

Debt Overhang: Why Recovery from a Financial Crisis Can Be Slow*

BY SATYAJIT CHATTERJEE

A

particularly troublesome feature of the most recent recession has been the painfully slow growth in employment during the recovery. For employment growth to accelerate, economists believe that firms need to invest in new productive capacity. This view is typically couched in terms of the need to reallocate jobs away from crisis-depressed sectors into other sectors. But doing so requires an expansion in productive capacity in those other sectors. Tepid employment growth is a sign that this investment in new productive capacity has not been forthcoming. One reason for the reluctance to undertake productive investment following a financial crisis is *debt overhang*, a situation in which the existence of prior debt acts as a disincentive to new investment. There are other explanations that, to varying degrees, account for the current reluctance of U.S. corporations to invest. In this article, Satyajit Chatterjee focuses on the debt overhang problem.

In their widely read book, Carmen Reinhart and Kenneth Rogoff have marshaled an impressive amount of data on global financial crises going back eight centuries. One lesson from



Satyajit Chatterjee is a senior economic advisor and economist in the Philadelphia Fed's Research Department. This article is available free

of charge at www.philadelphiafed.org/research-and-data/publications/.

their work is that economic recovery from bad financial crises tends to be slow. On average, it takes an economy somewhere around seven years following a crisis to get economic activity back to its normal trend path. In some cases, the return to trend can take much longer — close to two decades!

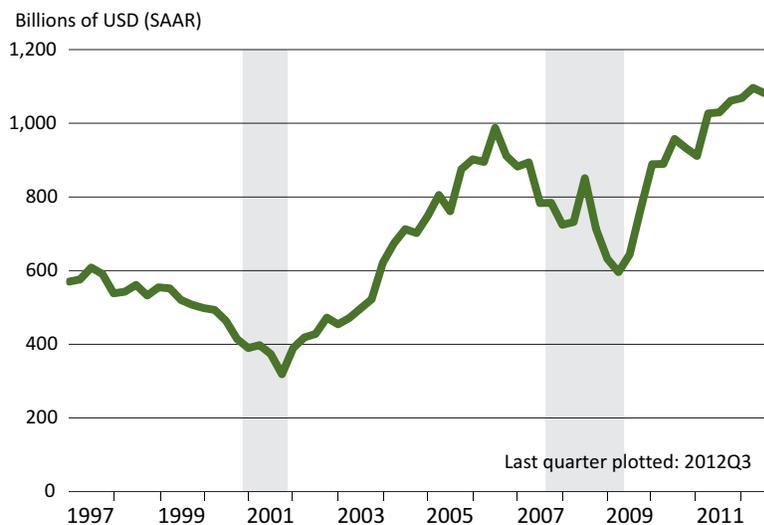
This historical experience resonates with our current situation. A particularly troublesome feature of the

* 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.

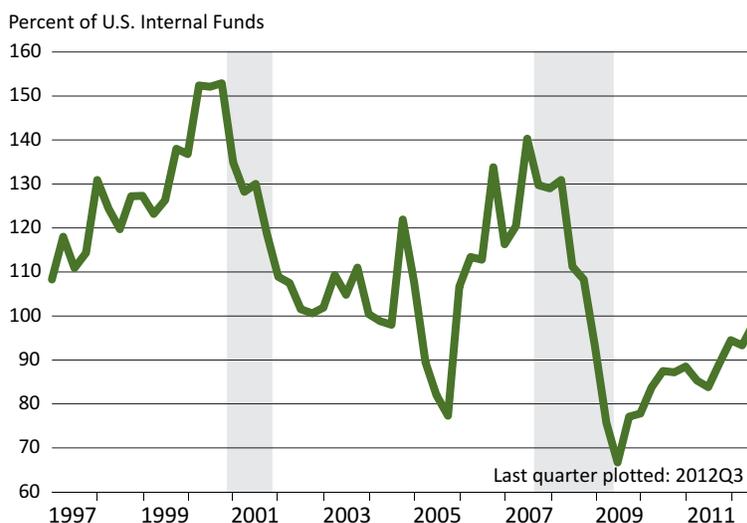
recent recession has been the painfully slow growth in employment during the recovery. In order for employment growth to accelerate, economists believe that firms need to invest in new productive capacity. This view is typically couched in terms of the need to absorb workers formerly employed in the sectors that were most adversely affected by the financial crisis — namely, the construction and financial sectors — into other sectors of the economy. The reallocation of jobs away from crisis-depressed sectors requires an expansion in productive capacity in other sectors. Tepid employment growth is a sign that this investment in new productive capacity has not been forthcoming.

