Center for American Progress

Ignoring Productivity at Our Peril

Slowing Productivity Growth and Low Business Investment Threaten Our Economy

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Introduction

Investing in our nation's future can mean different things to different people. Members of local school boards understand that functioning heating and air conditioning systems help students learn. College coaches know that a bigger stadium with more comfortable seats and better vendors will make for a more enjoyable experience that, in turn, will result in higher revenues and more competitive athletic programs. And broadcast executives invest in new, high definition cameras to give viewers superior picture quality to build program loyalty. These types of investments have one thing in common—they allow schools, sports teams, and TV stations to be more productive. Teachers, athletes, and newscasters can generate a more enjoyable experience and more revenue in the same amount of time.

That's the definition of higher productivity. Similarly, business investment is related to a company's productivity and ultimately to the entire economy's performance. More business investment can lead to higher future productivity growth via an enlarged capital base. The rewards of higher productivity growth come in the form of more money for workers to spend on consumption items. This extra money will provide businesses with an incentive to invest more in their buildings and equipment, thereby laying the foundation for even higher productivity in the future.

The virtuous cycle of higher investment, rising productivity growth, and growing income helped lift almost all economic boats in the late 1990s. Since the turn of the century, however, investment growth has been anemic, productivity growth has declined, and income growth has stagnated. A virtuous cycle is in danger of becoming a vicious cycle. Slow income growth does not give business executives an incentive to invest more money in growing their businesses, which in turn hampers productivity growth, thereby reducing future income growth.

Our national economy is not necessarily locked into such a vicious cycle, but government policymakers are currently ignoring these trends at our peril. This paper reviews the existing evidence on business investment and productivity growth and concludes the following:

- **Productivity growth has slowed since the 1990s:** At the end of the 20th century, both labor productivity (measured as output per hour, the standard definition of productivity) and so-called multifactor productivity (economists' approximation of innovation in the economy) grew rapidly—on average by 2.4 percent annually between the end of 1995 and March 2001, compared to 1.5 percent between 1973 and 1995—leaving decades of slow productivity growth behind. After 2002, however, productivity growth gradually slowed, and in 2006 the figure reached its lowest level—1.6 percent—since 1997.

- **Business investment has been low:** After reaching 12.6 percent of gross domestic product in 2000, business investment fell to 9.7 percent in March 2004, its lowest level since September 1992. Business investment then rebounded, reaching a level of 10.7 percent of GDP in the third quarter of 2006, before declining to 10.5 percent in the first quarter of 2007.

- **The recovery in investment was a result of a building boom and not an equipment gain.** Much of the recovery in business investment, small as it was, during this business cycle was due to investment in structures rather than in equipment. To date, investments in equipment and software have not recovered. Equipment investment dropped to 7.2 percent in the first quarter of 2004, down from a high of 9.4 percent in the third quarter of 2000. By the first quarter of 2007, equipment investment stood at just 7.3 percent of GDP.

- **Net investment as a share of GDP has been declining:** Net investment—total new investment minus depreciation—is barely keeping pace as businesses invest more in computers, software and other information technology assets that depreciate more quickly than in the past. Now businesses must spend more money to replace obsolete equipment, and thus more money must be spent in total, before the nation's capital base actually expands. During the current business cycle, which started in March 2001, net investment as a share of GDP fell to a historic low of 1.5 percent.

- **Little investment in the knowledge-based economy:** While investments in information processing and software equipment expanded relative to GDP by 1.3 percentage points during the 1990s, they have declined by 0.7 percentage points since March 2001. Over that same period the capital stock in information processing equipment and software, net of depreciation, declined relative to GDP for the first time since the early 1950s.

- **Businesses used money for share repurchases and dividends instead of capital expenditures:** The share of pre-tax profits used for net share repurchases and dividend payouts was 84.2 percent during the current business cycle, larger than it was for any previous business cycle. The share of after-tax profits used for net share repurchases and dividend payouts was 120.7 percent, another record high for any business cycle.

- **Consumption growth did not provide sufficient incentives for businesses to invest:** Throughout the current business cycle, from March 2001 to March 2007, consumer expenditures increased by an annualized inflation-adjusted rate of 3.2 percent, below the consumption growth rate of the 1980s and the 1990s. In addition, consumption so far this business cycle has been fueled to a much larger degree by new debt. Household debt grew more than four times faster in this business cycle than in the 1990s.

- **Investment and productivity growth may be linked:** Since 1947, faster productivity growth was preceded by business investment expansions relative to GDP. Periods of stronger investment growth were typically followed by an acceleration of productivity growth over a span of five years. Given low business investment levels in the United States in the 21st century, government policymakers may soon discover that the reverse is also true.

- **Business investment could replace consumers as the driver of the economy:** Stronger business investment growth could give the economy new momentum as consumption growth slows. Consumption has contributed to 83.9 percent of economic growth during this business cycle. But this consumption was largely driven by an unprecedented debt expansion that is now coming to an end. If investment growth were to rebound to the levels of the 1990s, when it contributed to over one-fifth of the total GDP growth rate, investment growth could then substitute for the waning momentum of consumption-led economic growth.

Boosting business investment to overcome indications of a vicious productivity cycle taking hold in our economy would have positive effects for the economy both in the short term and the long term. In the immediate future, faster investment growth could give the economy a much-needed boost as consumer spending slows in the wake of a massive debt run-up and as households concentrate on repaying their record-level debt. Over the long term, faster investment growth could help lay a stronger foundation for innovation—the key but elusive measure of our nation's overall competitive advantage in the global economy.

Policymakers, however, face a dual challenge. Businesses will not invest unless incomes rise faster than they have recently, which means policymakers need to ensure that workers can see more gains from a growing economy in the form of faster job growth and higher wage growth. At the same time, policymakers must create additional incentives for companies to invest in new technologies appropriate for a creative U.S. economy that remains on the cutting edge of global innovation.

This paper will examine the links between investment, productivity, income, and economic growth, and consider some worrying trends in all four of these interconnected arenas. We will then detail why more robust business investment growth and higher income growth are necessary for our economy to spark innovation and new economic opportunities for employers and employees alike.

Ignoring Productivity at Our Peril

The Link between Investment and Economic Growth

Business investment is tied to economic growth in two ways. Business investment lays the foundation for future productivity growth by increasing the capital base because faster productivity growth translates into faster economic growth, higher wages, increased benefits, and greater profits. More business investment means that businesses are buying more capital inputs, which in turn boosts economic demand and translates into faster economic growth.

These factors, of course, are interrelated. Faster economic growth translates into additional jobs, which means that workers have more money to buy consumer goods. If consumers spend more money, businesses then have an incentive to invest more. This chain of events results in faster output growth in the short run and, if all goes well, in faster productivity growth in the long run.

Under the right circumstances, this faster productivity growth translates into higher living standards in an expanding economy, a truly virtuous cycle that last occurred in the 1990s. The opposite is true, too. Less investment can result in less economic growth in the short run and slower productivity growth in the long run, which can translate into slower gains in people's living standards. Such a vicious cycle may well be upon us today.

Productivity growth has slowed since its 1990s acceleration

During the 1990s, the U.S. economy experienced a period of accelerating productivity growth. Beginning in the mid-1990s, output-per-hour began to grow faster than it had in prior years, reversing the productivity growth slowdown of the 1980s. Specifically, from 1990 to 1995, productivity grew at an annual rate of 1.5 percent compared to an annual rate of 2.5 percent between 1995 and 2000. This translates into an acceleration of 64.9 percent over a span of just five years (see Figure 1).

Another measure of productivity growth is so-called multifactor productivity, which approximates innovation. Multifactor productivity captures companies' performance that is not directly attributable to better-trained workers and improved machinery and buildings. The measure is intended to capture the gains that result from some of the more intangible changes at the company level, such as strategic investments and technological synergies, among others.

