

BITING THE HAND THAT FED IT: DID THE STOCK MARKET BOOM OF THE  
LATE 1990S IMPEDE INVESTMENT IN MANUFACTURING?

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**Abstract**

This paper analyzes the link between the run-up on the stock market and fixed investments, especially in the manufacturing sector, during the late 1990s. The stock market increase may have given lenders an incentive to invest primarily in companies that have seen large stock price gains, thereby possibly raising financial constraints for manufacturing firms. Further, possible large capital gains on the stock market may have made investments in fixed assets less attractive, thereby offering corporate decision makers incentives to use corporate resources to support share prices through dividend pay-outs and share repurchases. Our results indicate that overall investment during the late 1990s remained lower than it could have been without the large run-up of stock prices, due to a reorientation of the uses of corporate resources away from investments. We also find that investment in manufacturing, which was responsible for a large share of the productivity gains in the late 1990s, was impeded by the developments of the stock market. Especially, the reorientation of investment priorities in the face of rising stock prices is a consistent determinant of investment in manufacturing. Based on our results, the policy focus should be on offering incentives for corporate decision makers – managers and shareholders – to prioritize productive investments over other uses of funds, instead of means to entice lenders to increase lending to manufacturing firms.

## **I. Introduction**

After almost 10 years, the longest running post-war expansion came to an end in March 2001. Most memorable about the past business cycle was the stellar run-up of the stock market. Over the course of the business cycle, the stock market grew by 279%. Underlying this remarkable performance were productivity growth rates not seen since the 1960s, particularly in the late 1990s, and a subsequent acceleration of profit growth rates along with faster growing wages and employment. Consequently, output growth accelerated from 2.9% per year in the first half of the 1990s to 3.4% in the second half.

Most of the productivity growth acceleration in the late 1990s originated in the manufacturing sector. Labor productivity in the non-farm business sector increased from an annual average of 1.5% to 2.5% from the early to the late 1990s, and from 3.1% to 4.3% in the manufacturing sector. Hence, not only productivity growth, but also its acceleration, was greater in manufacturing than in the non-farm business sector overall.

But while the economy and the stock market continued to boom, manufacturing declined, beginning in 1998. Most notably, from March 1998 to March 2001, absolute manufacturing employment declined for the first time in an expansion.

Yet, the stock market run-up and manufacturing's decline may be related. In particular, the rapid rise in the stock market may have given lenders an incentive to invest primarily in companies that have seen large increases in their stock prices, thereby possibly raising financial constraints for firms located in sectors, where stock prices did not rise as fast. This seemed to have been especially true for the manufacturing sector, outside so-called hi-tech industries, as it was seen as a sector with less profit growth potential than information technology related sectors. Further, possible large capital gains

on the stock market may have made investments in fixed assets less attractive, thereby offering corporate decision makers – managers and shareholders – incentives to use corporate resources to support share prices through dividend pay-outs and share repurchases. This may have also disproportionately affected manufacturing since stock price growth for manufacturing remained weak and required more support than stocks in sectors that were growing already quite rapidly.

Analyzing the possible link between the stock market developments of the 1990s and manufacturing investment has clear policy implications. If the stock market bubble of the 1990s contributed to manufacturing's decline, public policies may have to be considered to counter the lack of adequate financing for manufacturing. These may either take the form of lending support programs, such as the Steel Loan Guarantee Program, or changes in the corporate governance structure depending on the ways by which the run-up in the stock market affected manufacturing investment, if at all.

## **II. Finance and Investment**

### **II.1 Literature Review**

Growth ultimately depends on physical capital accumulation that leads to quantitative and qualitative improvements. Presumably, investment is determined by the cost of capital, by investor expectations regarding prices and future sales, and by access to financing. Of particular interest to us is the link between financing and investment. Firms may not always get the financing they desire, since external financing is more expensive than internal financing due to informational costs in financial markets. The cost differential between internal and external financing, though, varies with firm characteristics in that smaller, durable-goods producing, and higher-leverage firms tend

to have less access to external financing than their counterparts. Moreover, external shocks, such as tighter monetary policy or large increases in stock prices, may affect the availability of financing for physical capital accumulation.

One standard assumption is that investment is determined by the cost of capital, whereby the cost of capital includes the price of investment goods, economic growth, expected rates of return and applicable taxes (Jorgenson, 1971). The originally strong findings that the cost of capital is the primary determinant of investment (Jorgenson, 1971), though, were not supported by later studies (Fazzari, Hubbard, and Petersen, 1988). It seems that the stronger earlier results inadvertently accounted for a sales accelerator effect (Fazzari, 1993; Chirinko, 1993). That is, these studies used models that made it hard to distinguish interest rate effects from explanatory variables central to the sales accelerator model, which uses output, internal funds, and the cost of capital to predict levels of future investment. More recent research took subsequently sales growth explicitly into account, and was consequently more successful than earlier work in explaining investment decisions (Fazzari, Hubbard, and Petersen, 1988; Chirinko, 1993).

Still, a substantial share of the variation in investment remained unexplained. Subsequently, theoretical advances made with respect to the value of information in financial market were expanded to include financing as a determinant of investment. In particular, information is not costless and thus some market participants may have more information than others. This information asymmetry may give rise to different costs for borrowers and lenders, ultimately resulting in credit rationing (Stiglitz and Weis, 1981). Consequently, measures of internal and external finance were included in studies of the determinants of investment (Fazzari, Hubbard, and Petersen, 1988; Fazzari, 1993;

Ndikumana, 1999). A consistent finding was that external financing was more costly than internal financing resulting in lower than desired levels of investment.

The cost wedge between internal and external financing varies by firm characteristics, most notably firm size, industry type, and leverage. Smaller firms are less able to finance investment internally, yet they face higher costs in financial markets (Fazzari, Hubbard, and Petersen, 1988; Gertler and Gilchrist, 1994). Also, highly indebted firms face greater financing constraints due to asymmetric information than do less-leveraged firms as investment becomes more sensitive to cash flow with rising leverage (Ndikumana, 1999). Lastly, durable goods manufacturing firms tend to have slightly higher debt-to-asset ratios, especially among small firms, suggesting that the cost wedge between internal and external financing is greater for durable goods producing firms than for non-durable goods producing (Ndikumana, 1998). Also, high-tech firms tend to have substantially lower levels of debt than other firms due to tax shields across industries (Ndikumana, 1998). Ndikumana (1998) speculates that the reason high-tech firms might tend to be less leveraged could be because they face higher costs of borrowing, or because they experience higher rates of return, which enables them to finance more internally.