But it is not for a lack of resources. Figure 1 displays the profits of the non-financial corporate sector and shows that profits rose strongly during this recovery. And if we examine the disposition of investible funds, we discover that the nonfinancial corporate sector has dramatically reduced its investment in productive capacity relative to the resources available for investment.

This is evident in Figure 2, which shows capital outlays of the nonfinancial corporate sector as a percentage of funds that the nonfinancial corporate sector already possesses (without recourse to any new borrowings or equity issues — so-called “internal funds”) and can use for this purpose. This percentage fell precipitously during the recession and has since remained depressed. These facts indicate that the U.S. nonfinancial corporate sector possesses investible resources but has chosen not to deploy these resources in productive investments during the re-

FIGURE 1**Domestic Nonfinancial Corporate Profits Before Tax with IVA and CC Adjustments**

Sources: BEA, Haver

FIGURE 2**Nonfinancial Corporations: Capital Outlays/U.S. Internal Funds (SA)**

Sources: FRB Flow of Funds, Haver

covery. Since our current slow recovery is partly attributable to the reluctance of businesses to invest in productive assets, we need to understand why financial crises have this effect on investment.¹

Economists believe that one reason for the reluctance to undertake productive investment following a financial crisis is *debt overhang*. Debt overhang is a situation in which the existence of prior debt acts as a disincentive to new investment. When a firm has outstanding debt on which the likelihood of default is significant, any investment that improves the firm's future profit potential also increases the value of outstanding debt. All else remaining the same, an increase in the value of outstanding debt reduces the value of equity in the firm; that is, it results in a wealth transfer from equity owners to existing creditors. Since equity owners are the ones who make investment decisions, the transfer acts like a tax on the return on new investment. This "tax" results in a drop in the rate of investment in business capital, which, in turn, slows down the recovery.

There are other possible explanations for the reluctance of U.S. companies to invest. One oft-cited reason is "increased uncertainty about the future." When investment decisions are costly to reverse, there is value in waiting and learning more about future conditions before committing funds to a project. Thus, increased uncertainty about the future may

¹ One might think that the reluctance to add new productive capacity results from current capacity utilization rates being low. If existing capacity is not being fully utilized, why expand capacity? True, but it raises the question of why utilization rates are low. If corporations as a whole were investing more, capacity utilization rates would go up right away. One must consider the possibility that low capacity utilization is a symptom of some deeper malady that is affecting investment – not the malady itself.

cause companies to delay investment. Aside from the increased uncertainty that inevitably accompanies a deep recession, commentators have pointed to uncertainty about the future path of U.S. fiscal (tax and expenditure) policy as well as uncertainty about the impact on businesses' health-care costs resulting from the recently enacted Affordable Care Act as factors holding back investment and hiring. Another explanation may be that the growth rate of (multifactor) productivity has fallen back to its historical norm from the above-average pace experienced during the decade preceding the onset of the financial crisis, causing the rate of investment growth to decline in tandem. Finally, it is thought that retiring baby boomers may be holding back business investment by depressing equity values as they sell stocks to fund their retirement. More fundamentally, a more slowly growing labor force requires less growth in capital equipment to productively equip new workers joining the labor force, so there is less growth in investment. Of course, all of these explanations, to varying degrees, account for the current reluctance of U.S. corporations to invest. In this article I focus on the debt overhang problem.²

FINANCIAL CRISIS AND THE GENESIS OF DEBT OVERHANG

The genesis of the debt overhang problem lies in the recent financial cri-

² Following the onset of the financial crisis, a number of researchers and many commentators have pointed to debt overhang as a reason for the drop in investment and its slow recovery. The article by Thomas Philippon and the commentary by Filippo Occhino, for instance, discuss the debt overhang problem as it pertains to the current crisis. Occhino and Andrea Pescatori's article discusses the role of debt overhang in constraining investment during business downturns more generally. The article by Karen Croxson, Susan Lund, and Charles Roxburgh stresses the global extent of the debt overhang problem and looks broadly at both private-sector and public-sector debt.

sis. The crisis caused the U.S. banking sector to deleverage. In doing so, banks cut off credit to the nonfinancial sector — the now infamous “credit crunch.” Because credit is a fundamental ingredient in the smooth operation of asset markets, the crunch adversely affected the value of all types of tangible business capital. The steep drops in the value of assets owned by the nonfinancial corporate sector also lowered the sector's net worth and raised the frequency of business failures.³ Both factors made corporate debt appear more risky to investors.