One important issue for multifactor productivity growth may be, for example, the intangible benefits from the successful integration of information technology systems in a company. The pattern in multifactor productivity growth is similar to the more basic measure of labor productivity: both accelerated in the late 1990s and slowed again in recent years, in this instance after peaking in 2004. The multifactor productivity growth rate in 2006 was 1 percent, the lowest for a non-recession year since 1997, just as was the case with labor productivity.[1]

Many researchers have argued that the high productivity growth of the second half of the 1990s can be largely attributed to expanding business investment in high technology hardware and software. During that time, businesses began to invest in computers and software and other information technologies in order to lower costs, improve their organization, and offer new and improved goods and services.

Specifically, business investment in computers and related information technology equipment more than quadrupled between 1995 and 1999. Studies vary in their estimates of the percentage contribution from the use of information technology to productivity growth, but all conclude that it made a considerably larger contribution in the second half 1990s than it did in the first half and hence was critical to the acceleration of productivity growth.[2]

Worryingly, business investment in critical equipment and software declined from a peak of 4.9 percent of GDP in the fourth quarter of 2000 to 3.6 percent by the second quarter of 2003, the lowest level since the end of 1995. Moreover, investment in information processing equipment and software has remained between 3.6 percent and 3.8 percent of GDP since June 2003.

At the same time, productivity growth has also slowed. From 2000 to 2005, labor productivity (output-per-hour) growth averaged 3 percent, down from 3.2 percent over the years 1999 to 2004, but still higher than the 2.8 percent averaged from 2001 to 2006 (see Figure 1). This slowdown in five-year average labor productivity growth rates reflects a gradual decline in annual productivity growth rates. Annual productivity growth steadily declined from a cyclical high of 4.1 percent in 2002 to 1.6 percent in 2006.[3] Additionally, the first quarter of 2007 saw annualized productivity growth of about 1 percent.

These differences may seem small, but they can be critical over extended periods of time. Typically, economists believe that a worker's compensation should rise in line with productivity growth.[4] This means that a 1.5 percent annual increase in productivity could mean that after 20 years, a worker's income could have risen by 34.7 percent. By contrast, an annual productivity growth of 2 percent could mean a 48.6 percent increase in income after 20 years. And with annual income growth of 2.5 percent, the income gain could be 63.9 percent after 20 years, which is 84.0 percent higher than what an annual productivity growth of 1.5 percent could deliver.

Have we already lost the gains of the 1990s?

Much of the current debate over productivity growth focuses on whether the recent slowdown in productivity growth will continue. If the answer is yes, then the gains from the introduction of new information technologies may have maxed out. If the answer is no, then other factors may be slowing productivity growth. Indications are that the answer is a tentative "no," but whether productivity growth continues to slow rests on understanding these other factors affecting productivity and then working to reverse them.

It is important to begin with accurate measures of national productivity growth in an increasingly global economy. Researchers have raised serious questions about the measured strength of productivity growth. Susan Houseman of the Upjohn Institute, for example, has recently argued that productivity growth has inappropriately included input costs that have been offshored.[5] Because the production no longer occurs in the United States, the gains associated with offshoring should not be included in the calculation of U.S. worker productivity. Accounting for this measurement change would substantially reduce productivity growth.

In addition, Dean Baker, co-director of the Center for Economic and Policy Research, has argued in two studies that what matters for future living standards is the productivity growth that actually adds new value to the economy.[6] Some added productivity growth, he notes, goes toward replacing obsolete capital equipment and is thus not laying a foundation for faster rising living standards in the future.

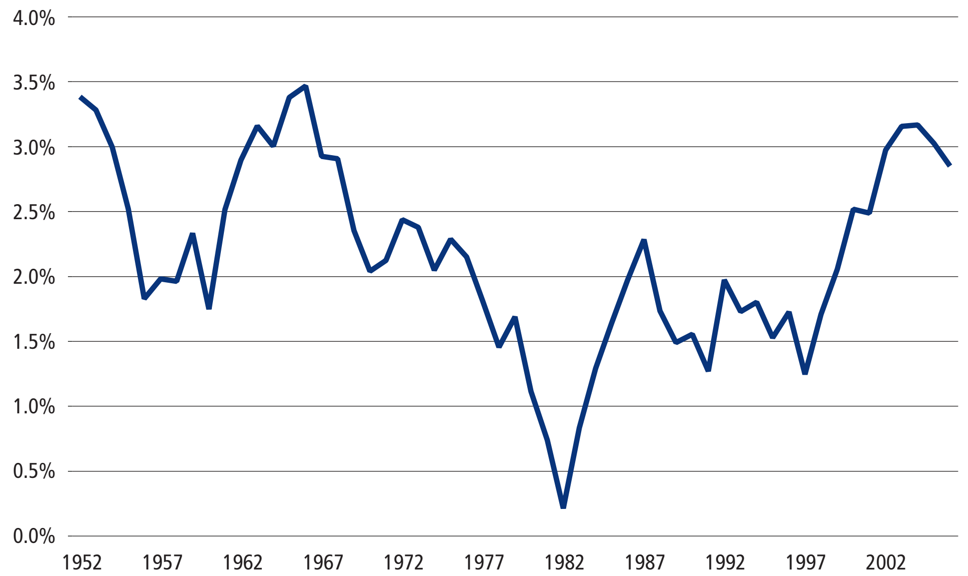
Adjusting for the fact that capital goods now depreciate more quickly than they have in the past means that our businesses now have to run faster just to stay in place. After adjusting for depreciation, Baker argues that productivity growth between 1995 and 2006 should be reduced by about 10 percent. That means productivity growth between 1995 and 2006 would have been 2.06 percent, instead of 2.23 percent.

Put differently, businesses must ensure that their workers become increasingly innovative just to cover the rising share of depreciation in our economy before there is new value added to the economy.

This debate over the measurement of productivity growth, however, does not detract from the overall fact that productivity growth has slowed in recent years. Rather, the new calculation simply means that productivity growth has slowed from lower levels than previously assumed. The different measure does, however, require a careful discussion over what the appropriate measures of productivity growth are, so that we can accurately understand the growth of the foundation of future living standards. Since the scope of this paper does not extend to make all of the proposed adjustments to productivity growth, it is important to keep in mind during the ensuing discussion that we may be overstating the productivity growth, at least since the 1990s.

Many researchers attribute the slowdown in productivity growth in recent years to cyclical factors. That is, productivity growth is slower now than it was in the late 1990s because employment has not fallen as quickly as the attendant decline in output growth. Once employment growth slows, however, productivity growth should accelerate again.[7,8] In short, if businesses were to lay off more workers then productivity would rise as remaining workers were persuaded to work harder and longer at their given assignments.

FIGURE 1: 5-YEAR AVERAGE PRODUCTIVITY GROWTH RATE, 1952–2006



Notes: Figures are annualized 5-year average growth rates. Authors' calculations based on BLS (2007).

