WILLIAM MILBERG AND NINA SHAPIRO

# Implications of the recent financial crisis for firm innovation

***Abstract:*** *This paper shifts the focus of discussion on the 2008 financial crisis from the problems of the financial sector to its effects on the real economy. We step back from the immediate facts of the crisis to consider the reason for finance and its importance in firm innovation, both theoretically and historically, and argue that (1) innovation has special financing requirements, being dependent on equity finance, and (2) while stock markets have promoted innovation in the past, the financialization of enterprises has changed the relation between stock prices and innovation, with adverse consequences for the growth of economies.*

***Key words:*** *financial crisis, firm innovation, stock markets, financialization.*

Discussion of the recent financial crisis has centered on the excesses of finance, the increases in debt and leverage that preceded the crisis, and causes and consequences of that "Ponzi" finance. But while these excesses of finance are important, and discussion of them illuminating (see, in particular, Cassidy 2009; Davidson 2009), this paper on the crisis has a different focus. It is concerned not with finance itself, its operations, or regulation, but with its effects on the "real economy," on the productive capabilities of firms and the innovation that develops them.

The effect of the crisis on innovation depends on its financial requirements, and we examine these in the first part of our discussion. We consider the function of finance along with the kind of finance innovation needs, and argue that its equity financing is more feasible than its debt financing. Equity finance is more suited to the uncertainties of innovation, and the intangibility of research and development investments, and this

William Milberg is a professor of economics at the New School for Social Research. Nina Shapiro is a professor of economics at Saint Peter's University. The authors are grateful to Bill Lazonick for detailed comments on a previous draft, and to Richard Garrett for suggestions and discussion. Jan Keil provided excellent research assistance. Support for this research was provided by the Ford Foundation project on "Finance for Innovation."



ISSN 0160–3477 (print)/ISSN 1557–7821 (online)

gives the stock market a special importance in the innovation undertaken by new firms—those too young to have capital of their own.

We discuss the effects of the stock market in the second part of the paper, which centers on the relation between stock prices and research and development (R&D) investment. We examine Tobin's (and Minsky's) *q* theory and the implications it has for this investment, along with the relationship between innovation and stock prices in the 1920s and 1990s. We compare the links between them in these periods with those of the 2000s, arguing that what distinguishes the recent run-up in asset prices from the bubbles of those other eras is that this bubble was not accompanied by an investment boom, in either fixed capital or R&D. Finance financed finance, increasing its availability instead of productive capabilities, with the innovations of the period mainly financial, and the legacy of not new production facilities and knowledge that could be utilized under more propitious conditions, but unfinished housing developments and abandoned houses.

What finance finances matters, and, in important respects, matters more than its excesses. For it is when, and only when, finance finances real investments that there are new technologies and products to develop and commercialize, and it is because it did not in the 2000s that the outlook for innovation today is bleak.

## Financial requirements for innovation

### *Finance*

If we take finance in its dictionary meaning, as "the money at the disposal of an organization, country, or person" (*Encarta Dictionary*) or, in its verb form, "to raise or provide the money required for something," then finance is needed when the revenues and expenditures of a business are out of sync, temporally or quantitatively. If expenditures had to be incurred before revenues were realized, money would have to be on hand to meet them, and this would also be the case if the requisite expenditures exceeded the incoming revenues. Finance, as Keynes (1939) suggests, bridges the gap between revenues and expenditures.

Insofar as production is time consuming, and both its inputs and outputs are commodities, most, if not all, production processes would require finance. The only ones that would not require it would be those whose products were ordered and paid for before they were produced. But in this case those who bought the products would, in effect, be financing their production; they would have to possess the requisite funds.



Production can be financed in one of three ways: (1) out of sales revenues, (2) through bank loans or other borrowings, or (3) through equity issues or other asset sales. The first is the way production is financed in Schumpeter's "circular flow," and is possible only in the case of its recurrent processes. In it, the same products are produced and consumed in the same amounts year after year. All the products have sales—none are new or produced anew—and revenue from sales that covers costs. Production generates the revenue it requires, and this revenue can finance it even though its processes take time, and products are sold after they are produced. For as long as production continues at the same rate as in the past, and its transactions are effected at regular and known intervals, it can be financed with the proceeds from past sales, with firms holding these funds in bank balances for the purposes of their upcoming transactions. There would be a transactions demand for money, but no "finance demand"—the need for bank loans or bond and equity issues.

For Schumpeter, as for Keynes, that finance is needed for growth, for increases in production in the case of Keynes (1939), and new product and process introductions in that of Schumpeter (1939). Innovation requires investment in new production facilities, those needed for the production of the new product or the improvement of production processes. Entrepreneurs cannot carry out these "new factor combinations" without this investment, through just a reorganization of production, and that investment, while profitable, cannot be financed out of its profits. Profit is not realized until the investment is completed, and the new production processes are in operation, and the money for the investment has to be provided beforehand.

New products have no sales until they are commercialized and, even then, sales may not be high enough, or costs low enough, for a profit. Their production cannot be financed out of their own revenues, as the production of established products can, and when their introduction requires new firms, as is assumed in Schumpeter (1939), it cannot be financed out of the revenue from other products either. That "internal financing" is possible only when established firms introduce these innovations, and even in this case, as Schumpeter (1939) notes, external finance may be required as those firms might not have sufficient profits for new product investments. Their revenues might be wholly taken up with the financing of existing operations, as would be the case for smaller firms and especially those operating in competitive markets (Eichner, 1976).

*New ventures*

Schumpeter's entrepreneurs finance their innovations through bank loans. Banks extend the requisite credit, and, in so doing, provide the funds needed for the expansion of the economy. Yet, innovation is risky, too risky for debt financing; both the profit from it and time of its realization are uncertain. Neither have the certainty assumed in Schumpeter (1939), and in the absence of that predictability, the debt financing of innovation would be possible only under special conditions, such as the relational banking of the Japanese "main bank" system or "universal banking" of the German one in Schumpeter's times.

While all investment is risky—its profit is a "prospective" one (Keynes, 1936)—investments in established products and technologies have at least a track record. They have been undertaken in the past, and undertaken profitably. Recessions and other unknowable developments can disappoint the expectations that prompted them, but, still, they have a history to draw on in the estimation of their "prospective yields." The profit from an investment in an auto assembly plant will likely be no more or less than the profit made from such investment in the past. It is determinable within limits, as is the time of its realization, for the time needed to bring the new plant online is likely to be the same as that needed for other plants constructed under similar conditions.