It is worth observing that “excessive borrowing” by the nonfinancial corporate sector during the boom years is *not* part of this narrative. Figure 3 shows the liabilities of the nonfi-

³ The net worth of the nonfinancial corporate sector is simply the difference between the value of its assets and its liabilities. The mechanism through which a drop in net worth amplifies a credit crunch is discussed in more detail in my 2010 *Business Review* article.

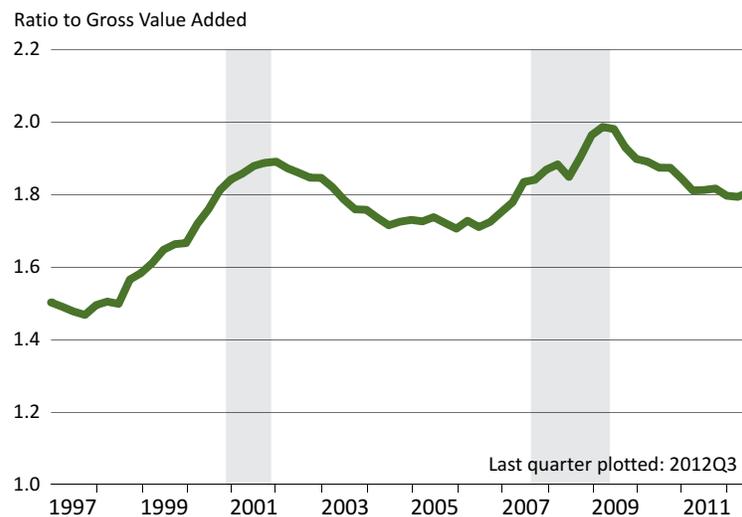
ancial corporate sector scaled by the gross value added in the sector.⁴ During much of the boom period, the liabilities of the sector shrank relative to its GDP. Nevertheless, it is true that whatever debt there was became much more risky following the onset of the financial crisis in the fall of 2008. Figure 4 shows the difference in yields on medium-term industrial bonds and U.S. Treasuries. The difference is the additional return required by investors to absorb the default risk present in industrial bonds but absent in Treasury bonds. As one can see, the compensation for default risk (the so-called *risk spread*) rose dramatically as the crisis unfolded and remains elevated today.

Although risk spreads can go up

⁴ Scaling by sector GDP takes account of the fact that borrowing is a natural complement of economic activity and tends to go up with it. Thus, to determine if the sector indulged in “excessive” borrowing, it is important to look at its liabilities relative to a measure of economic activity.

FIGURE 3

Nonfinancial Corporations: Liabilities as a Share of Gross Value Added



Sources: BEA, FRB Flow of Funds, Haver

for many reasons, the evidence is suggestive of a crisis-induced increase in default risk as well as loss rates given default. Figure 5 displays the number of business bankruptcy filings. Filings were on an upward trend even before the crisis, but they have accelerated since the third quarter of 2008. Although filings have come down, they remained elevated relative to the boom years until recently. Figure 6 displays the ratio of credit market debt of the nonfinancial corporate sector and the value of tangible assets in this sector. As shown, the ratio rose from around 42 percent at the start of 2007 to more than 56 percent at the height of the crisis. The ratio is currently above 50 percent. A higher value of debt relative to tangible assets is a concern for creditors because tangible assets are what creditors mostly recover if a company fails. A loan-to-value ratio of 50 percent is an indication to creditors that they should now expect higher loss rates (given default) compared with the pre-crisis years.⁵

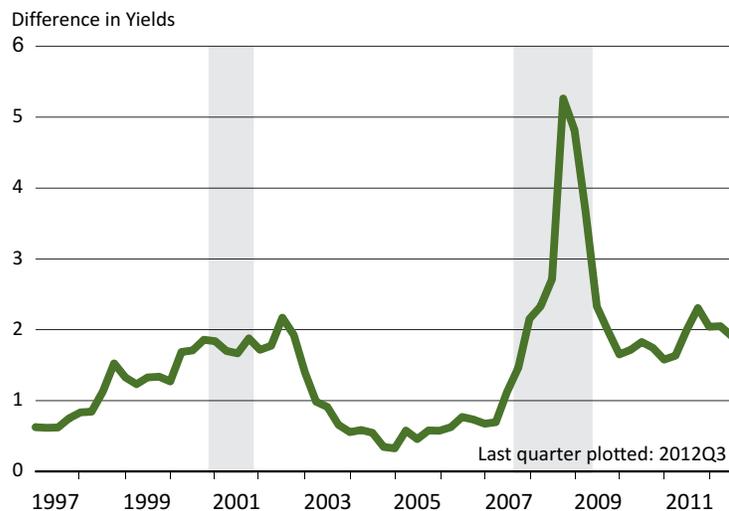
Finally, there is direct evidence of a greater likelihood of default or an increase in expected loss rates given default. This evidence comes from credit default swap (CDS) spreads on bonds issued by highly reputable U.S. corporations.⁶ A CDS written on a specific corporate bond is an agreement in which the seller of the CDS promises to compensate the buyer for