This standard explanation of the end of a cyclical downturn in productivity growth, however, rests on a pivotal caveat—it assumes that businesses will continue to invest, particularly in equipment, such as machinery, computers, and software, to help their remaining workers become more productive. This isn't happening today. Goldman, Sachs and Co., for example, has acknowledged that the drop in equipment will be worrisome if it is sustained.[9]

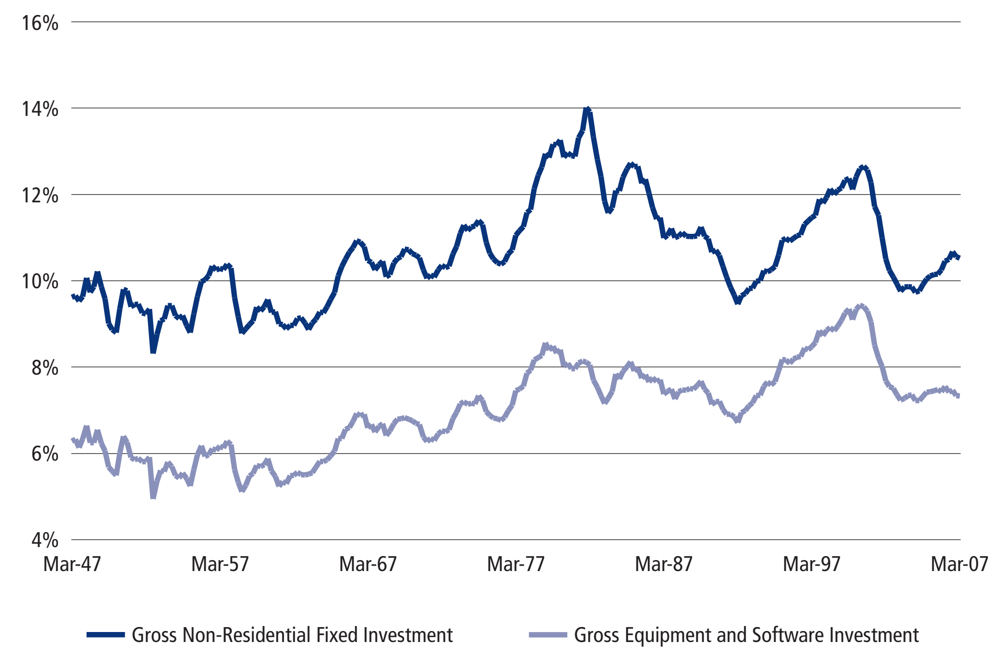
As long as business investment picks up steam again, the slowdown in productivity growth may be cyclical and not structural and hence will not persist for longer periods of time. Should investment growth stay slow, however, productivity growth could also remain low. Less productivity growth would essentially be the result of eroding buildings and equipment that are not being replenished through more investment.

This lack of investment growth would then contribute to a slowing economy that generates less income and slower consumption growth than would otherwise be the case. This could spell the beginning of a vicious cycle, whereby less investment translates into lower income and economic growth. This decreased growth would provide businesses even fewer incentives to invest, while the capital base erodes and the chances for faster rising living standards in the future diminishes.

Total investment growth, especially in equipment, has been meager

To understand the crucial role of investment it is important to keep in mind that there are two types of business investment—investment in structures, such as office buildings and manufacturing plants, and investment in equipment,

FIGURE 2: BUSINESS INVESTMENT AS SHARE OF GDP



Notes: Authors' calculations based on BEA (2007a).

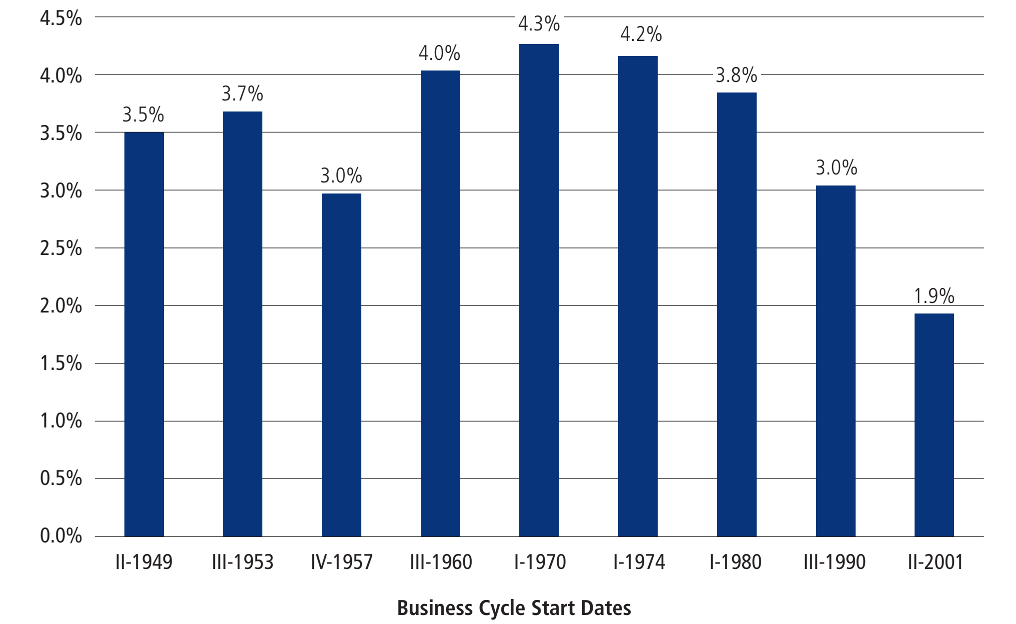
such as computers, software, and machinery. As pointed out earlier, investment in equipment, especially in computers and software, has been found to be particularly important for productivity growth in recent years.

But it is business investment, particularly in equipment, that has already showed a sub par performance over the current business cycle. After growing to 12.6 percent of GDP by the end of 2000, business investment fell to a low of 9.7 percent in March 2004, which is the lowest level since September 1992. After March 2004, business investment grew again, reaching a level of 10.7 percent of GDP in the third quarter of 2006, before declining to 10.5 percent in the first quarter of 2007 (see Figure 2).

A closer examination of the data, however, shows that much of the recovery of investment during this business cycle—meager as it may be—was due to investment in structures rather than in equipment (See Appendix 1, page 22). To date, investments in equipment and software have not recovered (see Figure 2). In particular, equipment investment dropped to 7.2 percent in the first quarter of 2004, down from a high of 9.4 percent in the third quarter of 2000. By the first quarter of 2007, equipment investment stood at just 7.3 percent of GDP.[10]

Given the particular role that equipment investment has played in the acceleration of productivity growth since the mid-1990s, the fact that it has remained at low levels after its initial sharp decline in this

FIGURE 3: NET INVESTMENT RELATIVE TO GDP, BUSINESS CYCLE AVERAGES



Notes: Authors' calculations based on BEA (2007a). All figures are percent of GDP. Averages are taken from business cycle peak to business cycle peak.

business cycle may be cause for concern. This may especially be the case when closer attention is paid to a more exact measure of investment growth: net business investment in information technology equipment and software.

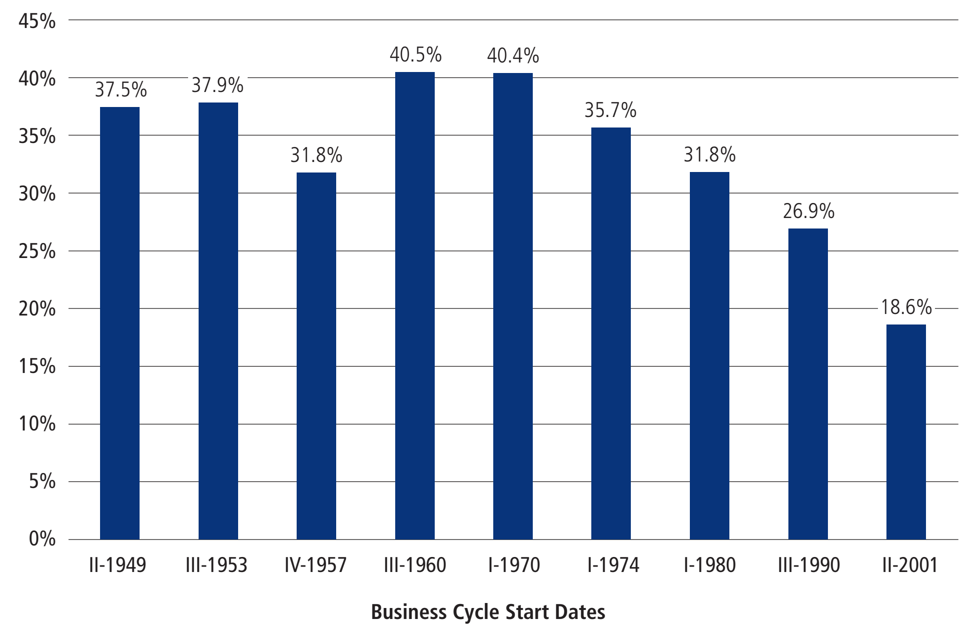
Net investment (after depreciation) is lowest for any business cycle

The fact that total investment spending on equipment relative to the size of the economy has essentially remained flat since its dramatic decline between 2000 and 2004 is actually more worrisome than it may seem at first. The main reason for this is that it takes more business spending now than it did in the past simply to replace obsolete equipment.

