The Economics of Household Leveraging and Deleveraging*

BY WENLI LI AND SUSHEELA PATWARI

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

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

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 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 borrower'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.

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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 incomes, 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

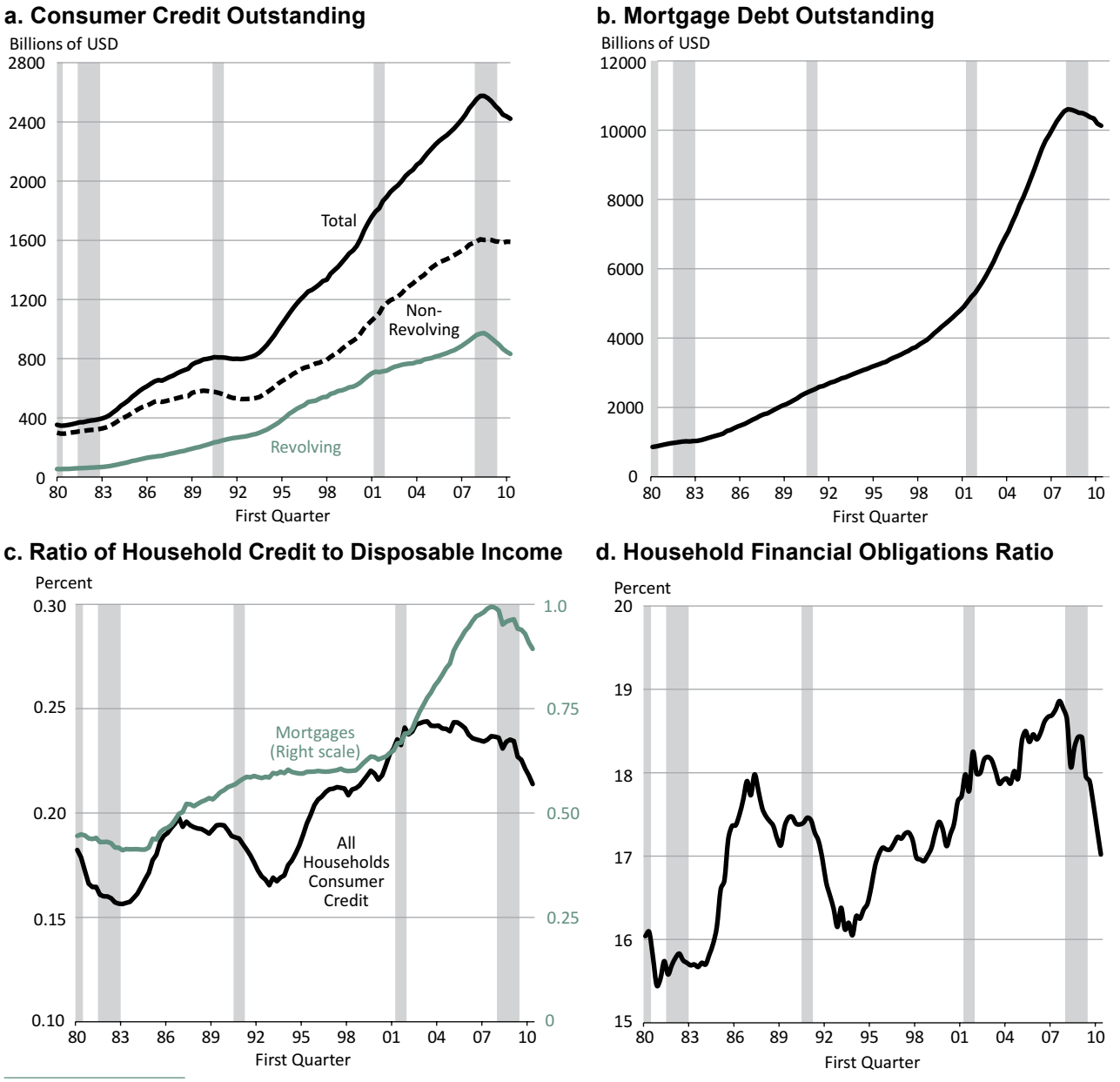
[1] People have termed events like these "Wile E. Coyote" moments. A recurrent event in the Road Runner cartoons is the point at which Wile E. Coyote looks down after having run several steps off a cliff. According to the laws of cartoon physics, it is only when he realizes that nothing is supporting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

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

FIGURE 1

Household Leverage



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]