⁵ On the face of it, a loan-to-value ratio of 50 percent suggests that creditors will not take any losses in case of bankruptcy. However, the value of the firm's tangible assets is much lower in bankruptcy than its reported value when the firm is a going concern. Indeed, it is not uncommon for creditors to dispose of recovered assets at huge discounts. These so-called "fire sales" occur because it is costly for creditors to hold on to recovered assets.

⁶ The index is based mostly on the corporate debt of nonfinancial firms. The few financial firms that are included in this index are firms whose debt maintained a top credit rating through the crisis.

FIGURE 4

Corporate Bond Spreads

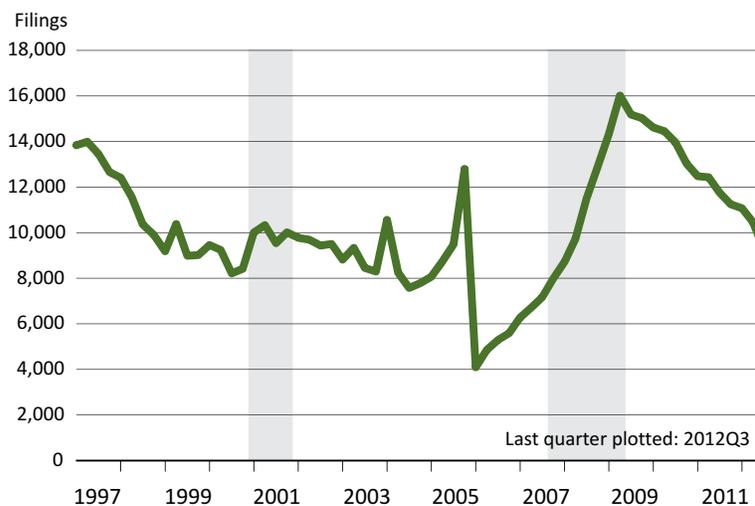


Note: Current Treasuries 5-10 years subtracted from corporate industrial bond 5-10 years, yield to maturity

Sources: Bank of America, Merrill Lynch, Haver

FIGURE 5

Business Bankruptcy Filings



Sources: Administrative Office of the U.S. Courts, Haver

any losses incurred due to default on the named bond. In return, the buyer pays the seller an insurance premium each period. This insurance premium is measured as a percent of the face value of the bond and is referred to as the CDS spread. A high spread means that default on the bond is more likely, that the loss incurred in the event of default is higher, or both. As Figure 7 shows, the CDS spread was around 50 basis points (a basis point is 1/100 of a percent) prior to the crisis, then rose dramatically during the crisis, and is still almost twice as high compared with the pre-crisis period.

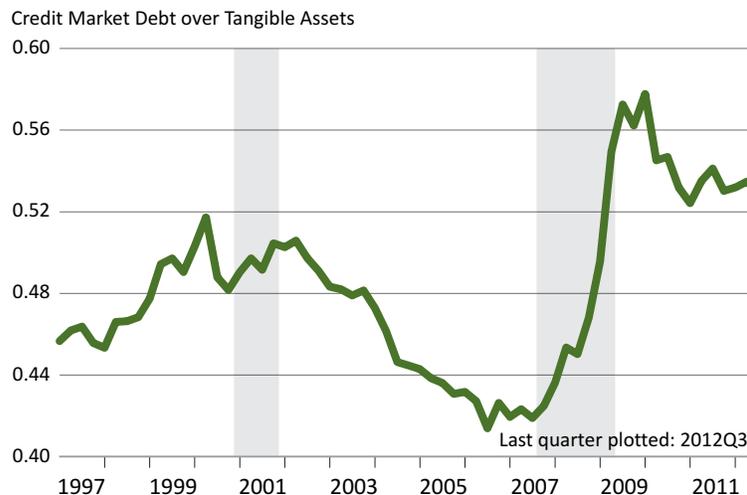
The bottom line is that corporate sector debt began to look substantially more risky to investors following the financial crisis, mostly because the crisis depressed asset values.