Capital tends to depreciate more quickly now than it has in the past as a result of a shift in investment toward information processing equipment and software. While information processing equipment and software constituted less than 10 percent of all investment in the 1940s and 1950s and less than 20 percent of investment throughout the 1960s and 1970s, it has made up over 30 percent of investment since the second quarter of 1991.[11]

What really matters for the future of rising living standards is how much businesses actually add to our nation's capital base. With more quickly depreciating capital goods, such as computers and software, now in the mix, our capital base tends to erode faster and more investment must be dedicated to replacing obsolete equipment. To see how much actual new

FIGURE 4: NET NONRESIDENTIAL INVESTMENT AS SHARE OF GROSS INVESTMENT, BUSINESS CYCLE AVERAGES



Notes: Authors' calculations based on BEA (2007a). All figures are percent of total non-residential fixed investment. Averages are taken from business cycle peak to business cycle peak.

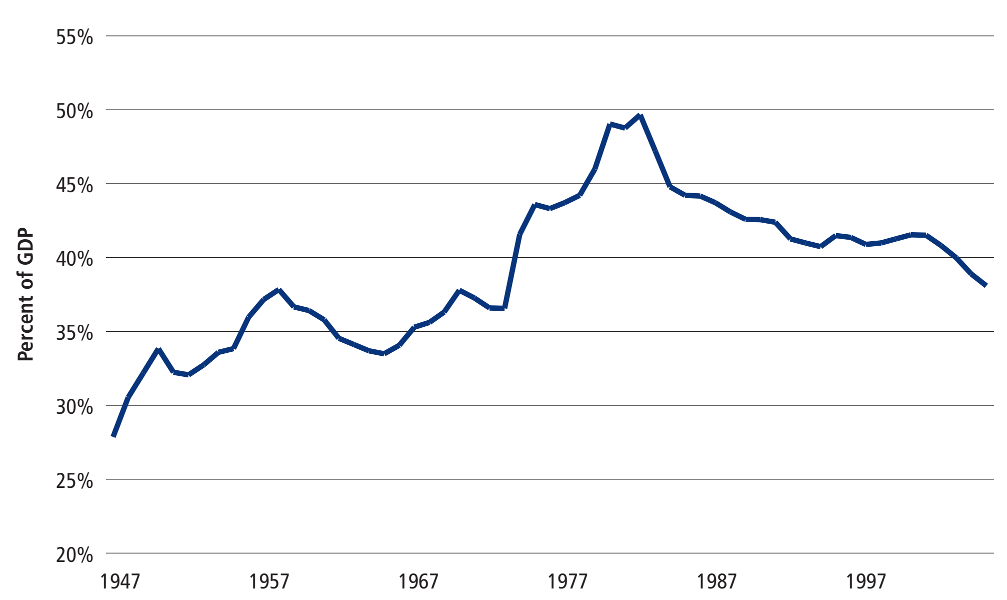
capital is added to the nation's existing capital stock, we need to calculate net investment—the amount of total investment minus depreciation in a given year.

Net investment declined to its lowest level of any business cycle during the current business cycle. In fact, the net addition to capital during this business cycle has been the lowest of any business cycle since World War II (see Figure 3). By 2004, net investment as share of GDP had fallen to a historic low of roughly 1.5 percent.

This low level of net investment is even more stunning when it is compared to the five years immediately preceding it, from the end of 1995 to the end of 2000, during which business investment accelerated and net investment averaged 3.8 percent of GDP. By the middle of the year 2000, net investment averaged 4.3 percent of GDP, the highest ratio since the second quarter of 1985. In comparison, even after net investment accelerated in the current business cycle, it peaked at just 2.9 percent of GDP in the third quarter of 2006.[12]

The low level of net investment reflects two trends. One is the aforementioned low level of total investment relative to the size of the economy. The second is that an ever-larger share of investment is needed to replace obsolete capital and, inversely, that an ever-smaller share of total investment can actually be counted as an addition to the capital stock. In this business cycle, only 18.6 percent of total investment was net new additions, down from 26.9 percent in the 1990s, and a peak of 40.5 percent in the early 1970s (see Figure 4).

FIGURE 5: EQUIPMENT STOCK RELATIVE TO GDP, 1947–2005



Notes: Authors' calculations based on BEA (2007a, 2007b).

As the composition of investment shifts to more quickly depreciating capital equipment, it requires additional total investment to achieve the same level of capital expansion that was generated in the past. The fact that net additions to the capital base have been relatively low during this business cycle has meant that capital stock in equipment has eroded relative to the economy. In 2005, the last year for which data are available, the existing stock of usable equipment equaled 38.1 percent of GDP, the lowest share since 1973. In comparison, the previous business cycle's existing stock of usable equipment was roughly 41 percent of GDP (see Figure 5).[13]

Critical inputs for knowledge-based economy are declining

Investments in equipment have been fairly uneven across the different types of investment goods in recent decades. Since the 1980s, investment and capital stock in information processing equipment has grown faster than for other business or industrial equipment (see Table 1). This shift largely reflects the transformation of the U.S. economy from an industrial economy to a knowledge-based economy.

It is especially worrisome to note that since 2000—amid the continued transformation of the economy toward a knowledge-based foundation—there has been a marked decline in investment and net capital stock of information processing and software equipment. While investments in these types of equipment expanded relative to GDP by 1.3 percentage points during the 1990s, they have declined by 0.7 percentage points since March 2001—a larger drop than that of industrial equipment and transportation equipment (see Table 1). Also, real investment in information process-

TABLE 1: EQUIPMENT AND SOFTWARE

BUSINESS CYCLE START DATE	TOTAL	INFORMATION PROCESSING AND SOFTWARE				INDUSTRIAL	TRANSPORTATION	OTHER
		Total	*Computers*	*Software*	*Other*			
Change relative to GDP (total percentage point change)								
Sept. 1960	1.2%	0.7%	0.3%	0.2%	0.3%	0.2%	0.0%	0.2%
March 1970	0.4%	0.1%	-0.1%	0.0%	0.1%	0.0%	0.2%	0.1%
March 1974	0.8%	0.7%	0.2%	0.1%	0.4%	0.2%	-0.2%	0.2%
March 1980	-1.2%	0.7%	0.3%	0.5%	-0.1%	-0.7%	-0.7%	-0.5%
Sept. 1990	1.3%	1.3%	0.2%	0.9%	0.2%	-0.1%	0.2%	-0.1%
March 2001	-1.2%	-0.7%	-0.2%	-0.1%	-0.3%	-0.2%	-0.3%	0.0%
Real growth rate (annualized percent change)								
Sept. 1990	9.1%	15.1%	n.a.	14.5%	8.4%	3.6%	5.1%	3.0%
June 2001	2.2%	4.4%	n.a.	3.8%	1.7%	-0.9%	-1.0%	2.2%
Capital stock relative to GDP (total percentage point change)								
1949	2.2%	-0.1%	0.0%	0.0%	-0.1%	1.5%	0.1%	0.9%
1954	3.2%	0.3%	0.0%	0.0%	0.3%	2.8%	-0.3%	0.4%
1958	0.7%	0.3%	0.0%	0.0%	0.3%	0.6%	-0.2%	0.0%
1961	-0.4%	1.6%	0.5%	0.3%	0.9%	-1.1%	-0.4%	-0.5%
1970	0.3%	0.7%	0.2%	0.1%	0.4%	-0.6%	-0.1%	0.2%
1974	9.4%	1.4%	0.1%	0.2%	1.2%	3.8%	1.7%	2.5%
1980	-3.4%	3.4%	0.8%	0.9%	1.8%	-2.4%	-2.5%	-2.0%
1991	-1.0%	1.9%	0.1%	1.7%	0.1%	-2.2%	0.5%	-1.2%
2000	-3.5%	-1.0%	-0.4%	-0.1%	-0.6%	-1.4%	-0.9%	-0.2%

Notes: Authors' calculations based on BEA (2007a, 2007b)

ing and software equipment grew only at an average annualized rate of 4.4 percent in the current business cycle, compared to a strong 15.1 percent in the previous business cycle.