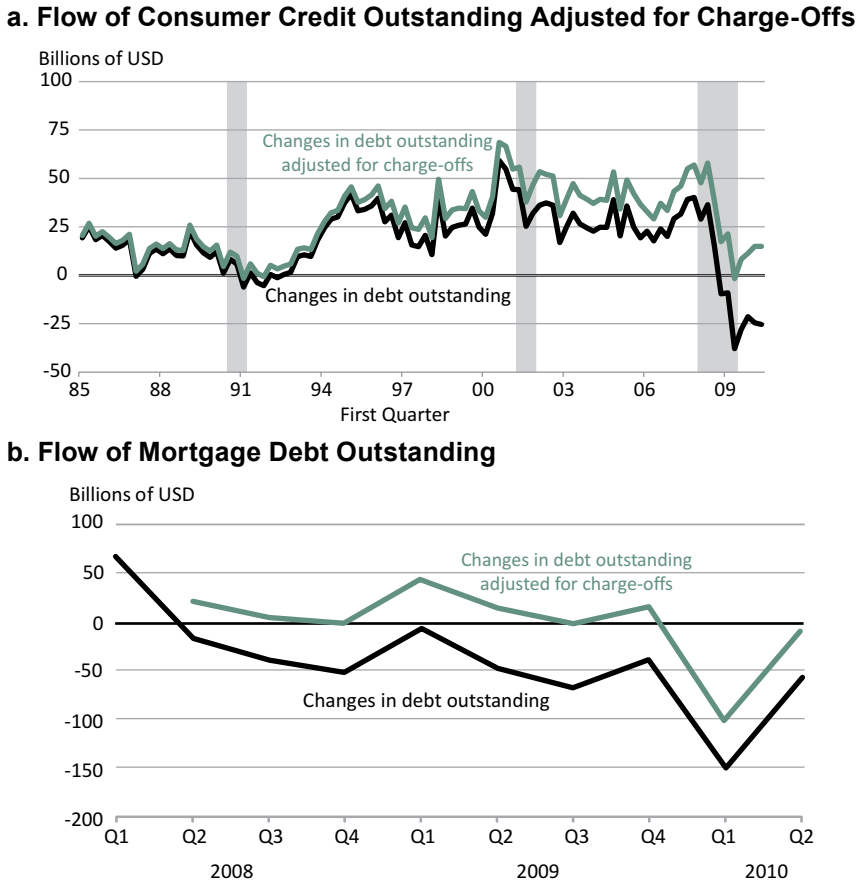
HOUSEHOLD DELEVERAGING: 2008-2011

The filing and subsequent bankruptcy of Lehman Brothers, the fourth 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



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

[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.

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 Paydowns. 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 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 sample 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.

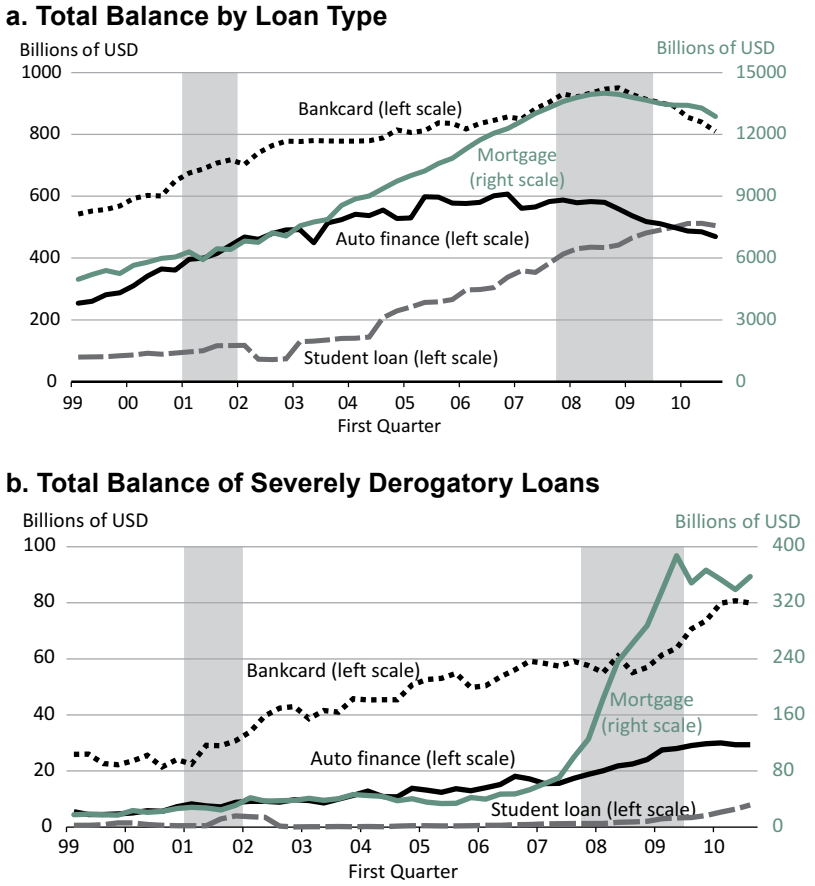
[5] For consumer credit, we use the charge-off rates obtained from the Call Reports. A bank charges off a loan when it is deemed uncollectible; that is, the loan is in default and it will not be repaid. In regard to mortgage debt, the Call Reports also provide us with charge-off rates for those loans 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.