The profit from an innovation is not so determinable, and in the case of revolutionary innovations (such as the personal computer), it is not determinable at all. Innovations, by definition, are new: untried and undeveloped products and technologies, with yet to be determined applications and uses. The profit from innovations cannot be known, and is not known, until the innovations are developed and their markets established, and the time needed for this is not predictable either. It not only takes a long time for innovations to be developed and commercialized,[1] it also takes an indeterminable amount of time, so that even if the innovation proves profitable, it may not turn a profit within the term limits of the loan that financed it.

The "moral hazard" problems of lenders would thus be especially great in the case of an innovation loan. Lenders would have to rely on the borrower's knowledge of the investment and projections of its profits, for there is little else to base these projections on, while the borrower will have not only a greater knowledge of the innovation

[1] In the case of biopharmaceuticals, drug development can take from ten to twenty years (Lazonick and Tulum, 2011).



than the lender, but also a greater confidence in it. He is, after all, its "inventor," and his personal involvement in it will be reflected in its profit forecasts.[2]

These "moral hazard" problems can, of course, be reduced through collateral, but R&D investments cannot be given in collateral. These investments have no "scrap value"; the money spent on the development of a new product or technology is not recoverable, in whole or in part, unless the innovation proves successful. Knowledge is intangible and new knowledge valuable only when it produces a marketable product or patentable process, and while loans can be collateralized with assets other than those financed, "start-ups" have no other collateral to offer. They cannot provide this collateral for the same reason they cannot finance innovations out of the profit from past investments: they have not yet made any.

Equity finance is the only alternative to government finance in the case of a new venture,[3] and though equity investors assume more risk than creditors, their returns can be much higher. Equity investments participate in the profit of the enterprise, in both the profit from its innovation and profit from its public incorporation (initial public offering, or IPO). The profit from its IPO can be realized even if the innovation fails, and in many cases has (Lazonick and Tulum, 2011), while its prospect can attract the requisite investment. Investors can finance the innovation in the hope of realizing those capital gains.

Venture capital is an especially propitious form of innovation financing. It provides the start-up capital that the friends and relatives of entrepreneurs provided in past eras, institutionalizing the provisioning of this capital in firms established for its purposes and competing on the basis of their investment returns. Because these venture capital firms are ongoing enterprises, with specialized management and market reputations, they can mobilize the capital of many investors as well as leverage their operations, significantly extending the financing available to new

[2] This is not to say that the borrower will be "opportunistic," or fail to disclose all relevant information about the innovation. The problem, here, is not the "asymmetry" of information highlighted in the new Keynesian theory, but the absence of information—the uncertainty of Keynes's theory (1936). It is the "entrepreneur's risk" that makes the lender's risk great in the case of an innovation loan. For the relation of the new Keynesian view to Keynes's own, see Crotty (1996) and Fazzari and Variato (1996).

[3] This is not to say that these financing options are mutually exclusive. Indeed, in many cases innovations have to be subsidized, through government grants or contracts, for their risks to be reduced enough for private financing (Lazonick and Tulum, 2011).

innovative enterprises, while freeing their finances from the vagaries of individual fortunes.[4]

Equity investments not only provide the incentives needed for the financing of innovation, they are also more suited to its uncertainties than bank credit. They are open-ended and unconditional, with no term limits. The capital invested in the enterprise stays in it; it cannot be "called in," as loan capital can, or withdrawn when revenues fall below a certain level. Venture capital can be "impatient" and investment in the innovation may be ended before it is developed, but the money invested does not have to be paid back. There is no specific date at which the equity finance expires, just as there is no date for any payment on the equity; its return is as indefinite as that on the innovation itself.

To summarize, then, innovation has special financing requirements. It requires (1) outside financing in that an innovation, by definition, cannot be self-financed, and (2) equity financing in that the risks of innovations are too great, and the capital invested too specialized, for debt financing. This equity financing can, in turn, be provided in one of two ways: (a) through investments in the innovation by the firm that undertakes it ("internal equity"), or (b) through investments in it by venture capital firms or other outside investors ("external equity"). The first option (a) is possible only in the case of established firms with sufficient profit for new endeavors, while the second (b) requires the stock markets and investment firms of modern finance.

## Stock prices and innovation

### *Bubbles*

The dependence of innovation on equity financing makes it dependent on the operations of stock markets and the firms that trade on them. These venture capitals, investment banks, and other investment firms invest for the purposes of capital gain. They finance new ventures not for the profit from their operation, but for the profit from their public incorporation and other stock offerings (Janeway, 2012),[5] and these capital gains are more likely in times of rising stock prices.

[4] Venture capital firms have the same innovation financing advantages that the large pharmaceutical companies have. The scale of their R&D investment (each fund finances a number of innovations) reduces risks, while the successes assure investors. For the importance of venture capital in the development of "Silicon Valley" see Lazonick (2007).

[5] "They construct an economic asset in the hope of eventually monetizing it in the public equity markets" (Janeway, 2012, p. 105).



Booming stock markets increase the funds for new ventures, as the profits from their incorporation rise with the rise in stock prices. These capital gain prospects draw in new investors, as does the ease of selling shares. The liquidity of these markets reduces the risks of investing in new ventures,[6] while the rise in the share prices of the incorporated ones promotes investment in others.

But while a rising stock market increases the funds for new ventures, it also proliferates their numbers, increasing the competition in the industries and markets they are developing (O'Sullivan, 2007). New firms will be "spun off" from already operating ones, as the employees of successful firms start their own firms with the money from the sale of their shares or exercise of their stock options (Lazonick, 2007), while other firms will be started up with the capital gains from the rise in share prices. And when that stock market boom is itself driven by the innovations of new enterprises, with the profit opportunities of their new technologies driving up stock prices, this new venture investment will likely reach unprofitable levels. There will be not only "fraudulent" investments floated on the stock exchange but also excessive investment in the new technology and the markets or industries affected by it (as occurred in the "dot-com" bubble, discussed below). The "bubble" will inflate the investment in the products of the technology as well as the prices of the enterprises that develop them, ending in not only a stock market crash but also an investment collapse.[7]

The uncertainties of new technologies lend themselves to the unmitigated optimism of financial market bubbles, and indeed, it is precisely because their profits are indeterminate that they can hold out the prospect of unlimited profit. It is not surprising, then, that so many of these bubbles have been associated with technological developments, or that major innovations have generated the financing that they required (Perez, 2009). But while the profit prospects of innovations might secure their capital market financing, that dependence on financial markets subjects them to the speculative excesses of these markets and the boom and bust cycles that accompany them.

