	80.2%	81.1%	78.0%	86.5%	85.9%	71.2%	65.2%	63.0%	60.6%	67.7%	59.2%	46.7%	66.7%	68.8%	72.9%	81.7%	82.8%

^aThe percentages reported are based on the population-weighted figures using the revised Kennickell-Woodburn consistent weights for each year. (For further discussion see the Survey of Consumer Finances codebooks at <http://www.federalreserve.gov/econresdata/scf/scfindex.htm>.) Referring to each financial institution with which the household does business, the survey asked: "How do you mainly do business with this institution?" Respondents could list multiple methods, with the main method listed first. This exhibit reports for all households with at least one financial institution all the methods a respondent listed for each of the household's financial institutions. Note, the percentages do not add up to 100 percent across columns, since households could list more than one method and more than one financial institution. Previous versions of this chart prior to 2006 reported for 1998 and 2001 on the main ways respondents did business with their depository financial institutions (i.e., commercial banks, trust companies, thrifts, and credit unions) rather than with any of their financial institutions.

^bIn 1995, the question did not include debit cards.

^cLow income is defined as less than 50 percent of the median household income; moderate income is 50 to 80 percent of the median; middle income is 80 to 120 percent of the median; and upper income is greater than 120 percent of the median. Each survey refers to income in the previous year. Median income in current dollars was \$32,264 in 1994; \$37,005 in 1997; \$41,990 in 2000; \$43,318 in 2003; \$48,201 in 2006; and \$49,777 in 2009.

Source: 1995, 1998, 2001, 2004, 2007, 2010 Survey of Consumer Finances data as of July 3, 2012, Federal Reserve System, and author's calculations.

Exhibit 2, Part 2**Percent of U.S. Households with at Least One Financial Institution Using Each Method
Among the Main Ways of Conducting Business with at Least One of Their Financial Institutions^a**

	Phone						Computer						Electronic ^b						
	1995	1998	2001	2004	2007	2010	1995	1998	2001	2004	2007	2010	1995	1998	2001	2004	2007	2010	
All Households	25.7%	49.7%	48.9%	49.0%	61.8%	61.4%	3.7%	6.2%	19.6%	33.7%	51.5%	60.5%	56.2%	81.7%	87.0%	89.2%	93.3%	94.8%	
By Age:																			
Under 30 years old	20.8%	45.4%	45.9%	43.2%	52.9%	58.6%	5.2%	8.3%	22.9%	42.2%	61.7%	73.9%	66.7%	81.0%	85.2%	89.2%	94.6%	96.9%	
Between 30 and 60 years old	28.1%	54.3%	52.4%	51.5%	64.8%	62.2%	4.5%	7.6%	24.2%	39.9%	60.5%	67.9%	59.9%	85.1%	89.4%	90.9%	95.1%	96.1%	
Over 60 years old	23.0%	40.6%	42.4%	46.0%	59.3%	60.7%	1.2%	1.6%	7.3%	15.4%	27.4%	40.0%	43.4%	73.9%	82.4%	85.4%	88.7%	91.2%	
By Income^c																			
Low income	13.5%	28.8%	29.2%	30.0%	46.8%	50.0%	1.3%	1.5%	4.8%	14.0%	23.9%	33.1%	35.3%	65.4%	73.8%	78.7%	83.7%	87.4%	
Moderate income	18.6%	42.5%	42.8%	44.8%	59.6%	59.6%	1.8%	2.7%	11.2%	22.5%	38.1%	48.5%	48.5%	80.1%	84.2%	84.8%	92.1%	94.2%	
Middle income	22.6%	51.7%	51.7%	50.7%	62.8%	64.4%	4.0%	4.3%	17.8%	32.5%	53.0%	64.1%	59.2%	85.2%	89.7%	92.1%	96.6%	97.0%	
Upper income	37.9%	64.9%	61.4%	60.4%	71.2%	68.1%	5.9%	11.5%	32.5%	49.5%	72.9%	82.1%	70.8%	91.0%	94.5%	95.6%	98.1%	98.7%	
By Education																			
No college degree	19.7%	41.9%	41.7%	43.4%	58.1%	57.1%	2.8%	2.7%	11.3%	24.0%	39.8%	48.8%	47.8%	76.5%	83.2%	85.7%	90.3%	92.8%	
College degree	38.1%	64.3%	61.9%	58.0%	68.2%	68.3%	5.6%	12.8%	34.8%	49.4%	71.8%	79.4%	73.5%	91.4%	94.0%	94.9%	98.4%	98.0%	

^aThe percentages reported are based on the population-weighted figures using the revised Kennickell-Woodburn consistent weights for each year. (For further discussion see the Survey of Consumer Finances codebooks at <http://www.federalreserve.gov/econresdata/scf/scfindex.htm>.) Referring to each financial institution with which the household does business, the survey asked: "How do you mainly do business with this institution?" Respondents could list multiple methods, with the main method listed first. This exhibit reports for all households with at least one financial institution all the methods a respondent listed for each of the household's financial institutions. Note, the percentages do not add up to 100 percent across columns, since households could list more than one method and more than one financial institution. Previous versions of this chart prior to 2006 reported for 1998 and 2001 on the main ways respondents did business with their depository financial institutions (i.e., commercial banks, trust companies, thrifts, and credit unions) rather than with any of their financial institutions.

^bIn 1995, electronic refers to ATM, phone, payroll deduction and direct deposit, electronic transfer, or computer. In 1998, 2001, 2004, 2007, and 2010, electronic refers to ATM, phone (via voice or touch-tone), direct deposit, direct withdrawal/payment, other electronic transfer, computer/Internet/online service, or fax machine.

^cLow income is defined as less than 50 percent of the median household income; moderate income is 50 to 80 percent of the median; middle income is 80 to 120 percent of the median; and upper income is greater than 120 percent of the median. Each survey refers to income in the previous year. Median income in current dollars was \$32,264 in 1994; \$37,005 in 1997; \$41,990 in 2000; \$43,318 in 2003; \$48,201 in 2006; and \$49,777 in 2009.

Source: 1995, 1998, 2001, 2004, 2007, 2010 Survey of Consumer Finances data as of July 3, 2012, Federal Reserve System, and author's calculations.