Two important external factors may influence the link between finance and investment, monetary policy and changes on the stock market. First, monetary policy may impact both the costs of capital and the availability of funds for investment. Moreover, smaller firms appear to be more severely impacted by monetary policy than larger firms (Gertler and Gilchrist, 1994). Second, the high stock market growth rates of the late 1980s and 1990s may have impacted investment. Rapid stock market growth that

deviates from economic fundamentals, resulting in a speculative bubble, could adversely impact physical capital formation as funds are allocated to uses other than financial investments. Hence, a stock market bubble, such as was observed in the late 1990s, may lead to an increasing allocation of financial capital in firms and their stocks who are seen to promise the largest capital appreciation<sup>1</sup>. Essentially, there are two mechanisms by which this could happen. For one, external capital providers, especially lenders, may limit their lending to sectors that are not seen as high growth sectors. But also non-financial firms will use their internal financing to invest in these sectors. Hence, firms that are not located in perceived high growth sectors, such as information technologies in the 1990s, may become increasingly more likely to experience financial constraints.

The evidence on the effects of a stock market bubble on investment are mixed (Morck, Shleifer, and Vishny, 1990; Blanchard, Rhee, and Summers, 1993; Galeotti and Schiantarelli, 1994; Chirinko and Schaller, 1996). In particular, it is possible that a stock market bubble increases overall liquidity, in the case of the U.S. in the late 1990s by attracting foreign capital, and thus alleviates financing constraints. In other words, although lenders may become less willing to lend to non-high growth sectors, there may still be enough liquidity to avoid increasing finance constraints in these sectors.

But there is some evidence of a changing allocation of internal resources that may have helped to reduce financing available for productive investments. Beginning in the early 1980s, financial assets became increasingly concentrated in the hands of institutional investors, such as pension funds. Perceiving the lack of substantial returns on equities in the 1960s and 1970s as a principal agent problem, whereby managers had

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<sup>1</sup> In a stock market bubble, capital appreciation becomes the primary means to generate rates of return, instead of dividends since profits are either low relative to stock prices or non-existent.

insufficient incentives to raise corporate share prices, institutional investors staged what is often called a “shareholder revolution”. The result of this “revolution” was that the interests of managers and institutional investors were aligned by using the carrot of stock options and stock grants and the sticks of shareholder resolutions and corporate takeovers (O’Sullivan, 2000a, 2000b). To avoid dilution of share prices and to raise stock prices to improve executive compensation and as defense against corporate takeovers, corporate management used larger proportions of retained earnings to buy back their own shares, and growing shares of profits to pay for dividends (Liang and Sharpe, 1999). Hence, fewer internal funds may have been available for investments in plant and equipment.

The overview of the literature points to two separate channels by which the run-up of the stock market, especially during the late 1990s, may have affected the availability of funds for investments in fixed assets in the manufacturing sector. For one, lenders may have become increasingly reluctant to lend to the manufacturing sector since profit opportunities loomed larger and larger elsewhere. And second, corporate decision makers may have desired to allocated corporate resources to supporting their share prices through dividend pay-outs and share repurchases, thereby leaving fewer internal resources for fixed investments.

## **II.2 Finance and Investment in the U.S. Economy in the 1990s**

The stock market continued its prolonged run-up that began in 1983 in the 1990s at an accelerated pace. The stock market as measured by the S&P 500 grew by a real rate of 9% during the last business cycle, after growing by 5.7% during the previous one. As a result, the real price earnings ratio (P/E), measured by the real S&P 500 relative to the average real earnings of the previous ten years, was on average two and half times as

high as during the 1980s with 27.7 compared to 11.9. By the end of 1999, this real P/E ratio reached its highest level ever with 44.2, which was also 36% higher than the real P/E ratio recorded in September 1929 (Shiller, 2000).

While the stock market reached historic highs, business investment, although rising, possibly remained below optimal levels. As illustrated in table 1 the rise in investment at the end of the 1990s did not lead to historically high levels of investment. Gross investment relative to GDP remained below the levels last seen during the early 1980s. For the business cycle as a whole, business investment averaged 11.4%, remaining below the levels of the 1980s and the late 1970s. Further, net investment relative to GDP averaged a mere 2.9% for the 1990s, its lowest level since the 1950s. The difference between gross and net investment is a result of the changing composition of investment towards more equipment investment.

Following low net investment, the capital stock also eroded. Nonresidential fixed assets relative to GDP in the 1990s were at their lowest level since the early 1990s. The capital stock relative to GDP dropped by 12.4 percentage points from 122.8% for the 1980s, to 109.4% in the 1990s (table 1). This decline is even more pronounced in manufacturing: the share of manufacturing assets out of total assets declined to 17.8% in the 1990s, its lowest level during the entire post-war period. In contrast, the share of assets of the electronics and electrical equipment manufacturing sector (which includes IT producing industries) relative to total assets grew continuously. In comparison, wholesale and retail trade increased their share of assets significantly from one business cycle to the next. By the late 1990s, wholesale trade firms' assets amounted to 4.9% of private non-residential fixed assets, and retail trade firms' assets equaled 6.5%.



### **II.3 Finance and Investment in the Nonfinancial Corporate Sector in the 1990s**

We can use the *Flow of Funds Accounts* published by the Board of Governors of the Federal Reserve System to see whether stock market run-up and the relatively low levels of investment are connected. In particular, we consider the counterfactual whether investment could have been higher if past trends in financial flows had held during the 1990s i.e., absent the changes associated with the stock market run-up.

For our counterfactual analysis, we use table F.102 from *Flow of Funds Accounts* for the non-farm, non-financial corporate sector, which represents about 70% of business investment. The quarterly data range from the first quarter of 1952 through the third quarter of 2001. The *Flow of Funds Accounts* statistics summarize information on the sources and uses of funds. Specifically, the sources of funds are the sum of total internal funds plus net increases in financial liabilities, and the uses of funds are the sum of gross investment plus net increases in financial assets.