The operations of stock markets affect the innovation of established firms as well as that of new enterprises. While these firms have capital

[6] The importance of this liquidity for venture capital financing is emphasized in Janeway (2012).

[7] That excessive investment is highlighted in Minsky (1986), but the dynamics of a Minskyan investment boom is quite different from an innovation-driven one. See the discussion of the Minskyan cycle below.

of their own, and the innovations of the more profitable ones (such as General Electric and Sony) can be financed internally, their investment can still be affected by the conditions of stock markets. They may have little need for the funds provided by these markets, but they can profit from investment in them, from speculation in other firms' shares, and/or from speculation in the companies themselves. The profitability of that financial investment increases with the rise in stock prices,[8] so that these increases in stock prices can divert funds from investments in product development and production processes,[9] turning firms into stock traders, with the same interest in short-term profits and capital gains that financial firms have.

This is not to say that mergers and acquisitions are made for speculative purposes only. They can be undertaken for strategic reasons, to increase the competitiveness of the enterprise in its existing markets, or for the long-term profit from expansion into new ones. Firms may have to acquire the technology of other companies to develop their own technologies, and given the pace of innovation in high-tech industries, acquisitions may be the only way to maintain or increase market share.[10]

Yet, bull markets provide lucrative alternatives to the investments of production. Speculation can dominate over enterprise in industry also, and whether it does so depends not only on the financial pressures of firms but also on norms and incentives. If the market value of companies matters more than their productive capabilities, if it is the measure of their performance and decides the pay of executives, the energies of firms will be directed toward increases in share prices. Short-term earnings will be decisive, with the quick gains of financial investments chosen over the more uncertain, long-term profits from investments in products and production processes. Bull markets will, in this case, reduce the investment funds of firms, attracting their profits rather than enhancing their finances, and the relation between stock prices and investment will be the exact opposite of the one assumed in the $q$ theory of Tobin and other economists.

[8] Mergers and acquisitions boom in times of rising stock prices (Medlen, 2003), contributing to those prices rising as well as being driven by them.

[9] This investment effect of a rise in stock prices is modeled in Bhaduri (2011).

[10] Cisco provides an interesting example of this acquisition growth strategy (Carpenter et al., 2003).



### *Q theory*

The effects of stock prices on the innovation and investment of firms depends then on their objectives, and especially on the extent to which enterprise (in Keynes's sense) dominates over speculation in their investment. If enterprise dominates, firms would acquire capital assets for the profit from their operation, not the capital gain from their sale, with the "quasi-rents" from them more important than the differences between their sale and purchase prices. Firms would decide investments on the basis of their prospective yields rather than expected price changes, and insofar as stock prices affect these profit estimates, a rise in stock prices could increase investment, as it does in Tobin's and Minsky's $q$ theory of investment.

In Tobin's $q$ theory, stock markets value the assets of firms, assessing their profitability, and firms decide investments on the basis of their market valuations. If the market value of a firm's assets, as reflected in the price of its stock and bonds, rises above the replacement cost of the assets—that is, if their $q$ ratio becomes greater than 1—the firm will increase its investment in them, and increases in stock prices will raise investment as long as these prices rise faster than the prices (or production costs) of capital goods (Tobin and Brainard, 1977).

A heightened market valuation of a firm is a heightened valuation of its assets, and an increase in the present (discounted) value of its projected future earnings. While the earnings from the productive assets of a business are not the same as the earnings from a share of stock—the earnings from these assets are the "net cash flows over their lifetimes," whereas those from a share "include all future dividends and other distributions"—the securities of a corporation are "essentially claims to the earnings thrown off by the real productive assets of the business" (Tobin and Brainard, 1977, p. 238). The value of these securities will thus rise with increases in the market assessment of those assets, "when the market revises upward its expectations of [their] future earnings, or revises downward its discount rates" (ibid.), and the market value of a firm's assets will be reflected, however imperfectly, in the price of its stock.

As stock prices reflect the market value of existing capital assets, they affect the investment in new ones, and affect that investment for the same reason that the resale prices of other reproducible assets (such as houses) affect their production. Just as a rise in the prices of existing homes relative to current building costs encourages residential construction, a rise in stock prices relative to current costs of capital assets encourages capital investment. The "incentive" for the investment, in both cases, "is the gain

to be made by the excess of market price over replacement cost" (Tobin and Brainard, 2007, p. 236), with the only difference between the cases being that stock prices express the market value of existing capital assets, while the prices of already constructed houses is their market value.

Securities markets are not markets for used (or new) capital goods, but, according to Tobin and Brainard (1977, p. 237), they provide more timely and pertinent information about the productive assets of enterprises than the secondhand markets for those assets. Stock markets are "well organized and efficient," with highly sensitive and flexible prices. Their prices fluctuate more than the costs of the assets they "indirectly" value, but they are decided on the basis of the expected earnings of these assets, not on how others are expected to value them or the enterprises that own them. Enterprise dominates over speculation in stock investments, and firms "maximize shareholder value" through profitable investments, as these increase their future earnings and thus appreciate their shares to the benefit of their shareholders (ibid., p. 242).

Minsky (1975, 1986) shared Tobin's view on the positive relation between stock prices and investment, though not his view of the efficiency of stock markets. For him, as for Tobin, the capital assets of firms were valued in the markets for their securities, for "in a corporate capitalist economy with a stock exchange, the market's valuation of a firm's capital assets and market position substitutes for the price of capital assets" (Minsky, 1986, p. 186). The price of these assets affected the demand for new investments of a similar kind—their "demand price"—as the expectations of firms (and their bankers) were "adaptive" (ibid., p. 205). They expected the profit from new investments to be the same as that earned on existing investments, so that if the value of these investments changed, as it would over the "course of the stock market," so would their demand price. The expected returns on new investments rose and fell with the movements in stock prices.

As the expected profit from investment depended on the level of stock prices, so did the pace of investment. If the market value of the "capital assets collected in a firm" is "high relative to the supply price of such assets newly produced, . . . the pace of investment in such assets will be stepped up" (Minsky, 1975, p. 101). Rises in stock prices increased investment, as they did in Tobin's $q$ theory, but the result of these rises was not the Walrasian equilibrium of Tobin's theory. Increases in investment raised aggregate demand and thus the profit from existing investments, heightening the profit expectations of firms and market valuations of their assets. A rise in stock prices led to a rise in investment and a rise in investment to an increase in profits and stock



prices, and the excessive investment of the boom, along with the accompanying rise in interest rates, eroded the finances of firms, ending in a collapse of investment.