Figures 1.1-1.6 illustrate the data in Exhibit 1 on the percent of U.S. households that use each instrument

FIGURE 1.1

Figure 1.1a Exhibit 1 ATM: By Age

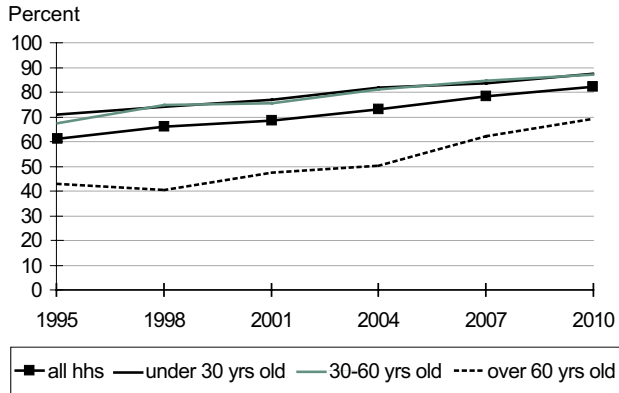


Figure 1.1b Exhibit 1 ATM: By Income

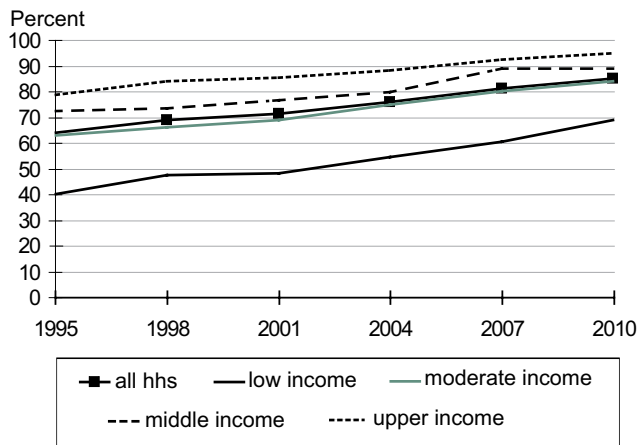


Figure 1.1c Exhibit 1 ATM: By Education

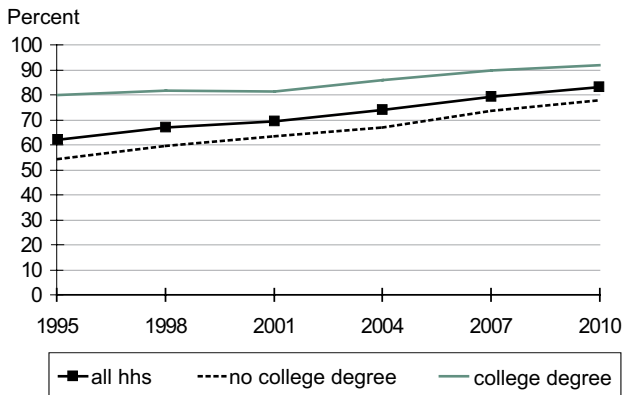


FIGURE 1.2

Figure 1.2a Exhibit 1 Debit Card: By Age

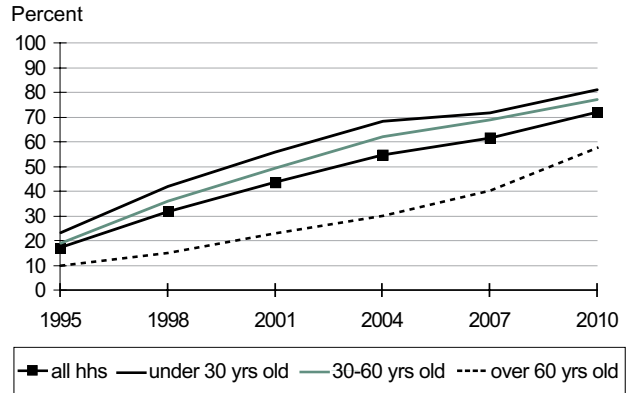


Figure 1.2b Exhibit 1 Debit Card: By Income

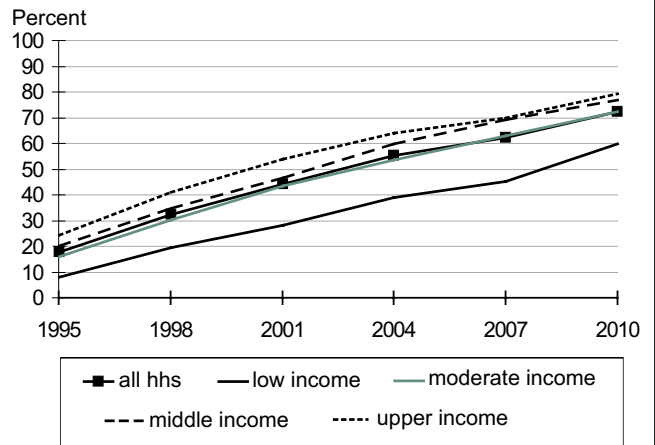


Figure 1.2c Exhibit 1 Debit Card: By Education

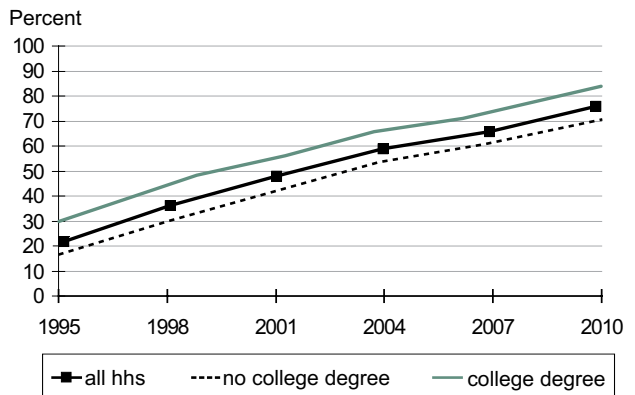


FIGURE 1.3

Figure 1.3a Exhibit 1 Direct Deposit: By Age

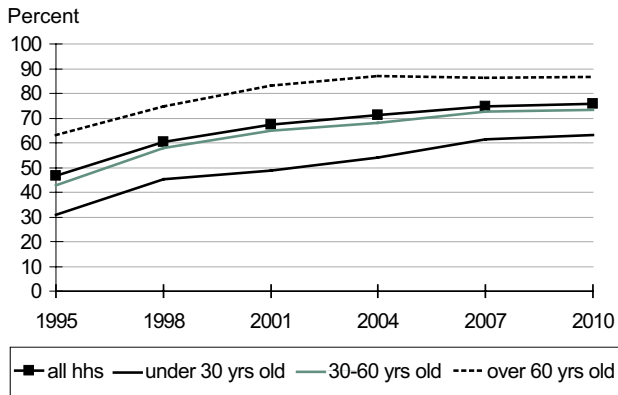


FIGURE 1.4