Our analysis proceeds in two steps. We first identify the sources of funds that are associated with specific uses. Then, we consider which sources of funds would have changed in the 1990s due to the changes associated with the stock market and what these changes imply for gross investment in the corporate non-farm, non-financial sector.

To identify the sources of funds associated with specific uses, we first assume that investment is funded by internal funds – the sum of internal funds minus foreign earnings retained abroad. If there is a financing gap – internal funds are less than investment – we allocate sources of external financing to uses of specific uses of funds, beginning with investment. Moreover, we assume that funds from the same source or of the same type are used to finance similar uses. Thus, we net out liabilities with the respective assets to

arrive at net sources and net uses (see table 2). We then sort sources in the order of their liquidity, from most to least liquid: 1) net trade credit, 2) net commercial paper, 3) net bank borrowing, 4) net mortgages, 5) net foreign assets, 6) net corporate bonds, 7) net equity issues, 8) net FDI, 9) net government, and 10) net miscellaneous. We also sort the net uses of funds in order of their liquidity, from the most liquid financial uses to capital expenditures<sup>2</sup>, and then match sources and uses in the order of liquidity.

The net sources and net uses are summarized in table 2, and our results allow us to consider changes in the flow of funds related to stock market run-up and investment financing. Specifically, we consider what happened to equity issues and to dividend payments during the 1990s since these are the primary channels to distribute corporate resources to shareholders, and since they can help to maintain high stock prices. As share prices rose to record levels, we would expect that share repurchases and dividend payouts also increased. However, if a larger share of corporate resources was distributed to shareholders, a smaller share of resources should be available for capital expenditures i.e., we should observe a growing financing gap. However, greater stock prices reflected to some degree an increased ability to take over other companies, which may have helped to attract additional funds from lenders, particularly in the bond market, and from overseas investors, to finance a possibly greater financing gap.

First, in the aggregate, non-financial corporations repurchased more shares than they issued during the 1990s, similar to the 1980s. On average, corporations repurchased their own shares to a tune equal to 9% of capital expenditures during the 1990s. In other

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<sup>2</sup> When expected net sources are actually net uses e.g., negative net equity issues in the 1990s, these are added in order of liquidity following the same order as for net sources.

words, corporate capital needs increased by 9% due to share repurchases. In the latter part of the 1990s, net share repurchases even averaged 17% of capital expenditures.

Second, corporations increased their dividends relative to high profit levels. A record high of 49% of before tax profits was paid out in the form of dividends during the 1990s, thereby requiring corporations to look for more external sources of funding. During the second part of the 1990s, dividend pay-outs equaled a surprising 50% of before tax profits, which were already high by historical standards (Mishel et al., 2001).

Third, as dividend pay-outs reached record high levels, the financing gap – the share of capital expenditures that needs to be covered by external funds – increased compared to the 1980s. Domestic internal finances relative to capital expenditures equaled 84% for the 1990s, compared to 88% for the 1980s. Moreover, since corporate equity issues were a net use of funds, instead of a net source, and since we assume that internal funds were used to finance share repurchases, the financing gap equaled 25% of capital expenditures in the 1990s. Also, while this financing gap was only 12% in the early 1990s, it grew to 38% of capital expenditures for the latter part of the 1990s.

However, it seems that while corporate capital needs grew, the availability of external debt financing, if not equity financing, increased. Net bond issues increased their importance as total bond inflows relative to capital expenditures averaged a historic high of 18%. Also, overseas capital inflows – attracted by the strong stock market performance – became the second most important source of external financing in the 1990s, after bond financing. For the 1990s as a whole, net bond issues together with net capital inflows funded 26% of capital expenditures and hence covered the entire financing gap for the 1990s. But in the second part of the 1990s, the 30% of capital

expenditures funded by bonds and capital inflows still left a financing gap of about 8% of capital expenditures, which was covered by, for instance, mortgages and tax deferments.

The question is whether capital expenditures would have been higher if corporate financial flows had not changed over time. To do this, a reference period must be established to which the actual corporate financing of the 1990s could be compared. We consider the 1980s and the early 1990s as reference periods to which we compare the late 1990s. The early 1980s constitute a break from earlier periods, since a larger emphasis was put on stock market growth with the rise of institutional investors. Alternatively, the second part of the 1990s appears different from the first part of the 1990s, largely because of accelerated productivity and stock market growth.

We now consider what would have happened to capital expenditures in the late 1990s if net equity issues, net capital inflows, net bond issues and dividend pay-outs had remained the same as in the early 1990s. If net equity, bond, and capital inflows had remained the same, an additional 6.2% of capital expenditures could have been financed<sup>3</sup>. Further, about 95% of capital expenditures are investment, suggesting that investment could have been 6.5% higher than it was during the late 1990s. Further, the difference in the ratio of dividend pay-outs to before-tax profits between the early and late 1990s was 1.52 percentage points. Assuming that these funds would have been used for capital expenditures, an additional 0.4% of investment could have been financed. In other words, if corporate financing had stayed the same in the late 1990s as in the early 1990s, corporate investment by nonfinancial firms could have been 6.9% higher than it was, and overall business investment 5% ( $0.726 \times 6.9$ ) greater.

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<sup>3</sup>This assumes that corporations invested less than their desired investment levels in the late 1990s.

Using the 1980s for comparison, we see that borrowing from the rest of the world was higher, net equity issues were less negative, and bond issues were smaller than in the late 1990s, resulting in 0.8% fewer capital expenditures. However, because dividend payouts out of before-tax profits were 11.4 percentage points lower in the 1980s, corporate investment by nonfinancial firms could have been 3.2% higher, resulting in an overall increase of their investment by 2.4% and by 1.7% of total business investment.

Investment could have been somewhat higher absent corporate financing changes following the run-up in the stock market. In particular, depending on the reference period chosen, business investment could have been 2 to 5% higher than it actually was.

## **II.4 Finance and Investment in Manufacturing**

The effects of financial market changes on investment can vary by sector. Due to its importance for productivity and economic growth, we are especially interested in the impact of firm level financing on investment in manufacturing. To analyze the changes in finance and investment in manufacturing, we use the Census Bureau's *Quarterly Financial Report* (QFR). The QFR presents estimated statements of income and retained earnings, balance sheets, and related financial and operating ratios for the domestic operations of all manufacturing corporations with assets over \$250,000, and of retail and wholesale trade corporations with assets over \$50 million.