While the finances of firms worsened as the boom proceeded, and more and more of them became dependent on credit and/or asset sales for debt payments, their objectives remained the same. Firms were not drawn into financial investments by the speculative gains of the bull market. They, instead, continued to invest for "yield"—for the earnings from capital assets, the "quasi-rents" expected from their "use in production" (Minsky, 1986, p. 200) rather than the capital gains expected from their sale. Investment finance became "speculative" in the course of the boom, as the "hedge" financing of investment gave way to its speculative financing, but investment itself did not.[11]

$Q$ theory has been criticized for its lack of unambiguous empirical support, for its "Wall Street" view of the firm and neglect of the role of management.[12] Yet, in spite of its limitations, $q$ theory does highlight a critical feature of capitalist economies: the dependence of their performance on the operations of stock markets. Innovation, as we have argued, relies heavily on equity financing, on venture capital and the possibility of enterprise incorporations (IPOs) in the case of new ventures, and on the reinvestment of profits in that of the innovations of established firms. The managers of these enterprises may know more about their operations and investment opportunities than investors, but they can still be affected by movements in stock prices, if for no other reason than that the performance of their firms is evaluated in these prices. And, whether they are affected in the way assumed in $q$ theory depends not only on the objectives of investors but also on their own objectives.

[11] In Minsky (1986), hedge and speculative finance are different types of investment financing, distinguished by the relation between the expected cash flows from existing investments and committed cash payments on the finance for the new investment. If the expected cash flows cover fully all payment commitments, both short and long term, then the investment is "hedge" financed, whereas if they can repay the debt in the long run, but can only cover the interest payments on it in the short run, then the financing of the investment would be "speculative."

[12] Crotty (1990) criticizes $q$ theory for its conflation of enterprise ownership and management; Gordon and Veitch (1986) find no empirical support for its "Wall Street view" of the relation between stock prices and investment, while Gilchrist et al. (2002) find some support for it, and Schoder (2011) reviews the recent literature and provides his own estimates using U.S. firm-level data on fixed investment for 1971–2007. He also fails to find the $q$ variable to be statistically significant in his GMM (generalized method of moments) regression, although he does find some support for a bond-based (as opposed to stock market-based) $q$.

In a brief overview of the U.S. experience in the next section, we find a correlation between stock price movements and innovative effort in the 1920s and 1990s, but not in the 2000s. In these earlier decades, increases in R&D and new product introductions were accompanied by a rise in stock prices, as the prospect of high returns on the new product and process investments increased the market valuations of the innovating enterprises, while the rise in the price of their stocks led to stock speculation (especially in the 1990s) and increased investment in new technology enterprises. While, here, the relation between stock prices and innovation was not the unidirectional one of the $q$ theory—innovation affected stock prices as much as they affected innovation—innovation did occur along with the rise in stock prices, so that the experiences of these decades is not inconsistent with the Tobin/Minsky view.

The experience of the 2000s was quite different—the $q$ correlation between innovative effort and stock prices, so prominent in the 1920s and 1990s, was not present. Instead of being accompanied by a surge of innovative effort, the stock price bubble of the 2000s was accompanied by a wave of "financialization," in which the financial sector grew as a share of gross domestic product (GDP) and its share of corporate profits spiked. This financialization, as we argue below, affected the operations of nonfinancial firms; these became more like financial concerns, maximizing shareholder value not through profitable investments in products and production processes (as Tobin's firms did), but through financial investments and stock buybacks. Speculation dominated over enterprise in their investment also, and it was because it did that the $q$ relation between innovation and stock prices was no longer operative.

## Financial bubbles and innovation: some historical comparisons

A number of studies show the extensive industrial innovation in the 1920s and its connection to the stock market boom of that decade. While innovation in the 1990s was largely in the emerging information technologies (IT) sector, the role of new equity issues was clear. In the 2000s innovation occurred mainly in the financial sector itself, with the explosive creation of new derivatives (in particular, collateralized debt obligations, or CDOs) and an apparent hedge in the form of credit default swaps. These financial innovations increased the profits of the financial sector, and financial stock prices increased with these increases in profits, but there is little evidence of a $q$ relation between stock prices and innovation in other sectors of the economy.



### *The 1920s: technical change and roaring equities*

According to Field (2003), the 1930s was a particularly strong decade of innovation. This was not the result of the financial crash that occurred in 1929, but because of the unusual combination of science and technology from the preceding decades that, combined with research and development in the 1930s, gave off a wave of productivity-enhancing innovations in sectors including chemicals, railroads, electrical machinery, and aviation. Field focuses on the productivity growth of the depression years, but what seems crucial is its dependence on the innovation/investment of the previous decade—the 1920s.

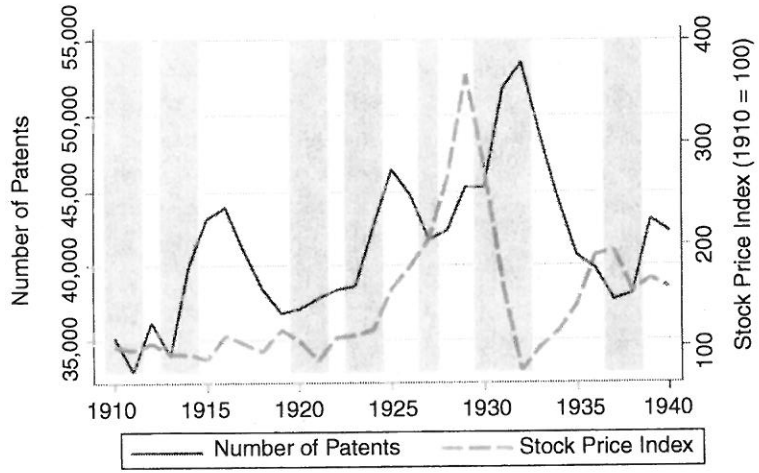
There is broad agreement on the growth in industrial production in the 1920s. Gordon and Veitch (1986) portray investment in relation to potential GDP, and show investment in relation to that natural GDP, and especially nonresidential investment, to be especially high in the 1920s (Gordon and Veitch, 1986, fig. 5.1). Galbraith writes in *The Great Crash* that "The twenties in America were a very good time," noting that "The Federal Reserve index of industrial production which had averaged only 67 in 1921 (1923 – 25 = 100) had risen to 110 by July 1928, and it reached 126 in June 1929" (Galbraith, 1955, p. 8; see also Isenberg, 1989).