Figure 1.4a Exhibit 1 Automatic Bill Paying: By Age

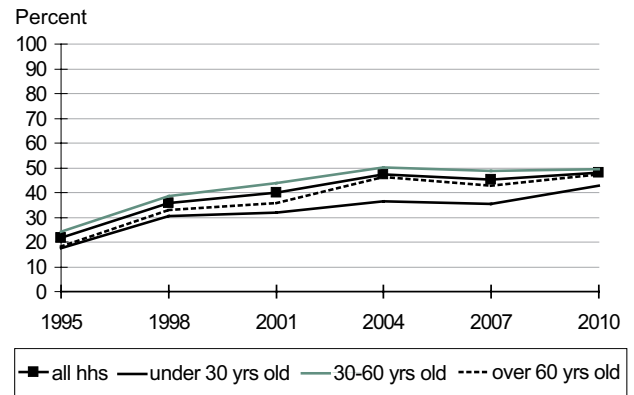


Figure 1.3b Exhibit 1 Direct Deposit: By Income

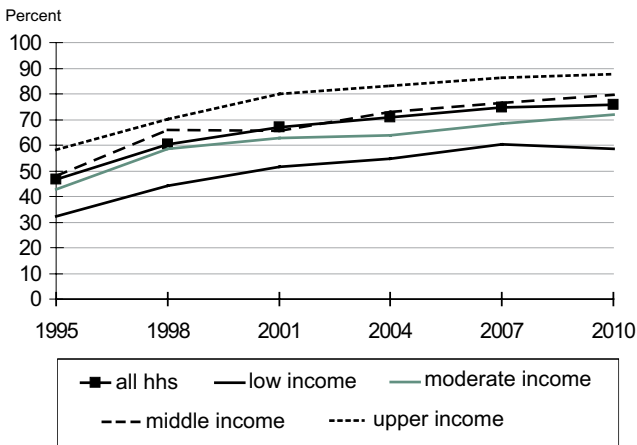


Figure 1.4b Exhibit 1 Automatic Bill Paying: By Income

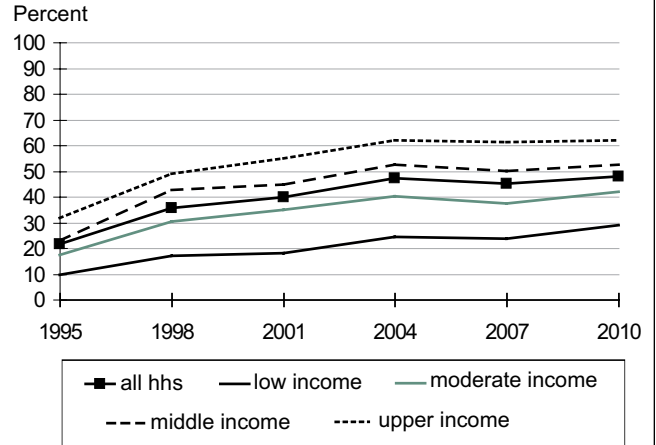


Figure 1.3c Exhibit 1 Direct Deposit: By Education

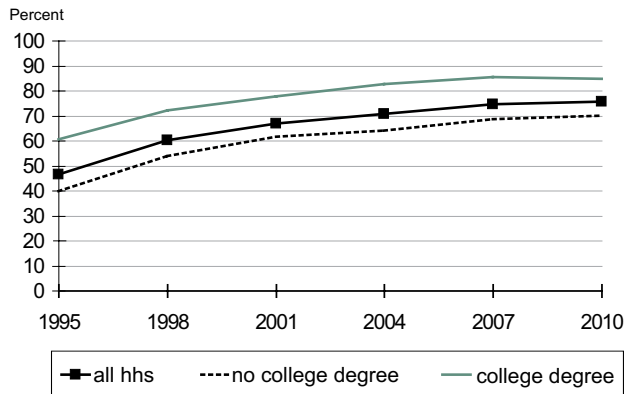


Figure 1.4c Exhibit 1 Automatic Bill Paying: By Education

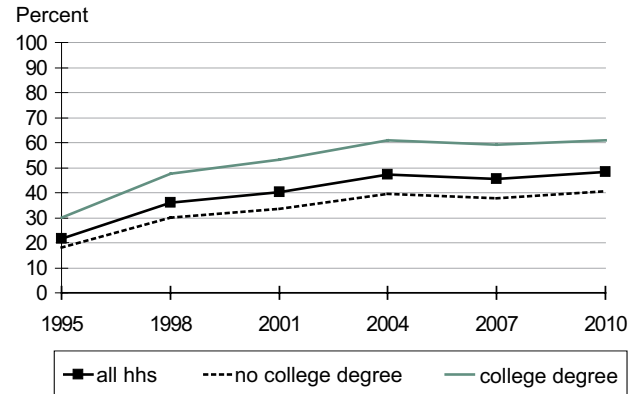


FIGURE 1.5

Figure 1.5a Exhibit 1 Software: By Age

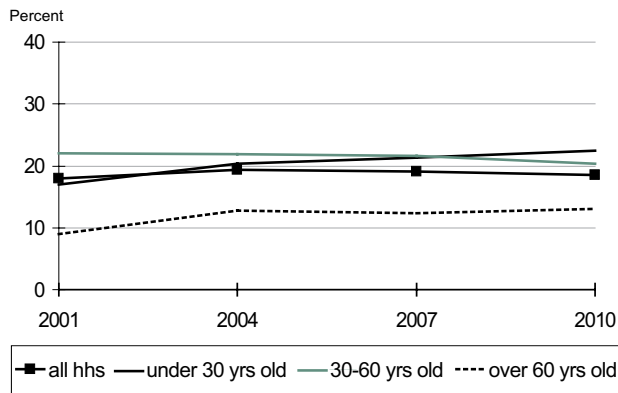


Figure 1.5b Exhibit 1 Software: By Income

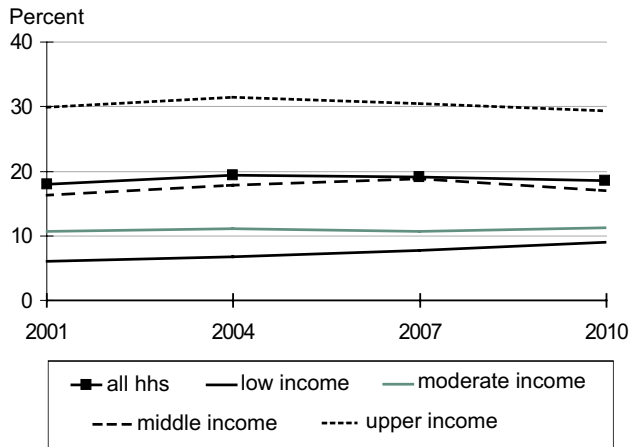


Figure 1.5c Exhibit 1 Software: By Education

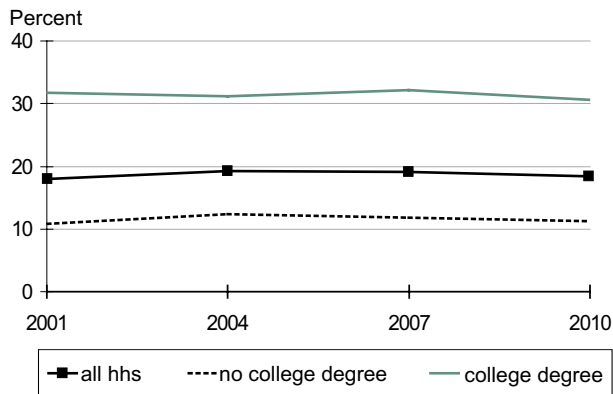


FIGURE 1.6