Finally, the net capital stock in information processing equipment and software declined relative to GDP for the first time since the early 1950s during this business cycle. Specifically, the ratio of information equipment and software capital relative to GDP was 1 percentage point lower in 2005 than it was in 2000. This decline in information equipment was larger than the declines in transportation equipment and other equipment, which includes construction machinery and oil and mining drilling equipment. Thus, the capital stock of equipment critical to a knowledge-based economy seems to have noticeably eroded since 2000.

Faster productivity growth requires stronger investment growth

The slowdown in investment over the past few years is worrisome because it may suggest a lower likelihood of faster productivity growth in the future. If the slowdown of productivity growth to a level below 2 percent persists as a structural problem, then the anticipated simultaneous slowdown in investment growth makes it less likely that productivity growth will grow faster in the near future.

And indeed, since 1947 there appears to be close relationship between changes in business investment and productivity growth. To calculate this connection, we first identify five-year periods during which productivity growth was substantially faster than it was in the preceding five years. We then calculate the change in investment relative to GDP during the five years before the acceleration, since it takes some time for capital investments to fully affect productivity.

Employing these investment parameters, we focus on three types of investment: total investment, net investment, and investment in equipment. We then compare the average increases in productivity growth for the five-year periods that were followed by faster productivity growth with the five-year average investment increases that were not followed by faster productivity growth. This (admittedly) simplistic methodology provides us with some indications that investment growth and productivity growth are correlated.

Since there is not a clear definition of what constitutes productivity growth acceleration, we calculate it for several thresholds. We identify a five-year period as clearly having higher productivity growth than the preceding five years if its average productivity growth rate is at least half a standard deviation, a full standard deviation, or one and a half standard deviations greater than the average productivity growth rate for the preceding five years. The standard deviation used here is the standard deviation for the average productivity growth rate over all five-year periods between 1947 and 2007.

The results show that periods of accelerated productivity growth were preceded by increases of investment relative to GDP (see Table 2). For instance, if productivity growth acceleration is defined as a five-year period that has average productivity growth that was at least one standard deviation greater than the average productivity growth of the preceding five years, then the typical investment change in the earlier five years was 1.3 percentage points relative to GDP. When there was no acceleration in productivity growth, there was also no change in the investment preceding it.

In addition, net investment relative to GDP increased by 0.6 percentage points

TABLE 2: AVERAGE CHANGE IN INVESTMENT TO GDP DURING PERIODS PRECEDING PRODUCTIVITY GROWTH ACCELERATION

Acceleration Compared to Preceding Five Years	Median Change in Investment Before Acceleration	Median Change in Acceleration if There Was No Acceleration	Median Change in Net Investment Before Acceleration	Median Change in Net Investment if There Was Not Acceleration	Median Change in Equipment Investment Before Acceleration	Median Change in Equipment Investment if There Was Not Acceleration
At least half a standard deviation greater	0.8%	0.0%	0.3%	-0.4%	0.4	0.1
At least a full standard deviation greater	1.3	0.0	0.6	-0.4	0.8	0.1
At least one and a half standard deviations greater	1.9	0.1	1.5	-0.3	1.0	0.2

Notes: All figures are in percent based on 5-year percentage point changes in the ratio of (net) investment relative to GDP. Authors' calculations based on BEA (2007).

on average before an acceleration of productivity growth, while it declined by 0.2 percentage points on average before periods with unchanged productivity growth. Finally, the data also indicate that productivity growth accelerations followed stronger equipment growth. These simple calculations suggest that since 1947 faster productivity growth was preceded by strong investment expansions.

Periods of faster productivity growth were preceded by periods of faster investment growth. But is the opposite also true? Were periods of strong investment growth typically followed by an acceleration of productivity growth? Put another way, were there a substantial number of instances in which investment grew noticeably but productivity growth did not accelerate?

To find the answer, we first identify periods of strong investment growth. In this case, periods of strong investment growth are defined as five-year periods during which investment relative to GDP expanded by 0.5 percentage points, by one percentage point, or by 1.5 percentage points.[14] We then calculate the ratio of productivity growth during the five years following the strong investment growth relative to productivity growth during the prior five years. Again, our primary focus is on total investment, net investment, and equipment investment.

The figures do in fact show that periods of strong investment growth were typically followed by an acceleration of productivity growth. For example, when investment relative to GDP expanded at a rate of at least one percentage point, productivity growth was typically 23.6 percent higher in the following five years than it was during the years of the investment expansion. Conversely, periods of weaker investment growth were typically followed by a small productivity growth slowdown.

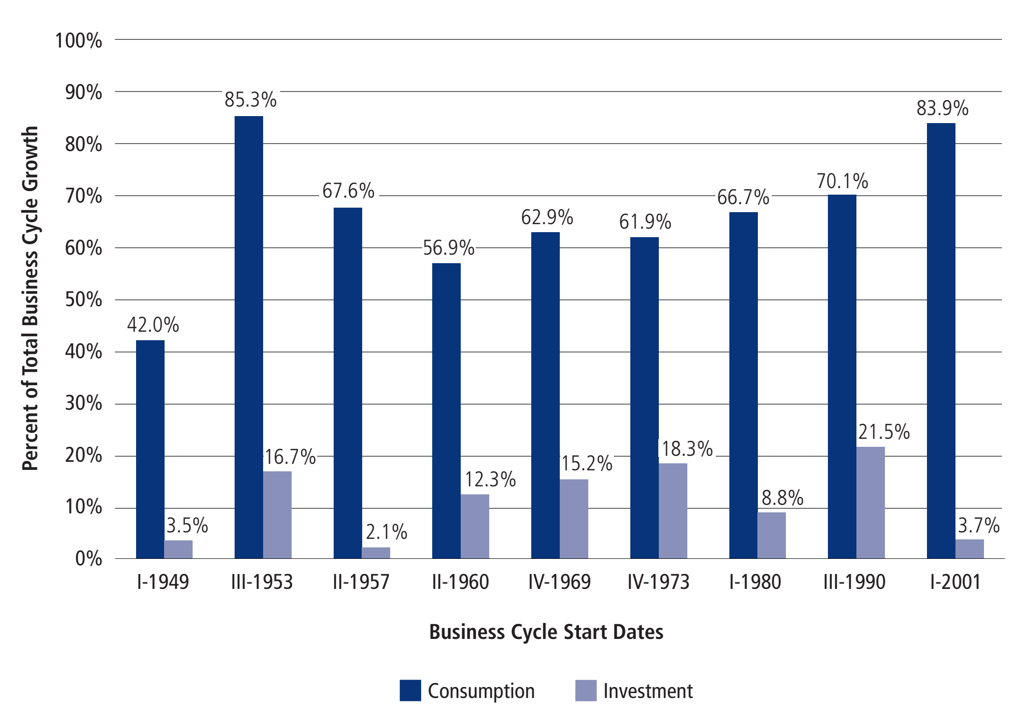
Productivity growth also expanded slightly more following strong net investment growth. In this case, productivity growth accelerated by 25.9 percent on average, following periods of strong net investment growth, which is marginally faster than the acceleration following strong total investment growth. Finally, accelerations in productivity growth were even slightly larger after five-year periods during which equipment investment increased by at least one percentage point relative