Figure 1 shows patent activity (patents granted) and the Dow Jones Industrial average for the period 1910–40. We see a clear correlation in the movement of stock prices and patents, although it is impossible from this to determine whether there is any causal relation—increased patenting seems to lead stock price movements in the period from 1910–25 and then stock price movements from 1925 to 1940 appear to occur ahead of changes in the rate of patenting.

A number of case studies have emphasized the strength of innovative effort by firms in the 1920s, as well as its relation to the surge in stock prices. Devine (1983) focuses on electrification in that decade, but shows that productivity growth in manufacturing generally was quite high (see Devine, 1983, table 2, p. 350). Gordon and Veitch (1986) also point to electrification during the 1920s as an important boon to economic growth, but highlight other innovations also, viewing the expansion of the 1920s as an outgrowth of a "Schumpeterian bunching of investments" in electrification, radio, telephone, chemicals, and the great expansion in the use of motor vehicles.

O'Sullivan (2007) emphasizes the role of the stock market in the financing of new firms in the new aviation and radio industries of the 1920s, while Nicholas (2007) highlights the effects of the industrial innovation on stock prices. He ties the stock market boom of the 1920s to the investment in

**Figure 1** Stock prices and patents, 1910–1940




*Sources:* U.S. Patent and Trademark Office; Federal Reserve Bank of St. Louis; NBER.
*Notes:* Recession years are shaded. Patents are "Utility Patents, granted"; Stock prices are the Dow Jones Industrial Average.

"intangible capital"—measured, in his article, by the patents obtained in that decade. He presents evidence on the relation between patents of particular firms (AT&T, General Electric, Western Electric, etc.) and the market value of their stocks, as well as on the relation between the growth of their patents in the 1920s and Tobin's $q$ (Nicholas, 2007, pp. 230–232), and finds that "intangible capital growth was substantial in 1920s America," that "investors realized it" and "integrated this information into their market pricing decisions" (ibid., p. 218).

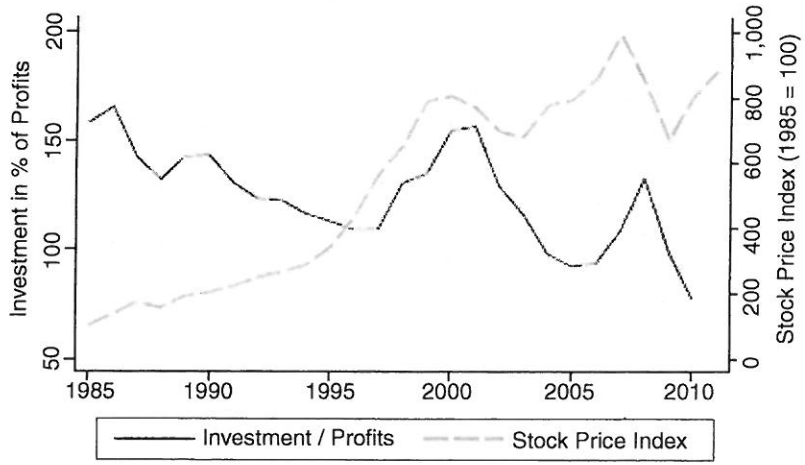
*The 1990s: dot-com boom and bust*

The apparently strong connection between stock prices and investment/innovations identified in the 1920s was also evident in the 1990s. The 1990s expansion incorporated the investment boom of a Minskyan cycle, with a 9.425 percent average annual growth rate in nonresidential private fixed investment over the years of that expansion (1992–99).

Figure 2 shows the relation between (nonresidential) fixed investment spending as a share of profits and stock prices over the period 1991–2010. We can see that the two variables converge in the early 1990s, and move up in tandem from 1995 to 2001. After the 2001 recession, however, they diverge, with the exception of 2006–7. Figure 3 shows the same

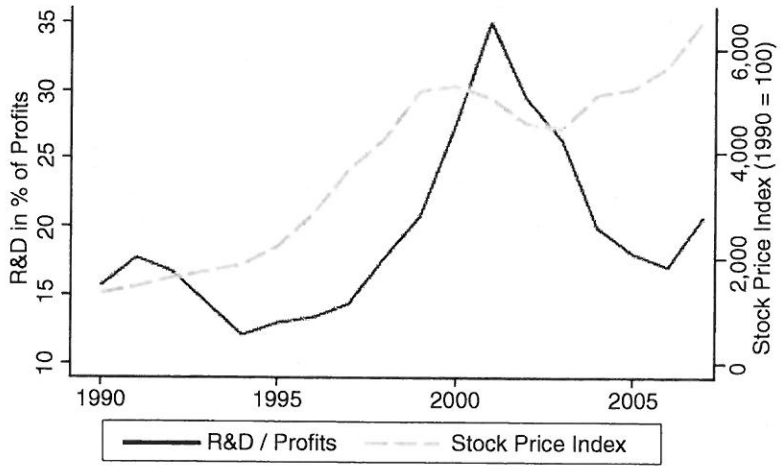


**Figure 2** Stock prices and investment as a percent of profits, 1965–2011




*Sources:* BEA; NBER; Federal Reserve Bank of St. Louis.
*Notes:* Recession years are shaded. Investment is private, nonresidential fixed investment. Stock prices are the Dow Jones Industrial Average.

**Figure 3** Stock prices and R&D spending as a percent of profits, 1991–2007




*Sources:* BEA 2010 R&D Satellite Account; Federal Reserve Bank of St. Louis.
*Notes:* Recession years are shaded. R&D spending is expenditure of private businesses. Profits are domestic business profits. Stock prices are the Dow Jones Industrial Average.

stock price index, graphed with R&D spending, and the 1990s shows a direct correlation between these two variables also.[13] Although no causal relation can be determined from these graphs, Figures 2 and 3 do show that in the 1990s upturn, there was a clear positive correlation between stock prices, fixed investment, and innovative effort as captured by R&D spending.