### **II.4.1 Univariate Analysis**

Again, we are interested in seeing whether corporate finance has changed over the course of the 1990s and whether these changes may have impacted investment in manufacturing. Our analysis focuses on a comparison between the early and the late 1990s since this was the time period when an acceleration of stock market growth was

observed. Also, as table 3 shows, most types of manufacturing firms saw a decline in their fixed assets relative to their assets from the early 1990s to the late 1990s<sup>4</sup>. Only small manufacturing firms increased their fixed assets relative to total assets, while retail and wholesale trade firms increased their ratio from the early 1990s to the late 1990s<sup>5</sup>.

Our issue of concern, though, is whether the lower relative accumulation of fixed assets was linked to a declining availability of financing that can be linked to the run-up in the stock market. In particular, we first look at profits as a source of internal financing and then study whether the share of profits that was dedicated to dividend pay-outs increased in the latter part of the 1990s. If the profitability of manufacturing firms increased, and the ratio of dividend pay-outs relative to profits also rose, the demand of manufacturing firms for external financing may have also increased.

Table 4 shows that the profitability of manufacturing firms generally rose and that it tended to be higher in manufacturing than in retail or wholesale trade firms in the latter part of the 1990s. Hence, the lower fixed asset accumulation was not tied to a reduced generation of internal resources. However, table 4 also shows that the share of profits paid out in the form of dividends increased for the manufacturing sector as a whole, for small manufacturing firms and for durable goods producing firms, leaving fewer internal resources for fixed capital expenditures.

As potentially a smaller share of internal resources is available, manufacturing firms have to turn increasingly to external financial sources for investment financing. However, the costs of external financing tend to be higher than internal financing, thereby possibly restricting the amount of investment that can be undertaken. Table 5

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<sup>4</sup> For definitions and sources of variables see the appendix.

shows that manufacturing firms indeed increased their short-term and their long-term debt relative to their fixed assets – a ratio that most accurately captures investment financing – from the early 1990s to the late 1990s, with the exception of small manufacturing firms, where the debt to fixed asset ratios remained relatively stable.

To see whether the increases in debt financing are associated with the changes on the stock market, we study whether long-term and short-term debt relative to fixed assets are consistently higher during periods immediately following above average increases on the stock market because more liquidity became available. Alternatively, the averages reported in table 5 may mask systematic changes in firm leverage following large changes on the stock market. In particular, extraordinary changes on the stock market may have meant that investors became less likely to invest in physical capital since financial markets offered, at least temporarily, greater profit opportunities as Blanchard et al. (1993) suspected prior to the run-up of the stock market in the late 1990s.

To test for the impact of rapid stock market growth on long-term and short-term debt, we analyze whether the levels of debt to fixed assets are systematically different immediately following stock market changes that are more than one standard deviation above or below the average stock market growth rate when compared to other periods. In particular, we use a Mann-Whitney ranksum test to compare the means for the three quarters following extraordinary stock market changes, increases and declines, and tranquil periods. Our results in table 6 show that stock market increases were only occasionally linked to changes in debt investment financing, with the exception of more short-term debt for nondurable goods producing firms and less long-term debt for small

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<sup>5</sup> Small firms are firms with assets below \$25 million, and high tech firms are firms in the industrial machinery and the electronic and electrical equipment sectors.

firms. Since long-term debt is more likely to be used to fund investment, it may have been the case that small manufacturing firms experienced greater financial constraints following extraordinary increases of the stock market. Also, stock market declines meant more short-term credit for durable goods producing firms and more long-term credit for all firms, except high-tech firms. In other words, it may be the case that slower stock market growth may have eased financial constraints for almost all manufacturing firms.

The debt to fixed asset ratios may not accurately reflect the financial constraints that manufacturing firms faced since they do not account for the costs of capital. Preferable measures may be interest expenses and the coverage ratio<sup>6</sup>. Interest expenses control for changes in interest rates and changes in the level of debt. Moreover, the coverage ratio is defined as the ratio of cash flow to total interest payments, and it appears to be a good proxy for movements of a firm's overall financial position (Gertler and Gilchrist, 1994). Higher coverage ratios indicate better financial health i.e., fewer financial constraints.

Again, we study whether interest expenses and coverage ratios vary with extraordinary changes on the stock market. Our results in table 6 show that faster stock market growth resulted in higher interest expenses for all firms, except small firms and nondurable goods producing firms, which is consistent with the changes in debt levels we observed earlier. But higher stock market growth rates were also associated with improving financial constraints, except small firms and nondurable goods producing. In comparison, stock market declines had no effect on interest expenses, and they largely

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<sup>6</sup> Since interest expense data are only available since 1998, we multiplied the short-term interest rate with the stock of short-term debt, and the long-term interest rates with the stock of long-term loans, and added the two together. For the years 1998 to 2001, this interest expense ratio has a correlation coefficient of 0.97



were associated with rising financial constraints. In other words, there is only little evidence to suggest that extraordinary stock market increases were associated with increasing financial constraints in the manufacturing sector. This seems to be consistent with our results from the previous section, which indicated that changes in corporate finance may have reduced investment by nonfinancial corporations only marginally.

#### II.4.2 Multivariate Analysis

So far, we have only focused on a univariate analysis to study the link between financial markets, financing and investment in manufacturing. Using a multivariate analysis allows us to analyze the joint effects of financial market changes and other factors on investment. We adapt Gertler and Gilchrist's (1994) analysis to include stock market changes and to apply it to physical capital formation. Our regression equation is:

$$\Delta I_t = \mathbf{b}_1(ES_{t-1} - Inv_{t-1}) + \mathbf{b}_2 i_{t-1} + \mathbf{b}_3 CR_{t-1} + \mathbf{b}_4 B_{t-1} + \mathbf{b}_5 \Delta I_{t-1} + \mathbf{b}_6 \Delta S_{t-1} + \mathbf{b}_7 \Delta i_{t-1} + \mathbf{b}_8 \Delta CR_{t-1} + \mathbf{b}_9 \Delta B_{t-1} + \mathbf{e}_t \quad (1)$$

Fixed capital growth,  $DI$ , is determined by the difference between expected sales,  $ES$  and inventory,  $Inv$ , by the short-term interest rate,  $i$ , by the coverage ratio,  $CR$ , by a measure for the stock market bubble,  $B$ , and by the changes of fixed capital, sales, the coverage ratio, and the bubble measure during the previous quarter. Due to the relatively short time period we are considering, we define expected sales as actual sales in the previous quarter extended by the average sales growth rate of the prior four quarters.