DEBT OVERHANG: WHAT IT MEANS AND WHY IT'S BAD NEWS

In his 1995 article, Owen Lamont gives an example of what debt overhang means and why it is bad for investment. Suppose that a firm has \$100 in debt, due next year, but will have assets worth only \$80. Thus, the firm will not have enough resources to meet its debt obligations next year and will default for sure. Now suppose that a business opportunity presents itself to this firm in the form of a project that will cost \$5 today and yield \$15 next year. If existing creditors are first in line for the payout of the firm, no outside investors will be willing to supply \$5 to the firm because the benefit will go to the original creditors, who will have their payoff go up to \$95. Lamont calls the \$20 gap between assets and liabilities the *debt overhang*. If the net payoff from the new investment cannot cover this gap, the project will never be financed by an outside investor. Debt overhang raises the bar for new investments: Only very profitable investments will be worth undertak-

FIGURE 6

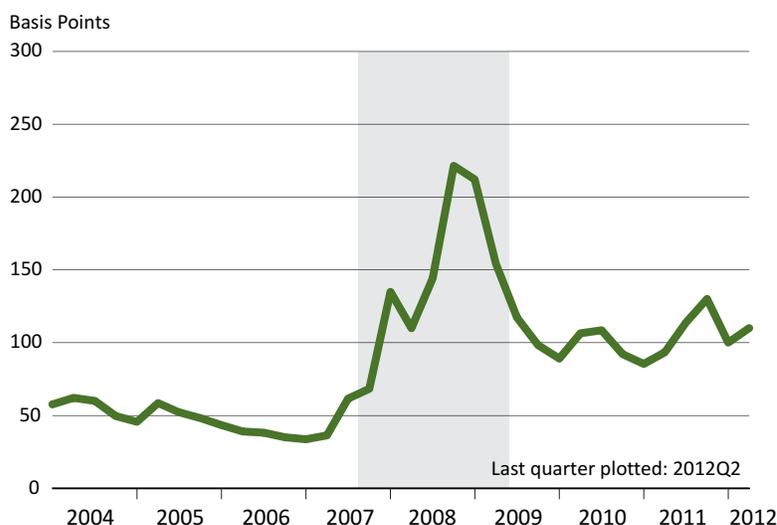
Nonfinancial Corporations: Credit Market Debt/Tangible Assets



Sources: FRB Flow of Funds, Haver

FIGURE 7

CDS Spreads for Investment Grade Bonds



Sources: Markit CDX.NA.IG, Bloomberg

ing. In this example, the return on the \$5 dollar investment would have to be at least \$25 to make the investment worthwhile to the outside investor. The return would enable the firm to repay what is owed to the original creditor and still make a positive return on the investment.

It is easy to generalize this example to the case where default is probable but not certain. First, assume that if no new investment is undertaken, the value of assets in the next period can be either \$80 or \$110 with equal probability. Thus, there is a 50 percent chance that the firm will be bankrupt and the creditors will get \$80, and there is a 50 percent chance that the firm will not be bankrupt, in which case we may assume that the creditors will receive \$100.⁷ The market value of the firm's debt is then $(\frac{1}{2}) \times \$80 + (\frac{1}{2}) \times \$100 = \$90$.⁸ Correspondingly, the market value of the firm's equity (i.e., the value of the firm to its owners) is $(\frac{1}{2}) \times \$0 + (\frac{1}{2}) \times \$10 = \$5$ (which follows from the fact that when the firm is bankrupt, the owners lose everything, and when it is not bankrupt, the owners retain the difference between the value of the assets and the value of the liabilities). Now, assume the new investment is undertaken. Then, the value of the firm's assets in the next period will be either \$95 (which is the sum of \$80 plus \$15, the latter being the return from the new investment) or \$125 (which is the sum of \$110 and \$15). Notice that even with the new investment, there is a 50

⁷ In this eventuality, the firm can borrow \$100 again from the same or a different set of creditors and pay off the loan that has come due. The process of using new loans to pay off maturing debt is called "rolling over" the debt.