TABLE 3: AVERAGE CHANGE IN PRODUCTIVITY GROWTH DURING AND AFTER PERIODS OF STRONG INVESTMENT GROWTH

Investment Growth During First Five Years Was	Median Ratio of Productivity Growth After and During Strong Investment Growth	Median Ratio of Productivity Growth of 5-year Periods Without Strong Investment Growth	Median Ratio of Productivity Growth After and During Strong Net Investment Growth	Median Ratio of Productivity Growth of 5-year Periods Without Strong Net Investment Growth	Median Ratio of Productivity Growth After and During Strong Equip. Investment Growth	Median Ratio of Productivity Growth of 5-year Periods Without Strong Equip. Investment Growth
At least 0.5 percentage points relative to GDP	110.5	96.7	113.4	96.2	94.3	99.3
At least 1.0 percentage points relative to GDP	123.6	96.2	125.9	95.7	127.1	95.5
At least 1.5 percentage points relative to GDP	159.6	93.1	165.6	95.7	177.4	95.7

Notes: All figures are in percent based on 5-year percentage point changes in the ratio of (net) investment relative to GDP. Authors' calculations based on BEA (2007).

FIGURE 6: RELATIVE GROWTH CONTRIBUTION FROM CONSUMPTION AND INVESTMENT



Notes: Authors' calculations based on BEA (2007a).

to GDP. Typically, productivity growth was 27.1 percent higher in the five years following a one percentage point increase in equipment investment relative to GDP over five years (see Table 3).

If these figures are any indication for future correlations between business investment and productivity growth, then it is worryingly unclear whether the U.S. economy will experience productivity growth acceleration in the upcoming months or years. Total investment in March 2007 was 10.5 percent of GDP, the same level as five years earlier. And equipment investment relative to GDP had dropped by 0.4 percentage points during the same period. At the same time, however, net investment had grown from a very low 1.9 percent of GDP to 2.8 percent of GDP.

So, in two out of three cases, the data do not suggest acceleration in productivity growth in the upcoming five years relative to the productivity growth of the past five years. Additionally, the productivity growth of the past five years averaged just 2.3 percent of GDP, which is well below the longer-term average productivity growth rates of previous years.

Stronger investment needed to drive economy

Aside from laying the foundation for faster productivity growth in the future, stronger investment growth could provide momentum for our flagging economic growth. To a much larger degree than in the recent past, U.S. economic growth has been carried by consumer spending during this business cycle. Between March 2001 and March 2007, 83.9 percent of economic growth came from consumption spending, a larger share than during any business cycle since the 1950s (see Figure 6).

During the same period, however, investment contributed the least to the total economic expansion of any business cycle since the late 1950s. Business investment contributed a total of 3.7 percent of economic growth between March 2001 and March 2007. In comparison, during the 1990s, business investment contributed to more than one-fifth of the growth rate, the highest share of any business cycle. In short, consumers stepped up while businesses stepped down.

This should be reason for concern since consumer spending has largely been driven by an unprecedented debt expansion that is now coming to an end. Consumer spending has already shown signs of slowing for some time now. In 2006, consumption increased by 3.2 percent in inflation-adjusted terms, down from a 3.5 percent increase in 2005 and a 3.9 percent gain in 2004.[15] Also, household spending on new homes and home renovations declined by 4.2 percent in inflation-adjusted terms—the first such decline since 1995 and the largest decline since 1991. Clearly, consumer spending has lost its momentum in recent years and investment growth could be considered a possible substitute for the driver's seat.

Firms decided to spend their money elsewhere

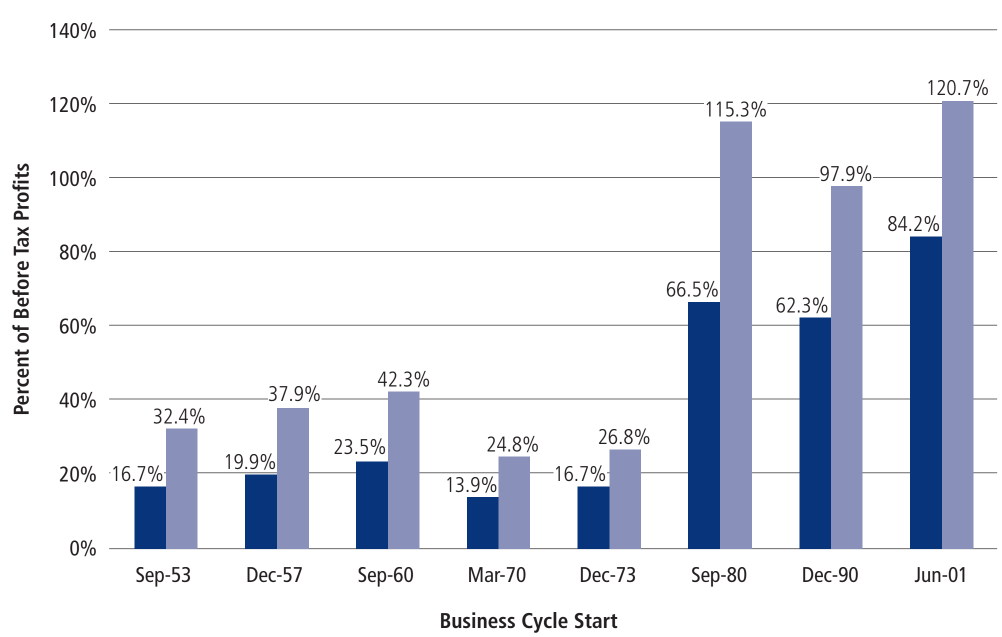
Getting businesses to spend more money on investment is easier said than done. There are essentially two short-run obstacles. First, businesses have used an increasing share of their profits for purposes other than the capital equipment expenditures, mostly on share buybacks and dividend payouts. Second, with consumer spending spurred by an unsustainable debt boom, businesses may well find they have fewer incentives to invest more since they could experience a slowdown in consumer-driven sales.

Certainly businesses held back on investing their resources in productive capital, despite very high profits. For example, the share of capital expenditures relative to pre-tax profits has sunk to its lowest level in decades. By the first quarter of 2007, capital expenditures of non-financial corporations amounted to 125.3 percent of pre-tax profits, the smallest ratio since the third quarter of 2006, which itself was the lowest ratio since the first quarter of 1955.[16]

This low ratio of capital expenditures in part resulted from high corporate profits. In the third quarter of 2006, corporate pre-tax profits reached their highest level relative to total assets since the second quarter of 1979. Also in the third quarter of 2006, after-tax profits relative to total assets reached their highest level since the second quarter of 1968.[17]

Corporations have used their funds to buy back their own shares and pay out dividends. The share of pre-tax profits used for net share repurchases and dividend pay-outs was 84.2 percent during the current business cycle, larger than it was for any previous business cycle (see Figure 7). The share of after-tax profits used for net share repurchases and dividend pay-outs was 120.7 percent, another record high for any business cycle.

FIGURE 7: NET SHARE REPURCHASES AND DIVIDEND PAY-OUTS RELATIVE TO BEFORE TAX PROFITS, BUSINESS CYCLE AVERAGES



Notes: Calculations based on BOG (2007). All figures are percent averages from business cycle peak to business cycle peak.