Figure 1.6a Exhibit 1 Any of the Methods: By Age
ATM, Debit Card, Smart Card, Direct Deposit, Automatic Bill Paying, or Software

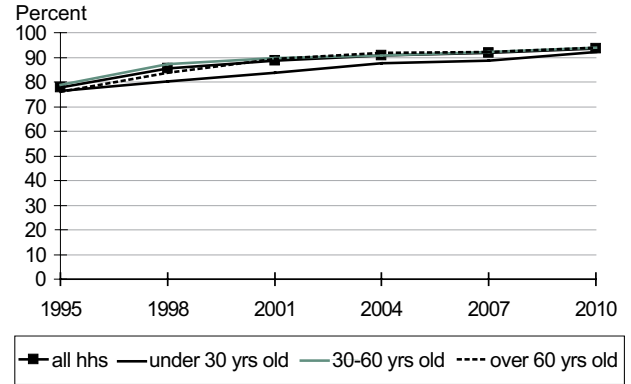


Figure 1.6b Exhibit 1 Any of the Methods: By Income
ATM, Debit Card, Smart Card, Direct Deposit, Automatic Bill Paying, or Software

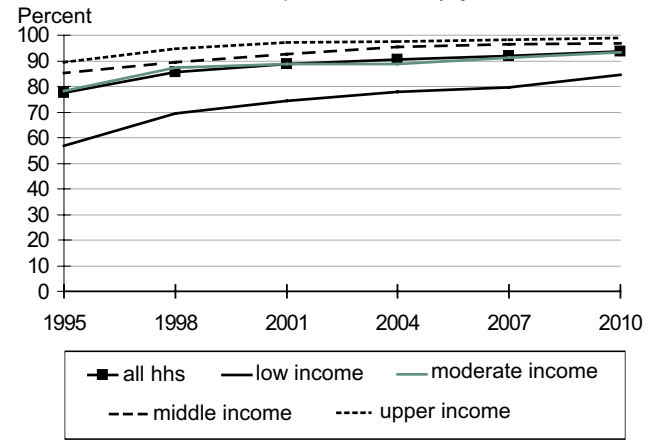
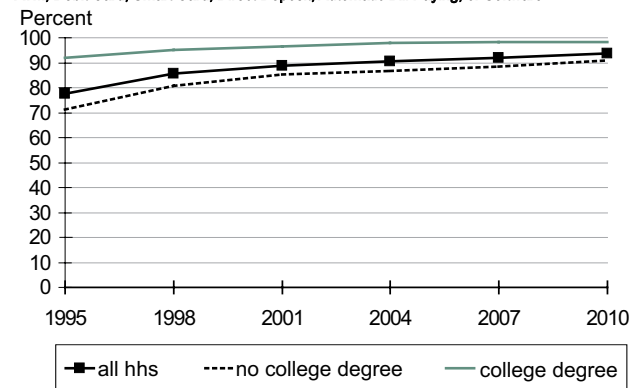


Figure 1.6c Exhibit 1 Any of the Methods: By Education
ATM, Debit Card, Smart Card, Direct Deposit, Automatic Bill Paying, or Software



Figures 2.1-2.6 illustrate the data in Exhibit 2 on the percent of U.S. households with a financial institution that use each instrument among the main ways of conducting business with at least one of their financial institutions