The 1990s had not only the investment boom of a Minskyan business cycle but also the financial innovation. Investment banks "talked up" the boom in Internet stocks, marketing their IPOs on the basis of a "new" financial valuation—"mind share" and "market share" (the former measured by the number of "Web site" hits) instead of the traditional valuations on the basis of net income or revenue growth (Cassidy, 2002). This ensured the provision of finance for the new Internet enterprises, and while that new financial valuation was not a new credit instrument, it was an innovation in risk assessment and had the same adverse effects as the financial innovations of a Minskyan boom. It increased the financial fragility of firms, leading, in this case, to the financing of many "failed" dot-com enterprises as well as some older technology ones, like Lucent, which got caught up in the excessive investment in the infrastructure of the "Web revolution."

The stock promotions of the investment banks drove up the prices of all stocks, not just the Internet (or high technology) ones, supporting the historically unprecedented stock price rise of that decade. The "new era" thinking promulgated by these firms affected stock evaluations in general (Shiller, 2005), with the financial analysts of these banks noting the turn to a higher productivity, lower inflation economy (which apparently justified higher price/earnings ratios then were realized historically). Thus, while the rise in the prices of Internet stocks increased investment in the new technology, the innovation financed with this venture capital raised the prices of all stocks, increasing the speculation in them and driving the stock market to record heights.

While the investment boom of the 1990s had both the financial innovation and stock price rises of a Minskyan boom, there remain important differences between them. Whereas the Minskyan boom is generalized, involving a rise in investment throughout the economy, the boom of the 1990s was concentrated in the high technology sectors, in computer

[13] See also Brown et al. (2009), which finds statistically significant correlations between equity finance (cash flow and equity issues) and R&D spending for young firms in their study of the 1990s U.S. IT boom.



equipment and software. Investment in these sectors increased at a much higher rate than in the others,[14] and this investment boom, unlike Minsky's, was expectation led—propelled by the profit promise of the new technology rather than the realized profit of past investments (indeed, much of the investment was in products that had not yet earned a profit). It was an innovation-prompted and -driven investment boom, not one that gradually built up steam through the adaptation of expectations to the increases in profits.

The "bust" that ended the boom of the 1990s also differs from Minsky's. For Minsky, it is the rise in interest rates or the lowering of "margins of safety" that creates the financial difficulties of firms (and banks). In the 1990s, it was the excessive investment in the markets related to the new technology that brought on the downturn. It was when these excesses became apparent—the excessive competition in Internet services and products and excess capacity in their infrastructure (such as fiber optic cables)—that the financing "dried up" and the firms failed. Again, stock prices and investment moved together, this time in the downward direction.

### *The 2000s: financialization*

An alternative to the Tobin/Minsky view on the relation between share prices and innovation emerged specifically in the mid-2000s, as economists increasingly recognized that higher share prices were associated not with more investment and expenditure on innovative effort on the part of firms, but with an increase in demand for financial assets, including shares of the firm itself (share buybacks). Figures 2 and 3 reveal the divergence in stock price movements from both investment and R&D out of profits during the upturn of the 2000s.[15]

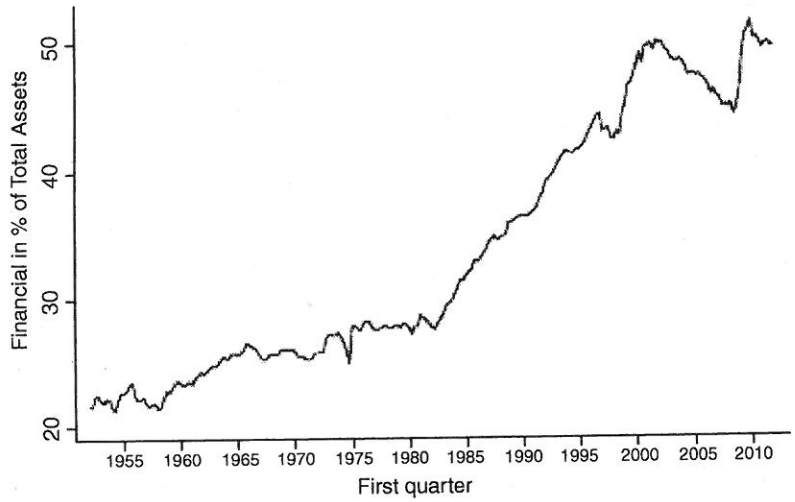
The alternative to investment out of profits as many economists have noted, was "financialization."[16] There were two dimensions to financialization.

[14] The average annual growth rate of investment in nonresidential information processing equipment and software was 18.3625 percent (1992–99), while the rate of investment in computer and peripheral equipment was even higher (39.625 percent), with both being significantly greater than the average annual growth rate in nonresidential private investment as a whole (9.425 percent for 1992–99). Calculations drawn from the National Income and Product Accounts (tables 5.3.1 and 5.5.1) of the Bureau of Economic Analysis.

[15] While nonresidential investment measured as a share of GDP (rather than profits) did increase in the expansion of the 2000s, its average annual growth rate was much less than in the 1990s and the lowest of any postwar expansion (Bivens and Irons, 2008).

[16] There is a vast and growing literature on financialization. See, for example, Epstein (2005), Orhangazi (2008), Bhaduri (2011), and Hein (2012).

**Figure 4** Financial assets as a percent of total assets, 1952–2012




*Sources:* Federal Reserve Flow of Funds of the United States; Federal Reserve Bank of St. Louis; NBER.
*Note:* Includes nonfinancial corporate business, seasonally adjusted annual rates.

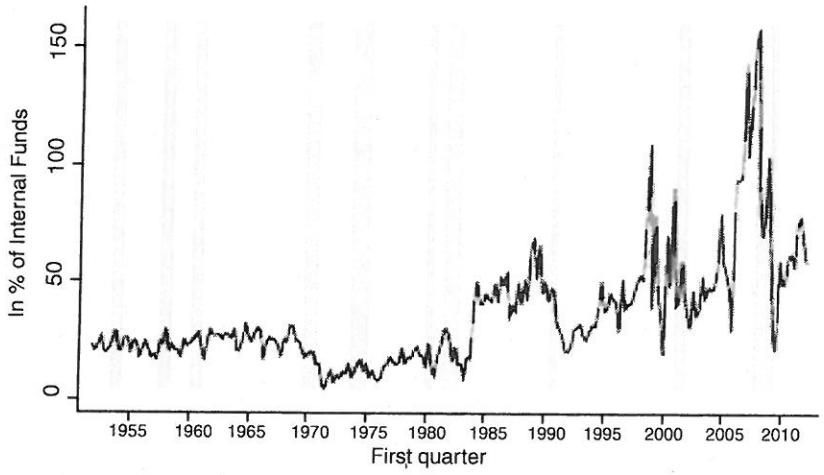
One was the growth in importance of the financial sector, measured in terms of the share of rentier income in national income or in terms of financial sector profits as a share of total corporate profits, which reached 40 percent in the early 2000s.