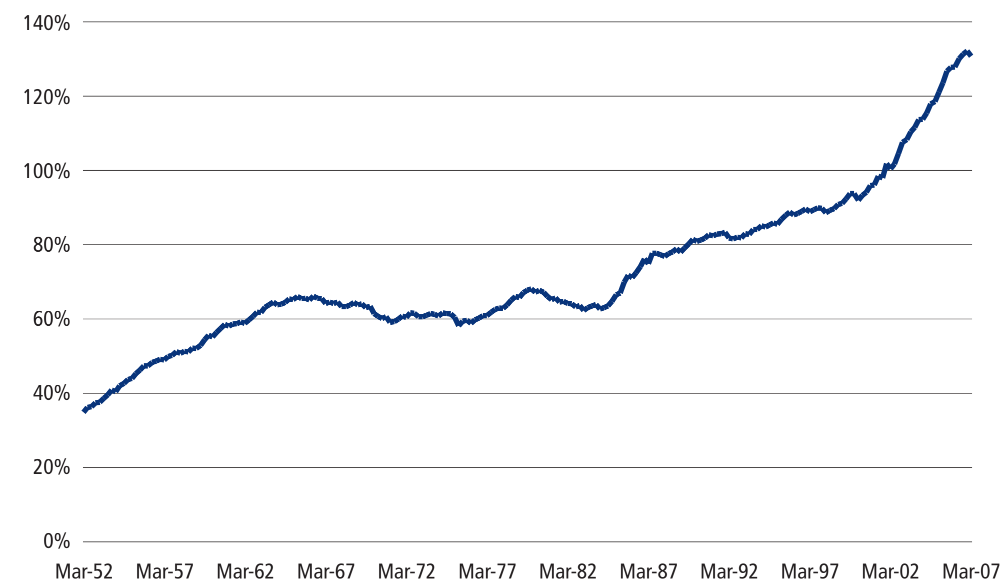
Consumer slowdown follows end of debt boom

In order for businesses to invest more in physical infrastructure, they need to believe that customers will be ready and able to buy their new products. This requires a reasonable assumption about the sources for consumption growth. Generally, companies rely on past sales growth to give them an indication of what the future may bring. Recently, however, businesses found essentially three primary reasons to hold off on investing at a faster rate:

- Consumption growth was relatively slow throughout this business cycle.
- Productivity growth remained high enough relative to demand growth, which allowed businesses to meet the slow increases in demand from households, businesses, and the government without increasing their resources very rapidly.
- Consumption growth was fuelled to a large degree by an unprecedented expansion of household debt and thus was unsustainable.

What made consumer spending so remarkable during this business cycle was not its annual increases, but rather that consumer spending never declined during the last recession, as is typically the case. In 2001, for instance, inflation-adjusted consumption growth was 0.8 percent, compared to a decline of 0.2 percent during the previous recession in 1990. Yet, consumption growth during the current business cycle has been comparatively slow. From March 2001 to March 2007, consumer expenditures increased

FIGURE 8: HOUSEHOLD DEBT RELATIVE TO DISPOSABLE INCOME



Notes: Authors' calculations based on BOG (2007). Household debt refers to credit market instruments.

by an annualized inflation-adjusted rate of 3.2 percent, below the consumption growth rate of the 1980s and the 1990s.

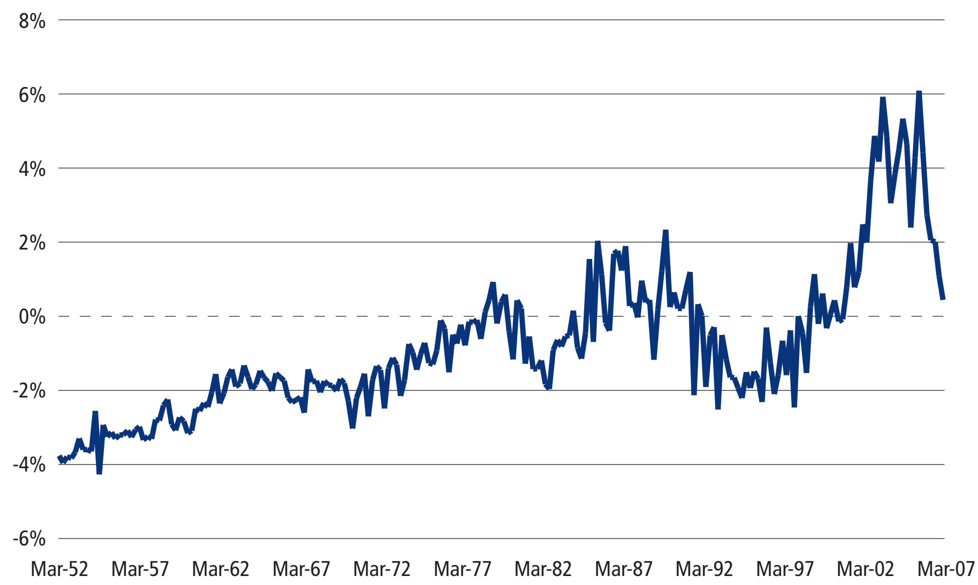
During the 1990s, for instance, consumption increased at an average rate of 3.4 percent, which glosses over the fact that consumption growth had an annualized average growth rate of 4.2 percent between December 1995 and March 2001—33.3 percent faster than the consumption growth rate since March 2001. Moreover, consumption growth has slowed from a high of 3.9 percent in 2004 to 3.3 percent in 2006. And, the fastest growth rate of 3.9 percent in 2004 was well below the consumption growth peak of 4.5 percent in the 1990s.[18]

These figures illustrate that consumption growth was not particularly strong during the current business cycle. What's more, the existing increases in consumer demand were driven to a large degree by an expansion of household debt. By the end of 2006, consumer debt relative to income reached a record high of 132.1 percent of disposable income (see Figure 8). This topped off an unprecedented increase in consumer debt, much of it in the form of new mortgages, relative to disposable income, which grew over four times more quickly after March 2001 than during the 1990s.

To look at this in another light, the first quarter of 2007 had a personal savings rate of negative 0.8 percent, which marked the eighth consecutive quarter with a negative personal savings rate. In the end, this fuel for consumption had to run dry since families cannot indefinitely borrow money faster than their incomes go up. By the first quarter of 2007, household debt did indeed decline relative to income.

This debt-driven boom seems to have come to an end. It has been clear that

FIGURE 9: THE DIFFERENCE BETWEEN NEW MORTGAGES AND REAL ESTATE SPENDING RELATIVE TO DISPOSABLE INCOME



Notes: Authors' calculations based on BOG (2007).

families would eventually have to slow their borrowing, particularly as debt payments increased. Average debt payments rose from 13 percent of disposable income in March 2001 to 14.5 percent in December 2006. Then, in the first quarter of 2007, the ratio of debt to disposable income fell to 130.7 percent, the first decline since March 2002 (see Figure 8).

An important factor contributing to the slower household debt growth is the fact that families are taking less equity out of their homes. The difference between new mortgages and money spent on upgrading homes in the first quarter of 2007 amounted to 0.43 percent of disposable income, the smallest ratio since the fourth quarter of 2000 (see Figure 9).

Moreover, lenders have become more reluctant to extend credit in the wake of rising defaults. For instance, the share of mortgages entering foreclosures rose to 0.58 percent in the first quarter of 2007, the highest share since the Mortgage Bankers Association collected these data in 1979, and the fourth increase in a row.[19] Other measures, such as bankruptcy rates and credit card charge-off rates, have also risen since the beginning of 2006. As economic distress signals among households are rising, lenders are starting to worry about their money and are tightening their credit standards. In effect, this means that debt-driven consumption growth is no longer sustainable.

Income growth could replace debt growth as driver of consumption

Instead of relying on debt as the driving force of consumption growth, income could play this role as well. Unfortunately, income growth has been slow. Income growth for this business cycle averaged an annualized monthly rate of 0.6 percent, the slowest for any business cycle since World War II and less than one-third the employment growth rate prior to this business cycle.[20] Employment growth has also slowed since it peaked in 2005.[21]

Further, weekly wages increased, after adjusting for inflation, by only 1.3 percent from March 2001 to May 2007, while hourly earnings increased by just 2.0 percent over the same period of time. These trends suggest that there has been little momentum behind income growth for the past few years. Yet with income growth remaining slow and debt growth ultimately unsustainable, the current slowdown in consumption growth is, in the end, inevitable. This provides businesses with fewer incentives to invest at an accelerated rate, which may explain the recent slowdown in business investment growth.