FIGURE 2.1

Figure 2.1a Exhibit 2 In Person: By Age

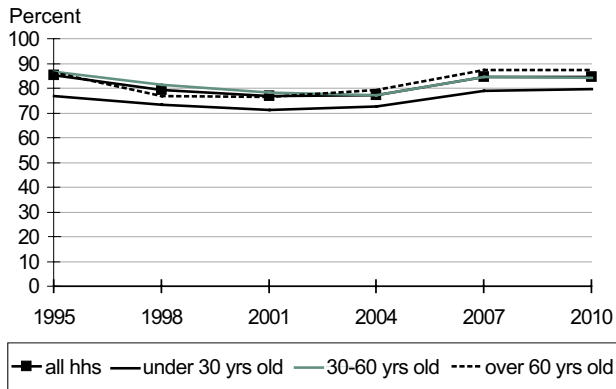


Figure 2.1b Exhibit 2 In Person: By Income

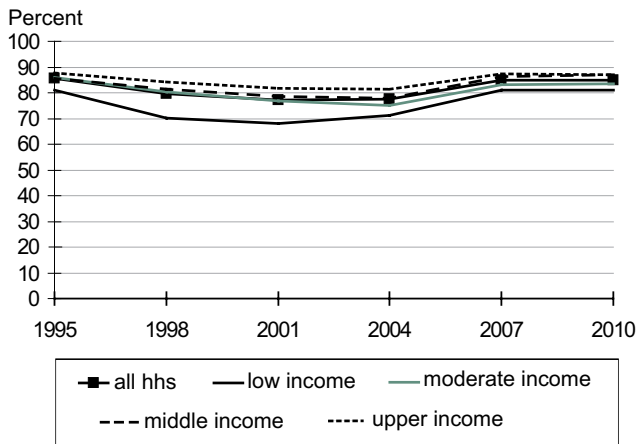


Figure 2.1c Exhibit 2 In Person: By Education

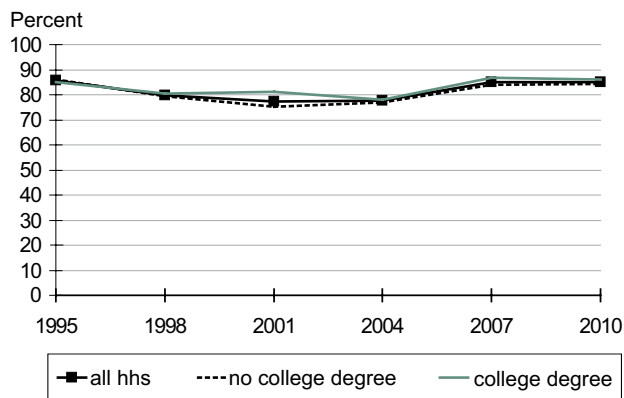


FIGURE 2.2

Figure 2.2a Exhibit 2 Mail: By Age

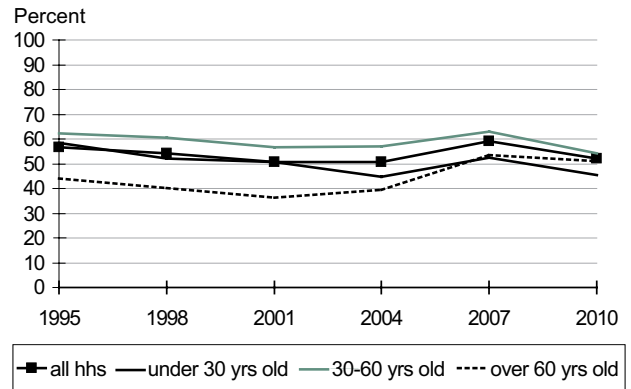


Figure 2.2b Exhibit 2 Mail: By Income

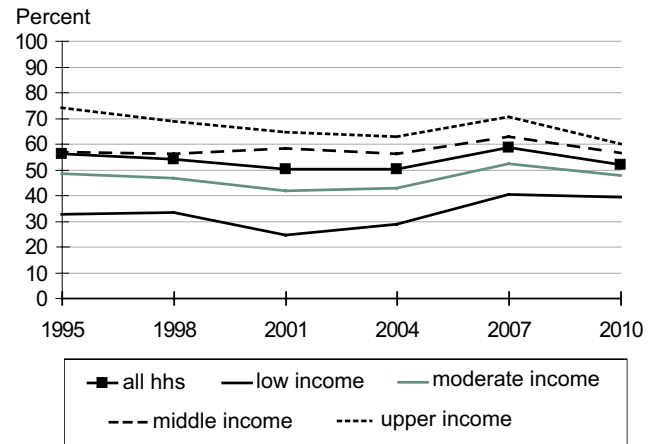


Figure 2.2c Exhibit 2 Mail: By Education

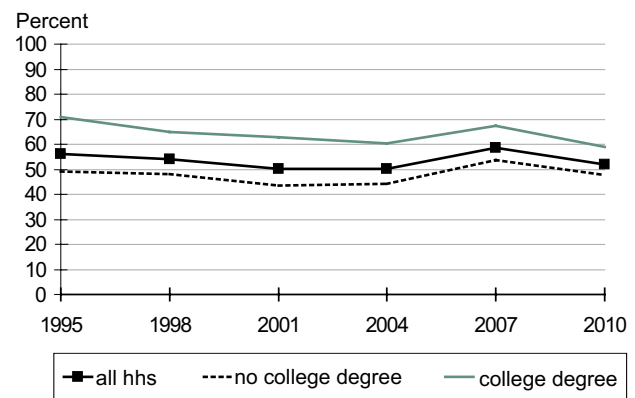


FIGURE 2.3

Figure 2.3a Exhibit 2 ATM/Debit: By Age

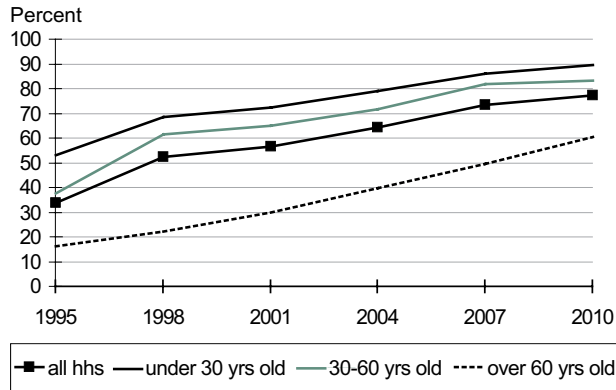


Figure 2.3b Exhibit 2 ATM/Debit: By Income

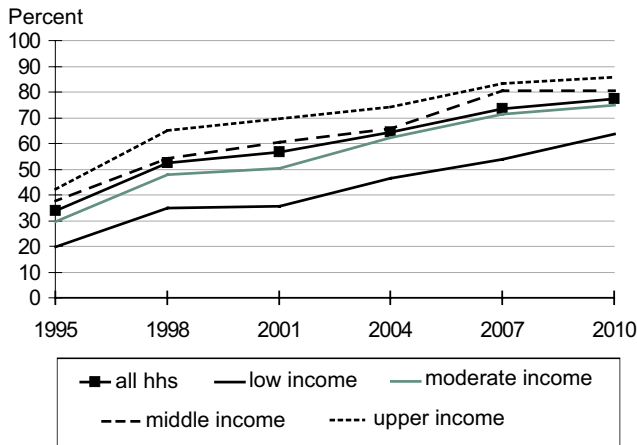


Figure 2.3c Exhibit 2 ATM/Debit: By Education

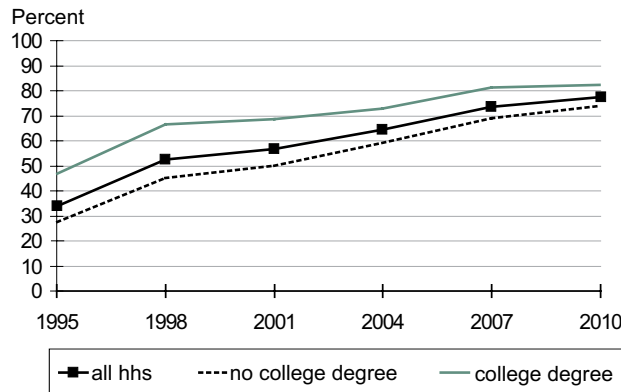


FIGURE 2.4

Figure 2.4a Exhibit 2 Phone: By Age

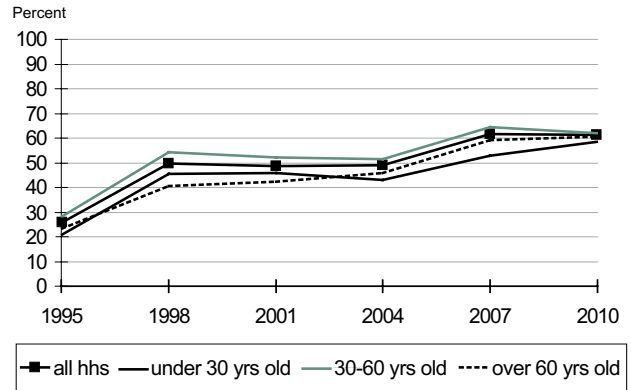


Figure 2.4b Exhibit 2 Phone: By Income

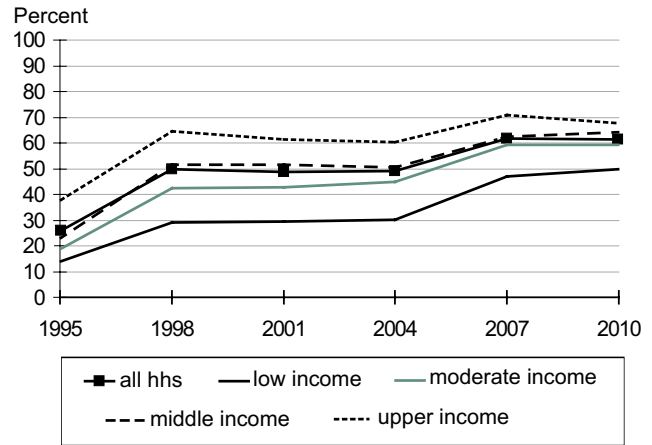


Figure 2.4c Exhibit 2 Phone: By Education

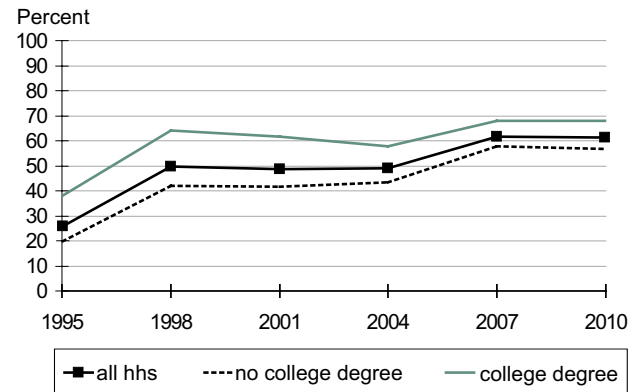


FIGURE 2.5

Figure 2.5a Exhibit 2 Computer: By Age

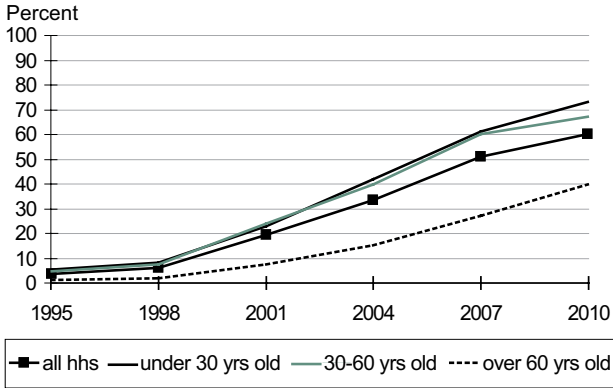


Figure 2.5b Exhibit 2 Computer: By Income

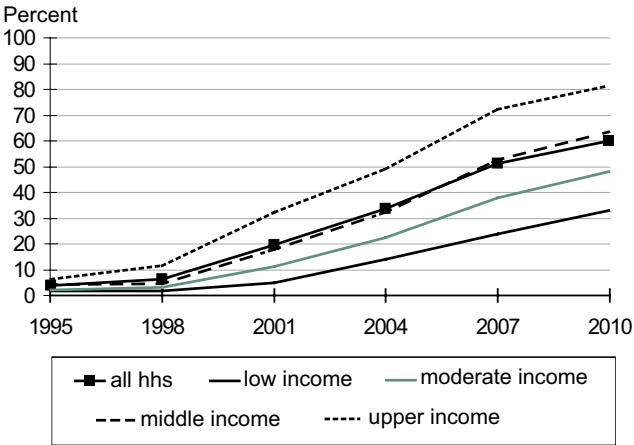


Figure 2.5c Exhibit 2 Computer: By Education

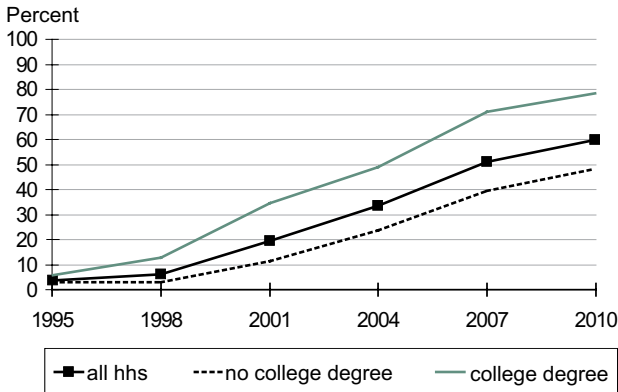


FIGURE 2.6

Figure 2.6a Exhibit 2 Electronic: By Age

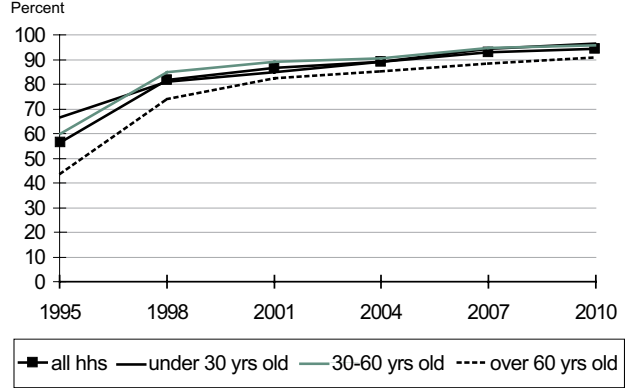


Figure 2.6b Exhibit 2 Electronic: By Income

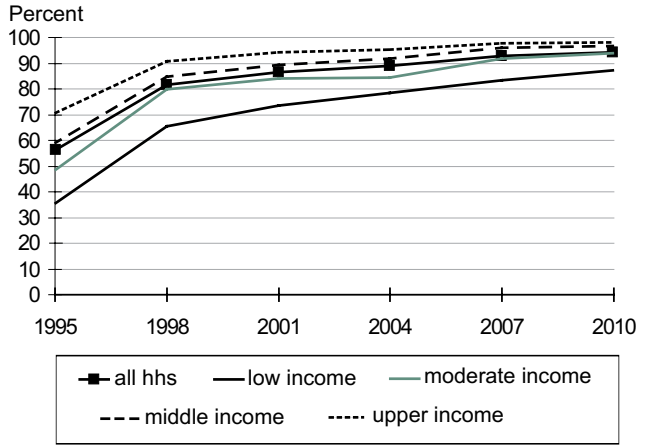
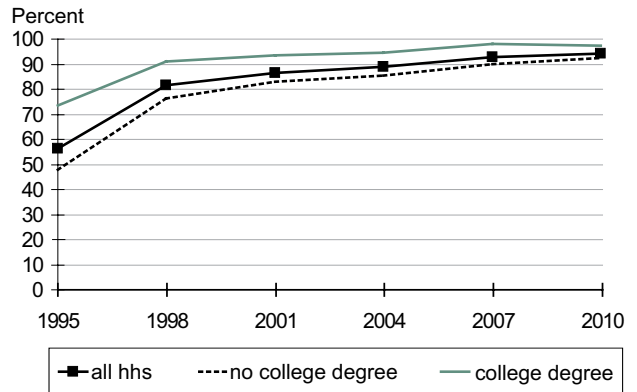


Figure 2.6c Exhibit 2 Electronic: By Education





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ELIMINATING SOCIAL SECURITY: IMPLICATIONS FOR LABOR SUPPLY AND CONSUMPTION DECISIONS

This paper incorporates home production into a dynamic general equilibrium model of overlapping generations with endogenous retirement to study Social Security reforms. As such, the model differentiates both consumption goods and labor effort according to their respective roles in home production and market activities. Using a calibrated model, the authors find that eliminating the current pay-as-you-go Social Security system has important implications for both labor supply and consumption decisions and that these decisions are influenced by the presence of a home production technology. Comparing their benchmark economy to one with differentiated goods but no home production, the authors find that eliminating Social Security benefits