We are particularly interested in the effects of financial variables on investment in manufacturing. In particular, there are two possible channels by which the run-up of the stock market may have impacted investment by manufacturing firms. First, external

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with the actual interest expense measure, and the two ratios have an R-squared of 0.96, suggesting that our calculated measure is a good approximation.

financial constraints may have grown as lenders turned away from manufacturing in the second part of the 1990s to pursue investments elsewhere. Hence, we expect that the coverage ratio, will have a stronger effect on investment in the late 1990s than in the early 1990s. Based on our descriptive results, we also expect that this effect varies by firm size, such that small firms are more impacted than larger firms. Second, corporate decision makers may decide to allocate internal resources to uses other than fixed investments as the stock market increases. We capture this possible channel by including a measure for the stock market bubble in our regression. In particular, we use Chirinko and Schaller's (1996) measure for the difference between fundamental and observed price, such that a greater stock market bubble should reduce investment growth.

The first regression in table 7 presents our base line model, which estimates equation 1 for all manufacturing firms for the entire business cycle. All variables have either the correct sign or are insignificant. In particular, faster sales growth results in more physical capital formation, whereas more investment in the last quarter results in less investment in the current quarter. In comparison, a stock market bubble has an overall negative impact, but the coverage ratio, has no discernible effect. In other words, while there are no signs of significant financial constraints, there is an indication that the stock market run-up may have helped to attract investments away from manufacturing investment. An increase in the stock market bubble measure of 1% results in a relatively small decline of investment of 0.02%. Similarly, an acceleration in the build up of the stock market bubble by 1% results in a reduction of investment by 0.1%.

In our previous discussion, we distinguished between the early and the late 1990s, since the late 1990s were marked by a sharp increase in stock market growth rates.

Hence, the next two columns in table 7 present separate estimates for the early and late 1990s. Stock market bubbles had a significant negative impact on investment in the early part of the 1990s, while other financial variables did not. In comparison, financial constraints appeared to arise for all manufacturing firms in the late 1990s as the coverage ratio has a strong positive effect on investment. But, the stock market has a substantially smaller effect on investment in the latter part of the decade than during the early 1990s. Specifically, a 1% increase in the coverage ratio results in 0.2% more investment. Our results indicate that investment in manufacturing may have been impeded by financial market profit opportunities that attracted funds that would have otherwise gone to productive investments in the early 1990s, and by increasing financial constraints arising from a reluctance on the part of lenders to investment in manufacturing in the latter part of the 1990s.

We are also interested in seeing whether these effects vary across firm size since our descriptive statistics indicated that especially small manufacturing firms may have experienced financial constraint. Thus, we include a dummy that takes on the value of one for small firms and zero otherwise. In addition, we introduce interactive terms between the coverage ratio and stock market bubble and firm size (table 8). The coverage ratio has a strong significant effect for small firms, but not for large firms, suggesting that small firms faced more financial constraints than larger firms. Moreover, this effect is three times as great in the late 1990s as it is in the early 1990s, suggesting that small firms faced increasing financial constraints when the stock market experienced increasing growth rates. Moreover, investment by small firms is adversely affected by a stock market bubble in the late 1990s, suggesting that the reorientation of investment away

from productive investments especially affected small firms. Overall, our results confirm that financial market changes in the late 1990s resulted in less investment than would have occurred otherwise by small manufacturing firms.

Finally, it is generally accepted that investment decisions vary by product type, which leads us to reestimate our regression separately for durable and non-durable goods producing firms. In particular, we include a dummy that takes on the value of one for durable goods producing firms and zero otherwise. Our estimates in table 9 suggest that investment by durable goods producing firms was more heavily impacted by the reorientation away from productive investments than non-durable goods producing firms, regardless of the time period under investigation. Hence, investment by both types of manufacturing firms was less than desired due to the run-up on the stock market, with a stronger effect on durable goods producing firms than non-durable goods producing firms. The mechanism by which investment was lowered was a reorientation by corporate decision makers away from productive capacity at the firm levels towards other investments e.g., mergers and acquisitions, rather than a reluctance on the part of lenders to invest in manufacturing firms.

### **III. Conclusion**

In this paper, we study the connection between the run-up on the stock market and fixed investments, especially in the manufacturing sector. For one, the rapid rise in the stock market may have given lenders an incentive to invest primarily in companies that have seen large increases in their stock prices, thereby possibly raising financial constraints for firms located in sectors, where stock prices did not rise as fast, especially in manufacturing. Further, possible large capital gains on the stock market may have

made investments in fixed assets less attractive, thereby offering corporate decision makers – managers and shareholders – incentives to use corporate resources to support share prices through dividend pay-outs and share repurchases.

Our results indicate that overall investment during the late 1990s, when the stock market experienced its largest growth rates, remained slightly lower than it could have been without the large run-up of stock prices. In particular, investment by nonfinancial corporations could have been 2% to 7% greater in the late 1990s absent the large changes on the stock, which led mainly to a reorientation of the uses of corporate resources away from investments towards dividend pay-outs and share repurchases.

We also find that investment in manufacturing, which was responsible for a large share of the productivity gains in the late 1990s, was impeded by the developments of the stock market. Although both channels – increased financial constraints and reorientation of investment priorities – seem to matter, the reorientation of investment priorities in the face of rising stock prices is a more consistent determinant of investment. Especially, investments by small manufacturing firms and by durable goods producing firms were adversely affected by the rise on the stock market in the late 1990s.

Our results suggest that the run-up of the stock market impeded investment, particularly in the manufacturing sector, more because of changes in investment priorities by corporate decision makers than because of a reluctance on the part of lenders. Hence, the policy focus should be on offering incentives for corporate decision makers – managers and shareholders – to prioritize productive investments over other uses of funds, instead of means to entice lenders to increase lending to manufacturing firms.