⁸ For simplicity, I have assumed that the interest rate on safe financial investments (say, a one-year Treasury bond) is zero. If the interest rate were positive, say, 1 percent, the market value of the firm's debt would be $\$90 \div 1.01$.

percent probability that the firm will go bankrupt, but instead of receiving \$80, the creditors will get \$95 in the event of default. Therefore, the market value of existing debt will rise to $(\frac{1}{2}) \times \$95 + (\frac{1}{2}) \times \$100 = \$97.50$. Correspondingly, the market value of equity will rise to $(\frac{1}{2}) \times \$0 + (\frac{1}{2}) \times \$25 = \$12.50$. The important point to note here is that although the total value of the firm rises by \$15 (the payoff from the new investment), half of the overall increase in value goes to current creditors and half to owners. The implicit expected percentage of the "tax" imposed by current creditors on the return on new investment to equity

It is worth pointing out that the debt overhang problem can be eliminated if the returns to new investment can be dedicated solely to new investors.

holders is 50 percent, which is simply the probability of bankruptcy.

The fact that the return to owners from undertaking a new investment is adjusted downward by the probability of default on existing debt is what financial economists call the "debt overhang" problem.⁹ Simply put, in the event of default, the returns to any new investment will first accrue to the creditors rather than to the equity holders, and this fact lowers the return to equity holders from funding new investment projects. All else remaining the same, the overhang can be expected to reduce investment by leveraged corporations. Said differently, the debt overhang raises the required rate of return for new investment to be undertaken.

⁹ See, for instance, the articles by Christopher Hennessey and Stewart Myers.

Empirical estimates of the effects of debt overhang for individual corporations appear to be quite large. According to the study by Christopher Hennessey, Amnon Levy, and Toni Whited, a 1 percent increase in leverage for a corporation with median leverage leads to a 1 percent decline in investment for that corporation. While it is not easy to translate this estimate into an estimate of the reduction in aggregate business fixed investment due to the debt overhang problem, it suggests that the effect is potentially significant. In the aggregate, the leverage of the nonfinancial corporate sector (measured as the ratio of its liabilities

to its net worth) is around 13 percent higher now than before the crisis, suggesting that business investment may now be 13 percent lower as a result of debt overhang. Over a four-year period (the third quarter of 2008 to the third quarter of 2012), this would amount to annual growth in business investment that is about 2 percent slower than what it would have been had the crisis not intervened.¹⁰

It is worth pointing out that the debt overhang problem can be elimi-

¹⁰ Normally, a lower level of business fixed investment can be expected to be partially offset by an increase in some other component of aggregate demand (such as higher consumer spending on durables), and the overall effect on real GDP would be smaller than that implied by a 13 percent decrease in business fixed investment alone. But when there is slack in resource utilization (as evidenced by the current high unemployment and low capacity utilization rates), there may not be any offset.

nated if the returns to new investment can be dedicated solely to new investors. This is not possible if new investors are given equity shares in the firm because, by law, equity holders cannot be paid off unless all creditors are paid off first. In other words, creditors have a *senior claim* on the income and assets of the firm vis-à-vis equity holders. On the other hand, if the new investment is debt financed (i.e., the firm issues debt rather than equity to its new investors), the debt overhang problem boils down to whether *new* creditors have a senior claim to the income and assets of the firm vis-à-vis existing creditors. If they do, the debt overhang problem again disappears.¹¹ In practice, creditors typically insist that their claims be senior to the claims of any future creditor of the firm so that the debt overhang problem remains even if the new investment is debt financed.¹²

The bottom line is that if a firm has debt outstanding on which there is a positive probability of default (risky debt), the presence of that debt lowers the returns to equity owners from new investment. This is because in the event of default, all of this new investment is lost. In this situation,

¹¹ For instance, in the example, suppose that all of the new investment is financed by new debt. Since the new investment costs \$5, the firm will owe \$105 next period. The probability of default is still 50 percent, since it will occur only if the value of assets turns out to be \$95. But if the \$5 claim of the new investors is senior to the \$100 claim of existing creditors, new creditors can be paid off even in bankruptcy because the value of the firm's assets (\$95) is sufficient to cover the \$5 claim of new creditors. Given this, new creditors would view the loan as a safe investment and would presumably go ahead and finance the investment project. In contrast, if the claim of new creditors is junior to the claims of existing creditors, they get nothing in the event of default because the \$100 claim of existing creditors will exhaust all of the firm's assets.

¹² It would take us too far afield to fully explain the reasons why existing creditors insist on the seniority of their claims vis-à-vis future creditors. The article by Burcu Eyigungor sheds light on this issue.

investors would be unwilling to invest in new projects unless these projects are very profitable. Consequently, the rate of growth of business investment is adversely affected by the presence of risky debt.

DEBT OVERHANG AND THE INCREASED VALUE OF LIQUIDITY

So far, I have considered the incentives of outside investors (equity holders or new creditors) to invest in a new project. However, as we have seen, the nonfinancial corporate sector is not starved for funds. For debt overhang to be an explanation for lackluster investment, we also need to consider the firm's incentives to invest its *own* funds in the new project.