Conclusion

Business investment and productivity are key components of economic growth and stability. Investment increases the capital base and lays the foundation for future productivity growth. Growing levels of business investment mean that businesses are demanding more capital inputs, which in turn increases economic demand in the short-run and translates into faster economic growth. Greater economic growth means more jobs and higher levels of consumption overall, which provides businesses an incentive to invest more in their operations, leading to faster output growth in the short run and, if all goes well, in faster productivity growth in the long run and ultimately higher living standards in an expanding economy.

This virtuous circle of productivity-driven growth characterized the mid- to- late-1990s, but over the past six years economic growth has largely been driven by consumer spending. This new engine of growth is unsustainable in the long run because of the low personal savings rate, slow income growth, and high household debt financing the consumption. Even though the economy has experienced ongoing replacement investment in new capital equipment and services, there has not been a high level of net new capital investment in recent years. Despite record profit levels, many companies have chosen to use their money in ways other than investing directly in growing their businesses overall productivity.

Now that consumption growth has slowed, businesses do not have an incentive to increase investment in their capital goods since income growth is also anemic. Combine these observations with the fact that productivity growth has slowed from its accelerated pace of the 1990s and does not appear to be increasing in the near future, and one can see that signs might in fact be pointing to a continued slowdown in economic growth over at least the next few quarters. The U.S. economy could be settling into a long-term, slow-growth pattern.

Unfortunately, this possibly unfolding scenario does not tend to generate the same level of support for policy action since it does not attract as much political attention and public concern as other economic events, such as a recession. Moving forward, this means that we need to pay more attention to income growth and to business investment, especially in new technologies appropriate for a knowledge-based economy. The U.S. economy is already finding it necessary to run faster simply to stay in place. Ignoring the need to concentrate more on improving income growth and business investment would open the door for substantially lower living standards in the future.

Appendix: The Role of Commercial Real Estate Investment in the Current Business Cycle

Commercial real estate has played an important role in the current business cycle and has contributed more to overall business investment compared to investment in equipment.

Investment as a share of GDP reached its most recent low point with 9.7 percent in the first quarter of 2004. Between then and the first quarter of 2007, investment relative to GDP increased by 0.8 percentage points to 10.5 percent. The bulk of this increase came from investment in structures such as hotels, offices, hospitals, and manufacturing space, among others. To be exact, 90.4 percent of the increase in investment relative to GDP came from an increase in investment in commercial buildings.[22]

This increase of investment in commercial structures, however, is not necessarily a result of more and better buildings being constructed. On the contrary, adjusting for inflation, the amount of commercial structures invested in was 19.7 percent less in 2005 than it was in 2000, the last complete year prior to the current business cycle for which data are available. In comparison, the amount of equipment invested in was 7.2 percent greater.

Faster inflation explains this discrepancy: commercial construction spending increased faster than GDP and faster than equipment spending, yet the amount of commercial construction that occurred actually fell. The main issue is that commercial construction prices rose by 34.6 percent from 2000 to 2005, while prices for equipment investment goods fell by 5.9 percent over the same time period.

At the same time, prices across the entire economy expanded by 12.7 percent. That is, the ratio of investment in structures increased largely because commercial construction prices rose almost three times as fast as prices in the economy overall. Importantly, this did not reflect an expansion of the capital base, other than its dollar valuation.

After adjusting for inflation, the trends are opposite from those relative to GDP. Equipment investment increased by an average annualized rate of 2.2 percent between March 2001 and March 2007, while structures investment declined by an average annualized rate of 1.5 percent during this time.

Either way, though, these figures show a substantial slowdown from the investment trends of the 1990s. During the 1990s, inflation-adjusted equipment investment grew at an average annualized rate of 9.1 percent and inflation-adjusted investment in structures expanded at a rate of 1.2 percent.[23]

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Endnotes

1 Authors' calculations based on BLS (2007a).

2 See Gordon (2003) and Oliner and Sichel (2000) for details.

3 Data, not shown here, are taken from BLS (2007).

4 Not only is this the foundation of modern economics, the alternative would also imply unrealistic long-run outcomes. If productivity grew faster than workers' compensation over sufficiently long periods of time, workers would receive an ever-smaller share of national income. In the extreme, the labor share of national income would ultimately approximate zero. In the opposite case, workers would receive all the gains and companies would get nothing. Neither scenario is likely.

5 See Houseman (2007) for details.

6 See Baker (2007a, 2007b) for details.

7 See GS (2007) and FRBNY (2007) for details.

8 One possible explanation for this cyclical discrepancy is that much of the recent growth was driven by the boom in construction. It is possible that a substantial share of workers in construction may have been undocumented. Since these workers were not counted in the run-up during the boom years, productivity growth may have been overstated. In turn, since these undocumented workers are not counted as disappearing from the labor force, recorded employment changes are smaller than they actually are, thus also reducing productivity growth.

9 See GS (2007) for details.

10 This trend mirrors the trend of investments in information processing equipment and software.

11 Details are not shown here. Calculations are based on BEA (2007).

12 Figures are not shown here and are authors' calculations based on BEA (2007). Details are available from authors upon request.

13 The total capital stock and the capital stock in structures relative to GDP show an increasing trend starting in 2003. Similarly, as figure 2 suggests, investment in structures relative to GDP increased in recent years while investment in equipment relative to GDP stayed flat. Importantly, the apparent increase of commercial real estate capital stock and of investment in structures is a result of accelerated commercial real estate inflation. For instance, after accounting for inflation, commercial real estate investment did not begin to accelerate until the middle of 2005, even though the non-inflation adjusted ratio of commercial real estate investment relative to GDP began to increase in the middle of 2003. See the appendix for details.

14 The average quarterly change in gross investment relative to GDP was 0.00 percentage points from 1947 to 2007 and the average quarterly change in net investment relative to GDP was -0.01 percentage points.

15 See BEA (2007a) for details.

16 Calculations are based on BOG (2007).

17 Calculations are based on BOG (2007).

18 See BEA (2007a) for details.

19 See MBAA (2007) for details.

20 Calculations based on BLS (2007b).

21 Calculations based on BLS (2007b).

22 Details are not shown here. Calculations are based on BEA (2007) and are available from the authors upon request.

23 Comparisons for earlier periods do not exist. Hence, the main text relies on the ratios of investment to GDP. Also, while the real trends may give a better sense of the potential effect of investment on the capital base, the ratio of investment to GDP is a more accurate indicator of the role of investment for economic growth in the short run.

About the Authors

Dr. Christian E. Weller is a Senior Fellow at the Center for American Progress. His expertise is in the area of retirement income security, macroeconomics, and international finance. Prior to joining the Center, he was on the research staff at the Economic Policy Institute, where he remains a research associate. Dr. Weller has also worked at the Center for European Integration Studies at the University of Bonn in Germany, under the Department of Public Policy of the AFL-CIO in Washington, D.C., and in banking in Germany, Belgium and Poland. Dr. Weller is a respected academic with close to 100 publications in academic and popular publications. His academic publications have appeared in the Journal of Policy Analysis and Management, the Journal of Development Studies, the Cambridge Journal of Economics, the Journal of International Business Studies, the Journal of Aging and Social Policy, and the Journal of Economic Issues, among others. His popular writings have been published in the New York Times, USA Today, and the Atlanta Journal Constitution. In 2006, he was awarded the Outstanding Scholar-Practitioner Award from the Labor and Employment Relations Association. His work is frequently cited in the press and he is often a guest on national TV and radio programs. Dr. Weller holds a Ph.D. in economics from the University of Massachusetts at Amherst.

Amanda M. Logan is the Special Assistant for Economic Policy at the Center for American Progress. Logan graduated summa cum laude from Moravian College in 2006 with a bachelor's degree in economics and political science.

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