TABLE 1  
INVESTMENT AND CAPITAL ACCUMULATION, 1952 TO 2001

Business cycle	Investment as share of GDP	Net investment as share of GDP	Private nonresidential assets relative to GDP	Manufacturing assets as share of private nonresidential fixed assets (PNFA)	Assets of electronics and electric and ind. machinery firms to PNFA	Wholesale trade firms' assets to PNFA	Retail trade firms' assets to PNFA
1954 to 1957	9.7	3.5	111	19.2	2.0	1.4	4.9
1958 to 1959	9.1	2.5	113.7	19.2	2.1	1.5	4.7
1960 to 1969	9.8	3.8	102.7	19.7	2.3	1.9	5.0
1970 to 1973	10.5	4.1	107.9	20.5	2.6	2.5	5.4
1974 to 1979	11.5	4.1	121.9	20.3	2.6	2.8	5.2
1980 to 1990	12	3.5	122.8	19.1	3.0	3.9	5.5
1991 to 2000	11.4	2.9	109.4	17.8	3.1	4.7	6.3
1991 to 1995	10.4	2.0	110.6	18.2	3.0	4.4	6.1
1996 to 2000	12.4	3.8	108.2	17.4	3.1	4.9	6.5

Notes: Periods are determined by NBER business cycle dates. Sources are BEA, NIPA; BEA, Fixed Assets.

TABLE 2  
SOURCES AND USES OF CORPORATE FUNDS

Business Cycle	Internal funds to CE	Net MF to CE	Net trade credit to CE	Net comm. Paper to CE	Net bank borrowing to CE	Net mortgages to CE	Net ROW to CE	Bonds to CE	Net equity issues to CE	Net FDI to CE	Net govt. to CE	Net misc. to CE	Dividends out of BT profits
53:3 to 57:3	93.3	0.0	-3.1	-0.1	2.8	3.3	2.6	13.1	6.5	-3.6	-3.8	-3.5	21.8
57:4 to 60:2	105.5	0.0	-3.1	0.3	4.9	3.8	2.9	14.3	6.2	-3.8	-6.9	-1.7	25.2
60:3 to 69:4	98.8	-0.1	-3.7	-0.3	7.8	4.3	2.9	13.0	2.2	-6.0	2.4	-2.7	25.4
70:1 to 73:4	82.1	-0.1	-0.8	-1.3	8.3	13.7	4.4	16.9	9.6	-5.7	2.5	-17.7	26.5
74:1 to 80:1	82.7	-0.3	-6.9	0.1	4.4	2.1	5.5	13.6	2.8	-4.7	3.9	15.0	20.3
81:1 to 90:3	87.7	-0.5	-4.5	1.8	9.2	1.3	10.5	16.4	-13.9	2.9	1.1	4.8	38.5
90:4 to 01:1	84.0	-2.7	-0.5	0.7	2.7	0.6	8.2	17.6	-8.9	-0.9	0.6	-9.4	49.2
90:4 to 95:4	89.1	-2.3	0.7	0.6	-1.5	-3.1	7.9	13.2	-1.1	-5.9	-1.6	-3.2	48.4
96:1 to 01:1	78.9	-3.2	-1.7	0.9	6.9	4.2	8.4	22.0	-16.6	4.0	2.7	-15.6	50.0

Notes: All figures are in percent. CE stands for capital expenditures. Source is the Board of Governors, Federal Reserve System, Flow of Funds Accounts, Table F. 102.

TABLE 3  
FIXED ASSETS RELATIVE TO TOTAL ASSETS, BY SECTOR, 1990 TO 2001

	Manufacturing					Trades		
	Total	<\$25 Million	\$25 Million +	Nondurable s	Durables	Hi-Tech	Wholesale	Retail
Full sample	55.7	70.98	54.59	62.93	48.36	42.68	29.85	52.81
1990 to 1995	58.94	69.09	58.1	65.57	51.61	46.25	29.04	50.9
1996 to 2001	52.45	72.87	51.08	60.3	45.11	39.11	30.66	54.72

Notes: All figures are in percent. Definitions of the periods are in the text. Variable definitions are detailed in the appendix. Source is Bureau of the Census, Quarterly Financial Report for Manufacturing, Mining, and Trade, 2001.



TABLE 4  
PROFITS TO ASSETS, BY SECTOR, 1990 TO 2001

	Manufacturing						Trades	
	Total	<\$25 Million	\$25 Million +	Nondurables	Durables	Hi-Tech	Wholesale	Retail
<b>Before tax profits to total assets</b>								
Full sample	1.7	2.5	1.7	1.4	1.8	1.8	1.0	1.6
1990 to 1995	1.3	2.2	1.4	1.6	1.2	1.3	0.8	1.3
1996 to 2001	2.0	2.8	2.0	2.1	2.0	2.4	1.2	1.8
<b>After tax profits to total assets</b>								
Full sample	1.2	2.1	1.1	1.4	1.1	1.3	0.6	0.9
1990 to 1995	0.9	1.8	0.8	1.1	0.8	0.9	0.5	0.8
1996 to 2001	1.5	2.4	1.5	1.6	1.4	1.6	0.8	1.1
<b>Dividend payments to before tax profits</b>								
Full sample	24.2	23.7	24.7	28.3	20.8	16.2	33.0	14.0
1990 to 1995	18.9	12.3	25.5	34.6	5.5	12.1	38.6	12.9
1996 to 2001	30.0	36.5	23.5	20.4	37.8	21.1	27.0	15.2

Notes: All figures are averages and in percent. Definitions of the periods are in the text. Variable definitions are detailed in the appendix. Source is Bureau of the Census, Quarterly Financial Report for Manufacturing, Mining, and Trade, 2001.