I will do this by going back to the example where the future value of the firm's assets is uncertain (and can be either \$80 or \$110). Imagine now that the \$5 is actually the firm's own money, obtained as profits from current operations. What should the firm do with it? The top row of Table 1 shows what the firm can get if it invests its \$5 in the new project today. With a 50 percent probability, the firm will go bankrupt and all of the return from the project will be lost, and with a 50 percent probability, the firm will survive and the project will return \$15.

On average, the new project will fetch an additional \$7.50 tomorrow. This amounts to an expected rate of return of $(7.50 - 5)/5 \times 100 = 50$ percent. This might look like an attractive return, except that when default is a possibility, there might be another strategy that will fetch the owners an even more attractive return.

Suppose that the firm's owners can keep the \$5 in the firm as cash and, in the next period, decide if they want to pursue the new investment after learning about the value of their existing assets. The returns from this strategy are displayed in the bottom row of Table 1. If the value of the assets turns out to be \$80 (which happens with a 50 percent probability), they have \$85 on hand. Since they owe \$100, they are bankrupt. At this point, suppose they are able to take \$1 out of the \$5 as profits and hand the firm over to the creditors.¹³ So, with a 50 percent probability, the owners

¹³ Bankruptcy law makes it illegal for corporations to distribute any dividends in a state of insolvency. Thus, the example is not to be taken literally. Rather, it is intended to capture the fact that owners do have opportunities to legally take money out of the firm when bankruptcy is probable but not certain. The assumption that only a portion of total cash holdings can be taken out in this manner acknowledges the limitations that exist on this type of equity extraction.

TABLE 1

Investment Strategy	Payoff in Bankruptcy (50 percent chance)	Payoff Outside of Bankruptcy (50 percent chance)	Average Payoff	Average Return (Average Payoff - 5)/5 * 100
Invest \$5 Now	\$0	\$15.00	\$7.50	50 percent
Hold \$5 in Cash & Invest Tomorrow If Not Bankrupt	\$1.00	\$15.00	\$8.00	60 percent

get back \$1. If the value turns out to be \$110, they have \$115 on hand, and their assets are worth more than their liabilities. At this point, they can ask their creditors to roll over the \$100 debt and invest the \$5 in the new investment project and earn \$15 in the following period. So, with a 50 percent probability, the owners get back \$15. The expected payoff from just hanging on to the \$5 as cash today is then $(\frac{1}{2}) \times \$1 + (\frac{1}{2}) \times \$15 = \$8$ and the expected return is $(8 - 5)/5 \times 100 = 60$ percent. Since 60 percent beats 50 percent, the firm's owners are likely to be tempted to just keep their profits as cash in the firm and decide what to do with it in the next period.

The bottom line is that cash has the benefit of liquidity: It gives equity owners the option to take some of their money out if bankruptcy becomes more probable. Thus, when there is a relatively high probability of bankruptcy, equity owners have an incentive to delay making real investments and accumulate cash with the intention of taking that cash out as dividends at some point in the future. This seems consistent with the evidence. As shown in Figure 8, the ratio of financial assets to gross value added in the nonfinancial corporate sector has risen during this recovery.

DEBT OVERHANG AND SELF-FULFILLING PESSIMISM

Many current observers of the U.S. economy hold the view that for an economy growing slowly from a depressed state, it does not take much in terms of some adverse shock to tip it into a recession. This being the case, our current slow recovery has engendered greater pessimism about the economy's future growth prospects. An important point that Lamont makes in his article is that in the presence of a debt overhang problem, pessimism about the future can be self-perpetuating.

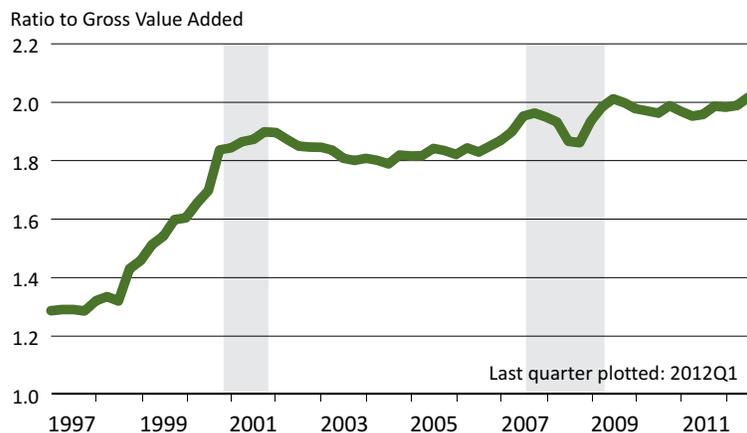
To understand his point in the context of our example, suppose that the business sector's collective reluctance to invest increases the probability of the bad outcome (low asset value) from 50 percent to 60 percent. Now the "tax" on new investment is 60 percent, and as shown in the top row of Table 2, the average payoff from investing \$5 today declines to \$6 and the average return declines to 20 percent. The decline in the rate of return would make outside investors (be they equity owners or creditors) more reluctant to