The second was the financialization of nonfinancial corporations, as traditionally nonfinancial firms became more like financial holding companies, with a spectrum of financial services and financial investments swamping production in terms of their contribution to company revenues. Figure 4 shows the share of financial assets in total asset holdings of nonfinancial corporations. We see that the ratio rose steadily through the 1980s and 1990s and reached a peak of 50 percent by the early 2000s. The ratio drops off sharply during the 2008 crash and has since jumped back up to precrash levels.

Another dimension of the financialization of nonfinancial enterprises was the increased use of profits to pay dividends and purchase the company's own stock. Figure 5 shows dividend payments and share buybacks by nonfinancial corporations beginning in 1985, showing a veritable explosion in the 2000s. When we compare the trend in share buybacks in the 2000s to the investment and R&D spending patterns shown in Figures 2 and 3, it is clear that the major nonfinancial corporations in the 2000s



**Figure 5** Net dividends and net equity issues as a percent of internal funds, 1951–2012



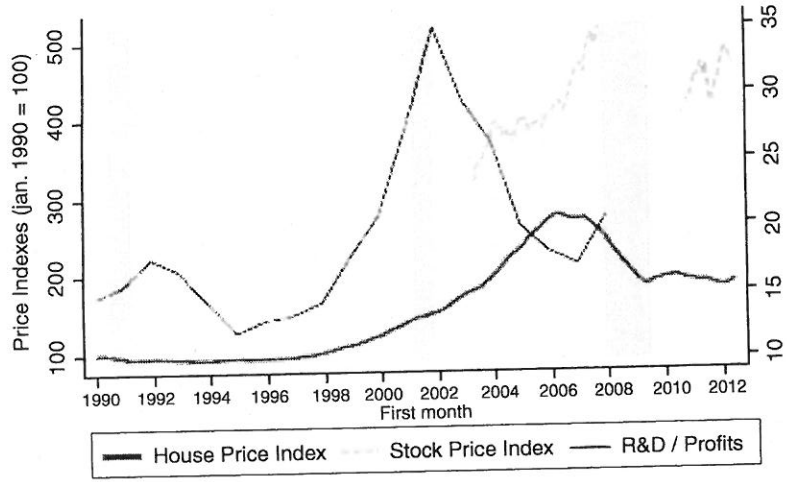

*Sources:* Federal Reserve Flow of Funds of the United States; Federal Reserve Bank of St. Louis; NBER.
*Note:* Includes nonfinancial corporate business, seasonally adjusted annual rates. Variables used: "Net dividends"; "Net new equity issues"; "U.S. internal funds, book value."

saw rising stock prices as a signal to buy back shares rather than reinvest in plant, equipment, or R&D. It would seem that the goal of capital gain through a rising share price took precedent in management decisions over that of increasing profits through investment in real assets.

Some economists, notably Stockhammer (2004) and Lazonick (2009), attribute the financialization of the nonfinancial sector to the "shareholder revolution" of the late 1970s and 1980s, which shifted power in corporate governance from managers to shareholders, bringing to the fore a concern for raising shareholder value. This resulted in a change in corporate strategy from the Chandlerian one of increasing enterprise profits through their retention and reinvestment, to the Jensenian one of increasing shareholder value through profit distributions and disinvestments (Lazonick, 2009; Lazonick and O'Sullivan, 2000). The accompanying growth in executive stock options, undertaken to better align manager and shareholder interests, intensified this financialization of the enterprise, creating greater incentives for managers to focus on short-term movements in share prices.

To be clear, the bull market of the 2000s was not without a rise in business spending and in innovation. But the upturn in spending was focused on housing construction, which is not the same as an increase

**Figure 6** R&D expenditures, monthly stock and house price indexes, 1990–2012




*Sources:* Federal Reserve Bank of St. Louis; NBER; Standard & Poor's; BEA.
*Note:* House price index is the S&P Case–Shiller Ten-City Home Price index. Stock price index is the Dow Jones Industrial Average.

in productive capacity as envisioned in $q$ theory. As shown in Figure 6, from the middle of the 2000s, stock prices continued to be correlated with the housing boom, but not with R&D. The innovation in this decade was largely concentrated in the financial sector, with the invention of new financial instruments (many tied to the housing market), new marketing techniques for financial products, and the innovative application of new information technology that reduced the costs, and increased the scope, of financial transactions.

With financial innovation driving an expansion of the financial sector and a heightened volume of speculative activity, there was a conflation of the important dichotomy that Keynes draws between enterprise ("the activity of forecasting the prospective yield of assets over their whole life") and speculation ("the activity of forecasting the psychology of the market") (Keynes, 1936, p. 158).[17] Thus the bull market in the 2000s has not to date been associated with the innovative effort that both the $q$ theory of investment, and the historical precedents, would indicate. Indeed, the

[17] Bhaduri (2011, p. 10) draws a similar distinction, writing that "Financial investment entails change of ownership (in the secondary market), while real investment results in the creation of new production capacity."



upturn in share buybacks beginning in 2010 would indicate that the era of financialization has not ended with the financial collapse of 2008.

## Conclusion

In this paper we have tried to shift the focus of discussion on the 2008 financial crisis from the problems of the financial sector to that of its effects on the real economy. We stepped back from the immediate facts of the crisis to consider the reason for finance and its importance in firm innovation, both theoretically and historically. Innovation, we found, has special financing requirements; it cannot be financed out of its own revenues in that it has not yet generated any, while its returns are too uncertain for debt financing, requiring equity finance.

Internal equity is not available in the case of new firms, so that their innovation depends on the external equity provided by investors. While established enterprises can have sufficient profit for innovation, they can distribute profits rather than invest them, and invest them in financial as well as real assets. Their innovative efforts thus also depend on the operations of stock markets, and these, we argued, can either promote the innovation of firms, as they did in the 1920s and 1990s, or deter their innovation, providing alternative uses for their profits, as occurred in the 2000s, with the result dependent on the objectives of both investors and firms.

The financialization that began in the 1980s has changed the objectives of nonfinancial corporations, and this, we argued, is the reason why the stock market boom of the 2000s was not accompanied by the investment and innovation of previous booms. The full effects of that financialization were felt in that decade, with finance financing finance, and growth driven by the bubbles it financed rather than innovation and real investment, and insofar as this was the root cause of the crisis, there is justifiable concern about the long-term nature of the economic stagnation we are experiencing today.