TABLE 5  
DEBT TO ASSETS, BY SECTOR, 1990 TO 2001

	Manufacturing						Trades	
	Total	<\$25 Million	\$25 Million +	Nondurables	Durables	Hi-Tech	Wholesale	Retail
	<b>Long-term debt to assets</b>							
Full sample	39.3	27.9	40.4	40.8	37.2	37.7	61.7	55.2
1990 to 1995	38.2	27.9	39.2	40.1	35.5	36.3	65.2	61.6
1996 to 2001	40.4	27.9	41.0	41.5	38.9	39.1	58.2	48.8
	<b>Short-term debt to assets</b>							
Full sample	7.9	11.1	7.55	7.4	8.5	12.1	37.1	7.4
1990 to 1995	7.1	11.5	6.69	6.6	7.9	12.1	56.1	8.7
1996 to 2001	8.6	10.7	8.41	8.2	9.2	12.0	37.1	6.0

Notes: All figures are averages and in percent. Definitions of the periods are in the text. Variable definitions are detailed in the appendix. Source is Bureau of the Census, Quarterly Financial Report for Manufacturing, Mining, and Trade, 2001.

TABLE 6  
THE EFFECT OF FINANCIAL MARKET CHANGES ON SHORT-TERM AND LONG-TERM DEBT, 1990 TO 2001

Industry	Stock market increase	Stock market decline	Stock market increase	Stock market decline
	<b>Short-term debt to fixed assets</b>		<b>Long-term debt to fixed assets</b>	
Manufacturing	-1.4	-1.5	1.2	-2.3**
Small firms	0.6	-1.5	2.3**	-2.2**
Large firms	-1.6	-1.4	1.2	-2.4**
Nondurables	-2.1**	0.4	1.1	-2.9***
Durables	-0.4	-2.1**	1.4	-2.2**
High tech	-1.0	-0.1	0.1	-1.0
	<b>Interest expense</b>		<b>Coverage ratio</b>	
Manufacturing	-1.7*	0.0	1.7*	3.2***
Small firms	-1.2	-0.1	0.5	2.5***
Large firms	-1.7*	0.0	2.2**	3.2***
Nondurables	-1.7	0.2	0.6	2.7***
Durables	-1.8*	-0.4	2.6***	2.9***
High tech	-2.6***	0.0	2.0**	4.2***

Notes: All tests are Mann-Whitney ranksum test statistics. A positive sign indicates that the periods after an interest rate of stock market change have smaller averages than all other periods, whereas a negative sign indicates that the quarter following an interest rate or stock market change have larger averages than other periods.

TABLE 7  
REGRESSION RESULTS FOR DETERMINANTS OF INVESTMENT IN  
MANUFACTURING, 1990 TO 2001

Explanatory variables	Full sample, 1990 to 2001	Partial sample, 1990 to 1995	Partial sample, 1995 to 2001
$ES_{t-1}-Inv_{t-1}$	0.018 (0.106)	-0.135 (0.129)	0.244 (0.170)
$i_{t-1}$	0.004 (0.009)	-0.002 (0.011)	0.049 (0.039)
$CR_{t-1}$	0.017 (0.015)	0.001 (0.014)	0.161*** (0.053)
$B_{t-1}$	-0.016* (0.009)	-0.053 (0.034)	0.017 (0.030)
$\Delta I_{t-1}$	-0.350*** (0.027)	-0.265*** (0.038)	-0.389*** (0.038)
$\Delta S_{t-1}$	0.055*** (0.021)	0.085*** (0.026)	0.016 (0.033)
$\Delta i_{t-1}$	-0.003 (0.030)	0.049 (0.038)	-0.077 (0.086)
$\Delta CR_{t-1}$	0.004 (0.008)	0.004 (0.007)	0.125 (0.100)
$\Delta B_{t-1}$	-0.059* (0.036)	-0.501** (0.248)	-0.072* (0.040)
Constant	6.302*** (0.293)	8.886*** (1.732)	4.960*** (1.028)
N	1594	758	836
Wald Chi(2)	191.18	56.76	145.82
p-value	0.000	0.000	0.000

Note: All variables are measured in natural logs, except for  $ES_{t-1}-Inv_{t-1}$ , which is measured by  $100*\log$ . \* indicates significance at the 10%-level, \*\* indicates significance at the 5%-level, and \*\*\* indicates significance at the 1%-level.

TABLE 8  
REGRESSION RESULTS FOR DETERMINANTS OF INVESTMENT GROWTH IN  
SMALL AND LARGE MANUFACTURING FIRMS, 1990 to 2001

Explanatory variables	All firms with size controls, 1990 to 2001	All firms with size controls, 1990 to 1995	All firms with size controls, 1996 to 2001
$ES_{t-1}-Inv_{t-1}$	-0.313** (0.154)	-0.472** (0.192)	-0.079 (0.247)
$i_{t-1}$	0.010 (0.009)	0.001 (0.011)	0.055 (0.039)
$CR_{t-1}$	0.010 (0.016)	0.003 (0.015)	0.110 (0.085)
Small firms * $CR_{t-1}$	0.117*** (0.016)	0.031 (0.052)	0.172 (0.111)
$B_{t-1}$	-0.016 (0.013)	-0.055 (0.043)	-0.008 (0.042)
Small firms * $B_{t-1}$	0.002 (0.017)	0.018 (0.051)	0.053 (0.058)
$\Delta I_{t-1}$	-0.352*** (0.027)	-0.275*** (0.038)	-0.386*** (0.038)
$\Delta S_{t-1}$	0.040* (0.021)	0.078*** (0.027)	0.001 (0.034)
$\Delta i_{t-1}$	-0.003 (0.029)	0.047 (0.038)	-0.080 (0.086)
$\Delta CR_{t-1}$	0.002 (0.008)	0.003 (0.007)	0.056 (0.248)
Small firms * $\Delta CR_{t-1}$	0.228*** (0.084)	0.374*** (0.135)	0.068 (0.272)
$\Delta B_{t-1}$	-0.009 (0.050)	-0.434 (0.308)	-0.002 (0.056)
Small firms * $\Delta B_{t-1}$	-0.123* (0.070)	-0.096 (0.366)	-0.156** (0.080)
Small firms	-1.872*** (0.951)	-3.109 (2.884)	-0.364 (0.268)
Constant	6.111*** (0.382)	8.550*** (2.160)	5.474** (2.436)
N	1594	758	836
Wald Chi(2)	217.85	70.83	157.31
p-value	0.000	0.000	0.000

Note: All variables are measured in natural logs, except for  $ES_{t-1}-Inv_{t-1}$ , which is measured by  $100*\log$ . \* indicates significance at the 10%-level, \*\* indicates significance at the 5%-level, and \*\*\* indicates significance at the 1%-level.