generates larger welfare gains in the presence of home production. This result is due to the self-insurance aspects generated by the presence of home production. Comparing their economy to a one-good economy without home production, the authors show that the welfare gains of eliminating Social Security are magnified even further. These policy analyses suggest the importance of modeling home production and distinguishing between both time use and consumption goods depending on whether they are involved in market or home production.

Working Paper 12-5, "Home Production and Social Security Reform," Michael Dotsey, Federal Reserve Bank of Philadelphia; Wenli

Li, Federal Reserve Bank of Philadelphia; and Fang Yang, State University of New York at Albany

INTERNATIONALLY INTEGRATED FINANCIAL MARKETS AND LEVELS OF PUBLIC DEBT

During the last three decades, the stock of government debt has increased in most developed countries. Also observed during the same period are a significant liberalization of international financial markets and an increase in income inequality in several industrialized countries. In this paper the authors propose a multi-country political economy model with incomplete markets and endogenous government borrowing and show that governments choose higher levels of public debt when financial markets become internationally integrated and inequality increases. The authors also conduct an empirical analysis using OECD data and find that the predictions of the theoretical model are supported by the empirical results.

Working Paper 12-6, "Financial Globalization, Inequality, and the Raising of Public Debt," Marina Azzimonti, Federal Reserve Bank of Philadelphia; Eva de Francisco, Towson University; and Vincenzo Quadrini, University of Southern California

DOCUMENTING THE PRESENCE OF A PRIVATE PREMIUM IN PUBLIC BONDS

This paper is the first to document the presence of a private premium in public bonds. The authors find that spreads are 31

basis points higher for public bonds of private companies than for bonds of public companies, even after controlling for observable differences, including rating, financial performance, industry, bond characteristics, and issuance timing. The estimated private premium increases to 40 to 50 basis points when a propensity matching methodology is used or when they control for fixed issuer effects. Despite the premium pricing, bonds of private companies are no more likely to default or be downgraded than are public bonds. They do not have worse secondary market performance or higher CDS spreads nor are they necessarily less liquid. Bond investors appear to discount the value of privately held equity. The effect does not come only from the lack of a public market signal of asset quality because very small public companies also pay high spreads.