## REFERENCES

Bhaduri, A. "Financialization in the Light of Keynesian Theory." *PSL Quarterly Review,* 2011, *64* (1), 7–21.

Bivins, J., and Irons, J. "A Feeble Recovery: The Fundamental Economic Weaknesses of the 2001–07 Expansion." *EPI Briefing Paper,* no. 214, December 2008.

Brown, J.; Fazzari, S.; and Petersen, B. "Financing Innovation and Growth: Cash Flow, External Equity, and the 1990s R&D Boom." *Journal of Finance,* February 2009, *64* (1), 151–182.

Carpenter, M.; Lazonick, W.; and O'Sullivan, M. "The Stock Market and Innovative Capabilities in the New Economy: The Optical Networking Industry." *Industrial and Corporate Change,* 2003, *12* (5), 963–1034.

Cassidy, J. *Dot.Con.* New York: HarperCollins, 2002.

———. *How Markets Fail.* New York: Farrar, Straus and Giroux, 2009.

Crotty, J. "Owner-Management Conflict and Financial Theories of Investment Instability: A Critical Assessment of Keynes, Tobin, and Minsky." *Journal of Post Keynesian Economics,* Summer 1990, *12* (4), 519–542.

———. "Is New Keynesian Investment Theory Really 'Keynesian?' Reflections on Fazzari and Variato." *Journal of Post Keynesian Economics,* Spring 1996, *18* (3), 333–357.

Davidson, P. *John Maynard Keynes.* Houndmills, UK: Palgrave Macmillan, 2009.

Devine, W. "From Shafts to Wires: Historical Perspective on Electrification." *Journal of Economic History,* June 1983, *43* (2), 347–372.

Eichner, A. *The Megacorp and Oligopoly: Micro Foundations of Macro Dynamics.* Cambridge: Cambridge University Press, 1976.

Epstein, G. (ed.). *Financialization and the World Economy.* Cheltenham, UK: Edward Elgar, 2005.

Fazzari, S., and A. Variato. "Varieties of Keynesian Investment Theories: Further Reflections." *Journal of Post Keynesian Economics,* Spring 1996, *18* (3), 359–368.

Field, A. "The Most Technologically Progressive Decade of the Century." *American Economic Review,* September 2003, *93* (4), 1399–1413.

Galbraith, J.K. *The Great Crash, 1929.* Boston: Houghton Mifflin, 1955.

Gilchrist, S.; Himmelberg, S.; and Huberman, G. "Do Stock Price Bubbles Influence Corporate Investment?" NBER working paper, 2002.

Gordon, R., and Veitch, J. "Fixed Investment in the American Business Cycle, 1919–1983." In R. Gordon (ed.), *The American Business Cycle: Continuity and Change.* Chicago: University of Chicago Press (for NBER), 1986, pp. 267–358.

Hein, E. "Finance-Dominated Capitalism, Redistribution, Household Debt and Financial Fragility in a Kaleckian Distribution and Growth Model." *PSL Quarterly Review,* January 2012, *65* (260), 11–51.

Isenberg, D. "The Financially Fragile Firm: Is There a Case for It in the 1920s?" Levy Economics Institute of Bard College, January 1989.

Janeway, W. *Doing Capitalism in the Innovation Economy.* Cambridge: Cambridge University Press, 2012.

Keynes, J.M. *The General Theory of Employment, Interest and Money.* New York: Harcourt Brace, 1936.

———. "The Process of Capital Formation." *Economic Journal,* September 1939, *49* (195), 569–575.

Lazonick, W. "The US Stock Market and the Governance of Innovative Enterprise." *Industrial and Corporate Change,* December 2007, *16* (6), 983–1035.

———. *Sustainable Prosperity in the New Economy.* Kalamazoo, MI: Upjohn Institute, 2009.

Lazonick, W., and O'Sullivan, M. "Maximizing Shareholder Value: A New Ideology for Corporate Governance." *Economy and Society,* 2000, *29* (1), 13–35.

Lazonick, W., and Tulum, O. "US Biopharmaceutical Finance and the Sustainability of the Biotech Business." *Research Policy,* November 2011, *40* (9), 1170–1187.

Medlen, C. "The Trouble with Q." *Journal of Post Keynesian Economics,* 2003, *25* (4), 693–698.

Minsky, H. *John Maynard Keynes.* New York: Columbia University Press, 1975.



———. *Stabilizing an Unstable Economy.* New Haven, CT: Yale University Press, 1986.

Nicholas, T. "Stock Market Swings and the Value of Innovation, 1908–1929." In N.R. Lamoreaux and K.L. Sokoloff (eds.), *Financing Innovation in the United States, 1870 to the Present.* Cambridge, MA: MIT Press, 2007, pp. 217–245.

Orhangazi, O. "Financialization and Capital Accumulation in the Nonfinancial Corporate Sector: A Theoretical and Empirical Investigation on the US Economy, 1973–2004." *Cambridge Journal of Economics,* 2008, *32,* 863–886.

O'Sullivan, M. "Funding New Industries: A Historical Perspective on the Financing Role of the Stock Market in the Twentieth Century." In N.R. Lamoreaux and K.L. Sokoloff (eds.), *Financing Innovation in the United States, 1870 to the Present.* Cambridge, MA: MIT Press, 2007, pp. 164–231.

Perez, C. "The Double Bubble at the Turn of the Century: Technological Roots and Structural Implications." *Cambridge Journal of Economics,* July 2009, *33* (4), 779–805.

Schoder, C. "Demand, q, Financial Constraints and Shareholder Value: An Econometric Micro-analysis of US Fixed Investment." Schwartz Center for Economic Policy Analysis, New School, Working Paper 2011-8, 2011.

Schumpeter, J. *Theory of Business Cycles.* New York: McGraw-Hill, 1939.

Shiller, R. *Irrational Exuberance.* New York: Broadway Books, 2005.

Stockhammer, E. "Financialisation and the Slowdown of Accumulation." *Cambridge Journal of Economics,* September 2004, *28* (5), 719–741.

Tobin, J., and Brainard, W. "Asset Markets and the Cost of Capital." In R. Nelson and Bela Balassa (eds.), *Private Values and Public Policy: Essays in Honor of William Fellner.* Amsterdam: North-Holland, 1977, pp. 235–262.