TABLE 9  
REGRESSION RESULTS FOR DETERMINANTS OF INVESTMENT GROWTH IN  
DURABLE AND NONDURABLE GOODS PRODUCING FIRMS, 1990 to 2001

Explanatory variables	All firms with size controls, 1990 to 2001	All firms with size controls, 1990 to 1995	All firms with size controls, 1996 to 2001
$ES_{t-1}-Inv_{t-1}$	0.046 (0.001)	-0.010 (0.133)	0.238 (0.172)
$i_{t-1}$	0.005 (0.009)	-0.003 (0.011)	0.047 (0.039)
$CR_{t-1}$	0.078* (0.045)	0.032 (0.048)	0.165** (0.080)
Durable goods * $CR_{t-1}$	-0.071 (0.047)	-0.038 (0.050)	-0.022 (1.03)
$B_{t-1}$	-0.028** (0.013)	-0.072* (0.044)	0.096** (0.045)
Durable goods * $B_{t-1}$	0.021 (0.018)	0.023 (0.051)	-0.132** (0.058)
$\Delta I_{t-1}$	-0.354*** (0.027)	-0.267*** (0.038)	-0.394*** (0.038)
$\Delta S_{t-1}$	0.053*** (0.021)	0.084*** (0.026)	0.016 (0.033)
$\Delta i_{t-1}$	-0.001 (0.029)	0.056 (0.038)	-0.074 (0.086)
$\Delta CR_{t-1}$	0.258** (0.110)	0.100 (0.141)	0.371** (0.167)
Durable goods * $\Delta CR_{t-1}$	-0.255** (0.111)	-0.097 (0.141)	-0.393* (0.207)
$\Delta B_{t-1}$	-0.103** (0.051)	-0.470 (0.313)	-0.142** (0.058)
Durable goods * $\Delta B_{t-1}$	0.076 (0.071)	-0.156 (0.366)	0.128 (0.080)
Durable goods	2.237* (1.176)	2.184 (2.959)	3.104 (2.081)
Constant	3.903*** (1.125)	7.603*** (2.610)	3.014* (1.668)
N	1594	758	836
Wald Chi(2)	204.62	62.36	158.00
p-value	0.000	0.000	0.000

Note: All variables are measured in natural logs, except for  $ES_{t-1}-Inv_{t-1}$ , which is measured by  $100*\log$ . \* indicates significance at the 10%-level, \*\* indicates significance at the 5%-level, and \*\*\* indicates significance at the 1%-level.

## Appendix:

TABLE A.1  
VARIABLE DEFINITIONS AND SOURCES

Variable name	Definition	Source
Investment	Nonresidential fixed investment	Bureau of Economic Analysis (BEA), National Income and Product Accounts (NIPA), Table 5.2.
GDP	Gross Domestic Product	BEA, NIPA, Table 1.1
Net Investment	Net nonresidential fixed investment	BEA, NIPA, Table 5.2
Private Nonresidential Assets	Net current cost private fixed assets (NPFA)	BEA, Fixed Assets, Table 4.1
Manufacturing assets	NPFA of manufacturing firms	BEA, Fixed Assets, Table 3.1ES
Assets of electronics and electric and industrial machinery	NPFA of industrial machinery and electronics and electrical equipment producing firms	BEA, Fixed Assets, Table 3.1ES
Internal Funds	Internal funds minus foreign earnings retained abroad.	Board of Governors, Federal Reserve System, Flow of Funds Accounts, Table F. 102 (BoG)
Capital Expenditures (CE)	Capital expenditures	BoG
Net Mutual Funds (MF)	Money market mutual funds plus changes in mutual funds shares	BoG
Net Trade Credit	?	BoG
Net Commercial Paper	Commercial paper assets minus commercial paper liabilities	BoG
Net Bank Borrowing	Sum of bank assets (checking accounts, time savings accounts, consumer credit) minus sum of bank liabilities (savings institutions, finance companies, bank loans n.e.c.	BoG
Net Mortgages	Mortgage assets minus mortgage liabilities	BoG
Net Sources from the Rest of the World (ROW)	Foreign deposits minus foreign earnings retained abroad minus liabilities owed to the rest of the world	BoG
Bonds	Corporate bond issues	BoG
Net Equity	Net equity issues	BoG
Net Foreign Direct Investment (FDI)	FDI outflow minus FDI inflows	BoG
Net Government	Government assets (U.S. government securities, municipal securities) minus liabilities owed to governments (U.S. government securities, municipal securities, taxes payable)	BoG
Net Miscellaneous	Miscellaneous assets (security repurchase agreements (RPs), insurance receivables, equity in government-sponsored enterprises (GSEs), investment in finance company subsidiaries, other) minus miscellaneous liabilities (acceptance liabilities to banks, asset-backed	BoG

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<b>Variable name</b>	<b>Definition</b>	<b>Source</b>
	securities (ABS) issuers, pension fund contributions payable, other)	
Dividends	Dividend payments	BoG
Before-Tax Profits	Before tax profits	BoG
Fixed Assets	Depreciable and amortizable fixed assets.	QFR
Total Assets	Total assets	QFR
Total Debt	Sum of short-term bank debt, commercial paper, and "other" short-term debt; and long-term bank debt, bond debt and "other" long-term debt.	QFR
Long-Term Debt	Sum of long-term bank debt, bond debt and "other" long-term debt.	QFR
Short-Term Debt	Sum of short-term bank debt, commercial paper, and "other" short-term debt	QFR
Before-Tax Profits	Net income or loss before taxes	QFR
After-Tax Profits	Net income or loss after taxes	QFR
Investment	The difference in the current quarter's level of Fixed Assets from the previous quarter's.	QFR
Retained Earnings	Net income retained in business	QFR
Profits	Income or loss before taxes.	QFR
Dividends	Dividends	QFR
Stockholder Equity	Stockholders' equity	QFR
Interest Expense	Sum of the product of the short-term interest rate and the stock of short-term debt, and the product of the long-term interest rate and the stock of long-term loans	QFR
Coverage Ratio	The ratio of cash flow to total interest payments	QFR
Increase/Decrease in Interest Rate	Change in target federal funds rate	Federal Reserve Bank of New York, Target Federal Funds Rate.

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