Working Paper 12-7, "The Private Premium in Public Bonds," Anna Kovner, Federal Reserve Bank of New York, and Chenyang Wei, Federal Reserve Bank of Philadelphia

HOW INVENTORIES AFFECT TRADE, INFORMATION DISSEMINATION, AND PRICE FORMATION

The authors study trade between a buyer and a seller who have existing inventories of assets similar to those being traded. They analyze how these inventories affect trade, information dissemination, and prices. The authors show that when traders' initial leverages are moderate, inventories increase price and trade volume (a market "run-up"), but when leverages are high, trade is impossible (a market "freeze"). Their analysis predicts a pattern of trade in which prices and volumes first increase and then markets break down. Moreover, the presence of competing buyers may amplify the increased-price effect. The authors discuss implications for regulatory intervention in illiquid markets.

Working Paper 12-8, "Market Run-Ups, Market Freezes, Inventories, and Leverage," Philip Bond, University of Minnesota, and Yaron Leitner, Federal Reserve Bank of Philadelphia

TESTING FOR BIAS IN EXPECTATIONS AS MEASURED BY ECONOMIC FORECASTS

Economists have tried to uncover stylized facts about people's expectations, testing whether such expectations are rational. Tests in the early 1980s suggested that expectations were biased, and some economists took irrational expectations as a stylized fact. But, over time, the results of tests that led to such a conclusion

were reversed. In this paper, the author examines how tests for bias in expectations, measured using the Survey of Professional Forecasters, have changed over time. In addition, key macroeconomic variables that are the subject of forecasts are revised over time, causing problems in determining how to measure the accuracy of forecasts. The results of bias tests are found to depend on the subsample in question, as well as what concept is used to measure the actual value of a macroeconomic variable. Thus, the author's analysis takes place in two dimensions: across subsamples and with alternative measures of realized values of variables.