[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 Experian, 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



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 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.

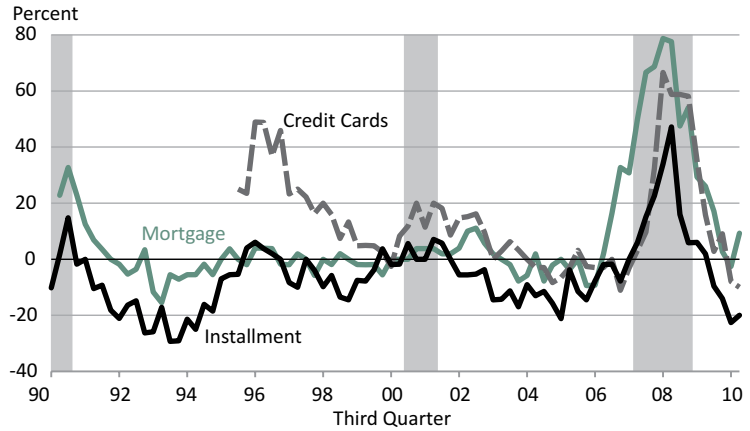
[8] In general, only part of the severely derogatory loans will end up in bankruptcy. There are, however, cases in which borrowers have filed for bankruptcy after being only 60 days delinquent on some of their debt.

[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.

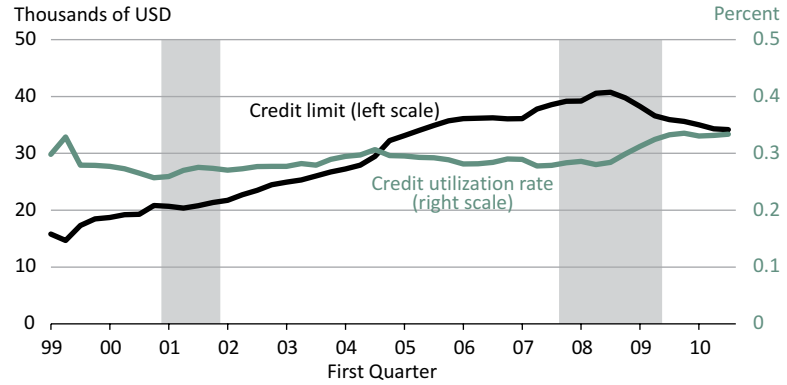
FIGURE 4

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

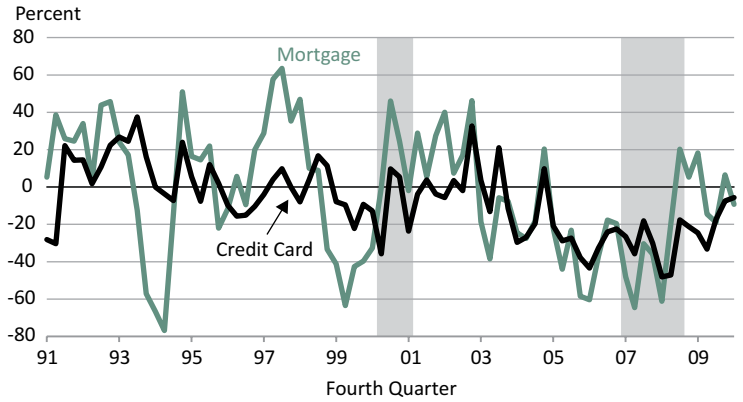
Until 2008, U.S. households were accumulating debt at a rapid pace, allowing consumption growth to outstrip that of income. The economic environment has since turned south, with housing values dropping dramatically. The sharp rise in unemployment rates has also led to substantial reductions in income. 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.

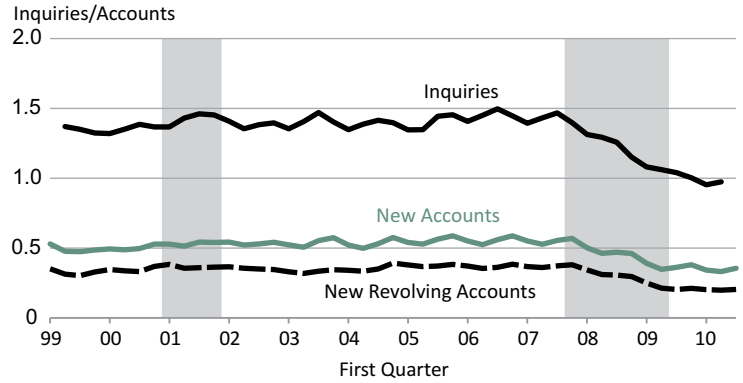
FIGURE 5

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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