pour new money into the firm. Also, while the payoff from the "hold on to cash" option declines to \$6.60 and its rate of return to 32 percent, the difference in the rate of return between the two strategies *widens* to 12 percent from 10 percent. Thus, the strategy of just hanging on to the cash will seem even more attractive to business owners.

In sum, an increase in pessimism (by which we mean a greater probability weight on the bad outcome) makes the "tax" imposed by the debt

FIGURE 8

Nonfinancial Corporations: Financial Assets as Share of Gross Value Added



Sources: BEA, FRB Flow of Funds, Haver

TABLE 2

Investment Strategy	Payoff in Bankruptcy (60 percent chance)	Payoff in Bankruptcy (40 percent chance)	Average Payoff	Average Return (Average Payoff - 5)/5 * 100
Invest \$5 Now	\$0	\$15.00	\$6.00	20 percent
Hold \$5 in Cash & Invest Tomorrow If Not Bankrupt	\$1.00	\$15.00	\$6.60	32 percent

overhang problem higher and retards business investment even more. Slow growth in business investment, in turn, can keep a lid on the speed of economic recovery and makes pessimism about the future self-perpetuating.

CONCLUSION

Recovery from financial crises tends to be slow, and one reason for this is the debt overhang problem. The declines in asset values that accompany a financial crisis lower firms' net worth. If these firms are

carrying debt, the loss of net worth brings them closer to default. Debt overhang occurs when there is a significant probability that a firm will go bankrupt in the near future. The overhang of existing debt reduces the incentives of new investors to invest in business capital because, in the event of default, part of the return on new investment accrues to existing creditors. Debt overhang also increases owners' incentives to invest their current profits in financial assets because these assets are easier

to liquidate when business conditions deteriorate and bankruptcy becomes more likely. On both counts, the rate of investment in business capital is adversely affected. Thus, debt overhang is one potential explanation for why firms have been reluctant to expand capacity in this recovery. The macroeconomic consequence of this reluctance to invest is a slow recovery. To the extent that a slow recovery engenders pessimism, it exacerbates the debt overhang problem.

REFERENCES

Chatterjee, Satyajit. "De-Leveraging and the Financial Accelerator: How Wall Street Can Shock Main Street," Federal Reserve Bank of Philadelphia *Business Review* (Second Quarter 2010).

Croxson, Karen, Susan Lund, and Charles Roxburgh. "Working Out of Debt," *McKinsey Quarterly* (January 2012).

Eyigungor, Burcu. "Debt Dilution: When It Is a Major Problem and How to Deal with It," Federal Reserve Bank of Philadelphia *Business Review* (forthcoming).

Hennessey, Christopher. "Tobin's Q, Debt Overhang and Investment," *Journal of Finance*, 59:4 (August 2004).

Hennessey, Christopher A., Amnon Levy, and Toni M. Whited. "Testing Q Theory with Financing Frictions," *Journal of Financial Economics*, 83 (2007).

Lamont, Owen. "Corporate Debt Overhang and Macroeconomic Expectations," *American Economic Review*, 85:5 (December 1995).

Myers, Stewart, C. "Determinants of Corporate Borrowing," *Journal of Financial Economics*, 5:2 (October 1977).

Occhino, Filippo. "Is Debt Overhang Causing Firms to Underinvest?" Federal Reserve Bank of Cleveland *Economic Commentary*, 2010-7 (July 2010).

Occhino, Filippo, and Andrea Pescatori. "Debt Overhang in a Business Cycle Model," Federal Reserve Bank of Cleveland Working Paper 10-03R (December 2010).

Philippon, Thomas. "The Macroeconomics of Debt Overhang," paper presented at the 10th Jacques Polak Annual Research Conference, Washington D.C., November 5-6, 2009.

Reinhart, Carmen, and Kenneth Rogoff. *This Time Is Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press, 2009.