Working Paper 12-9, "Forecast Bias in Two Dimensions," Dean Croushore, University of Richmond, and Visiting Scholar, Federal Reserve Bank of Philadelphia

DESCRIBING A NEW KEYNESIAN MODEL WITH A ZERO LOWER BOUND ON NOMINAL INTEREST RATES

Motivated by the recent experience of the U.S. and the Eurozone, the authors describe the quantitative properties of a New Keynesian model with a zero lower bound (ZLB) on nominal interest rates, explicitly accounting for the nonlinearities that the bound brings. Besides showing how such a model can be efficiently computed, the authors found that the behavior of the economy is substantially affected by the presence of the ZLB. In particular, the authors document 1) the unconditional and conditional probabilities of hitting the ZLB; 2) the unconditional and conditional probability distributions of the duration of a spell at the ZLB; 3) the responses of output to government expenditure shocks at the ZLB; 4) the distribution of shocks that send the economy to the ZLB; and 5) the distribution of shocks that keep the economy at the ZLB.

Working Paper 12-10, "Nonlinear Adventures at the Zero Lower Bound," Jesús Fernández-Villaverde, University of Pennsylvania; Grey Gordon, University of Pennsylvania; Pablo Guerrón-Quintana, Federal Reserve Bank of Philadelphia; and Juan F. Rubio-Ramírez, Duke University

REGULATING BANK LENDING PRACTICES AND THE OPTIMAL PROVISION OF PRIVATE LIQUIDITY

The authors show that the regulation of bank lending practices is necessary for the optimal provision of private liquidity. In an environment in which bankers cannot commit to repay their creditors, the authors show that neither an unregulated banking

system nor narrow banking can provide the socially efficient amount of liquidity. If the bankers provided such an amount, then they would prefer to default on their liabilities. The authors show that a regulation that increases the value of the banking sector's assets (e.g., by limiting competition in bank lending) will mitigate the commitment problem. If the value of the bank charter is made sufficiently large, then it is possible to implement an efficient allocation. Thus, the creation of a valuable bank charter is necessary for efficiency.

Working Paper 12-11, "Private Liquidity and Banking Regulation," Cyril Monnet, University of Bern, and Daniel R. Sanches, Federal Reserve Bank of Philadelphia

HOW MUCH MONEY DID THE IMPLEMENTATION OF CHECK 21 SAVE?

The authors estimate the cost savings to the U.S. payment system resulting from implementing Check 21. This legislation initially permitted a paper substitute digital image of a check, and later an electronic digital image of a check, to be processed and presented for payment on a same-day basis. Check 21 has effectively eliminated the processing and presentment of original paper checks over multiple days. By shifting to electronic collection and presentment, the Federal Reserve reduced its per item check processing costs by over 70 percent, reducing estimated overall payment system costs by \$1.16 billion in 2010. In addition, payment collection times and associated float fell dramatically for collecting banks and payees with consequent additional savings in firm working capital costs of perhaps \$1.37 billion and consumer benefits of \$0.64 billion.

Working Paper 12-12, "Getting Rid of Paper: Savings from Check 21," David B. Humphrey, Florida State University, and Visiting Scholar, Federal Reserve Bank of Philadelphia, and Robert Hunt, Federal Reserve Bank of Philadelphia

MARKET DISCIPLINE, RISK-TAKING, AND BANK STABILITY

Self regulation encouraged by market discipline constitutes a key component of Basel II's third pillar. But high-risk investment strategies may maximize the expected value of some banks. In these cases, does market discipline encourage risk-taking that undermines bank stability in economic downturns? This paper reviews the literature on corporate control in banking. It reviews the techniques for assessing bank performance, interaction between regulation and the federal safety

net with market discipline on risk-taking incentives and stability, and sources of market discipline, including ownership structure, capital market discipline, product market competition, labor market competition, boards of directors, and compensation.

Working Paper 12-13, "A Primer on Market Discipline and Governance of Financial Institutions for Those in a State of Shocked Disbelief," Joseph P. Hughes, Rutgers University, and Loretta J. Mester, Federal Reserve Bank of Philadelphia

EXAMINING HOW SENIORITY CAN MITIGATE THE DEBT DILUTION PROBLEM

An important source of inefficiency in long-term debt contracts is the debt dilution problem, wherein a borrower ignores the adverse impact of new borrowing on the market value of outstanding debt and, therefore, borrows too much and defaults too frequently. A commonly proposed remedy to the debt dilution problem is seniority of debt, wherein creditors who lent first are given priority in any bankruptcy or restructuring proceedings. The goal of this paper is to incorporate seniority in a quantitatively realistic, infinite horizon model of sovereign debt and default and examine, both theoretically and quantitatively, the extent to which seniority can mitigate the debt dilution problem.

Working Paper 12-14, "Debt Dilution and Seniority in a Model of Defaultable Sovereign Debt," Satyajit Chatterjee, Federal Reserve Bank of Philadelphia, and Burcu Eyigungor, Federal Reserve Bank of Philadelphia

FORGIVING STUDENT LOANS WHEN BORROWERS DON'T COMPLETE COLLEGE

Participants in student loan programs must repay loans in full regardless of whether they complete college. But many students who take out a loan do not earn a degree (the dropout rate among college students is between 33 to 50 percent). The authors examine whether insurance, in the form of loan forgiveness in the event of failure to complete college, can be offered, taking into account moral hazard and adverse selection. To do so, they develop a model that accounts for college enrollment and graduation rates among recent U.S. high school graduates. In their model, students may fail to earn a degree because they either fail college or choose to leave voluntarily. The authors find that if loan forgiveness is offered only when a student fails college, average welfare increases by 2.40 percent (in consumption equivalent units) without much effect on

either enrollment or graduation rates. If loan forgiveness is offered against both failure and voluntary departure, welfare increases by 2.15 percent, and both enrollment and graduation are higher.

Working Paper 12-15, "Insuring Student Loans Against the Financial Risk of Failing to Complete College," Satyajit Chatterjee, Federal Reserve Bank of Philadelphia, and Felicia Ionescu, Colgate University

TRADE WEDGES AND FLUCTUATIONS IN INTERNATIONAL TRADE

The large, persistent fluctuations in international trade that cannot be explained in standard models by changes in expenditures and relative prices are often attributed to trade wedges. The authors show that these trade wedges can reflect the decisions of importers

to change their inventory holdings. They find that a two-country model of international business cycles with an inventory management decision can generate trade flows and wedges consistent with the data. Moreover, matching trade flows alters the international transmission of business cycles. Specifically, real net exports become countercyclical and consumption is less correlated across countries than in standard models. The authors also show that ignoring inventories as a source of trade wedges substantially overstates the role of trade wedges in business cycle fluctuations.

Working Paper 12-16, "Trade Wedges, Inventories, and International Business Cycles," George Alessandria, Federal Reserve Bank of Philadelphia; Joseph Kaboski, University of Notre Dame; and Virgiliu Midrigan, New York University