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Early Warning Signs of the U.S. Productivity Pickup: Implications for Europe

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With real GDP growth averaging 4.4% over the past five years, there is now a clear consensus that sustainable annual growth in the U.S. has risen to at least 4 percent. That is, with the unemployment rate steady, American GDP can grow at a rate that is 1½ percentage points higher than it could just 5 years ago. Labor productivity has risen by the same 1½ percentage points and is now growing at least 3 percent per year.

Most analysts believe that other countries around the world have not shared the unprecedented recent performance of the U.S. economy. The productivity acceleration appears to be a uniquely American phenomenon. In particular, the growth statistics suggest that the European economies have not experienced the same pickup in growth.

This observation leads to me to ask a series of questions. What were the sources of this growth, and why is it that the European experience appears different? Can we, even in retrospect, identify any early warning signs that might help us to see if productivity is poised to accelerate elsewhere? Finally, to what extent is the divergence between U.S. and European measured growth rates a result of differences in statistical methods used to compute real output?

Growth Accounting: The Sources of Growth in the U.S.

The increase in growth from the first to the second half of the 1990s is significant, and it is important to understand where it has come from. Two economists from the Federal Reserve Board, Stephen Ohliner and Daniel Sichel, provide an accounting of the sources of increased growth into the components that are due to increases in labor and capital inputs, and those that are otherwise unexplained. Importantly, they are able to estimate the amount of the productivity acceleration that can be attributed to increases in investment in information technology equipment.

I reproduce Ohliner and Sichel's Table 1 below.[1] The numbers very clearly show that the 2 percentage point rise in U.S. growth comes from three primary sources: *higher labor inputs, higher*

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investment in information technology capital, and increases in multifactor productivity. The first of these mirrors the fall in the U.S. unemployment rate from over 5 ½% in 1995 to 4 percent today, combined with average labor force growth of 1.3% per year, has led to an increase in employment of nearly 2% per year for 4 years. Since the unemployment rate is very unlikely to fall further, we must assume that this is only sustainable at roughly half of this level, the roughly 1% long-term average growth rate of the labor force.

What is most striking about the Ohliner and Sichel results in Table 1 is the importance ascribed to the *increase in IT investment*, which accounted for one-quarter of the increase in growth. Looking at this further, we see that the doubling of the growth rate of hardware inputs, to a phenomenal average rate of 36% per year, is largely responsible.

Finally, estimates of multifactor productivity growth have risen by nearly 0.7 percentage points per year. Multifactor productivity growth is the portion of growth that we cannot account for explicitly by measured increases in factor inputs. There are a number of possible interpretations of this increase, one of which is that it represents the increased productivity arising from the efficient use of technology in production.[2]

The general impression is that the rest of the industrialized world has not shared the rise in U.S. growth. Looking from the vantage point of the year 2000, can we see any reasons for American performance that would provide us with places to look in trying to determine if other countries are moving down the same road?

Early Warning Signs

Were their any early warning signs of increased growth in the U.S.? To answer this question, we can go directly to information on labor productivity and costs. Using data for the nonfinancial corporate sector,[3] we see in the top panel of Table 2 that things clearly began to change in the mid-1990s. The decline in unit labor costs in 1996, coming together with an increase in corporate profits, seem in retrospect to have been one of the first signs of what was to come.

Information Technology Investment

One of the most dramatic aspects of the U.S. experience of the last five years is the acceleration in the level of *information technology investment*. Looking to the middle of Table 2,

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[1] Ohliner, Stephen D. and Daniel A. Sichel, "The Resurgence of Growth I the Late 1990s: Is Information Technology the Story?" Unpublished manuscript, Board of Governors of the Federal Reserve System, February 2000. Available at www.sf.frb.org.org/conf2000/papers/resurgence.pdf.

[2] Before continuing, it is worth pointing out that Robert Gordon has looked at these same numbers and come to somewhat different conclusions. Gordon makes two points. First, he notes that evaluation of the changes in the productivity trend requires careful treatment of cyclical factors. From this he concludes that this accounts for part, but not all of the acceleration of the late 1990s. Second, Gordon's analysis shows that the productivity growth increase is concentrated in the durable manufacturing sector. That is, the improvement in productive efficiency has not been shared across the entire economy, but has been entirely in less than one-tenth of the economy (measured by employment). See Gordon, Robert, J. "Does the 'New Economy' Measure up to the Great Inventions of the Past?" *Journal of Economic Perspectives*, 2000, forthcoming. http://facultyweb.at.northwestern.edu/economics/gordon/researchhome.html.

[3] These data are based largely on the income side of the national accounts, and are thought to be more reliable.

we see that the growth rate of investment in computer hardware more than doubled from about 20% per year in the first half of the 1990s to nearly 50% per year during the latter half of the decade.

The incredible acceleration in the installation of computer hardware seems an unmistakable sign of what has happened. *Can we find something equivalent in Europe?* The answer here seems to be no. Recent work by Julian Callow of Credit Suisse First Boston[4] suggests that the countries of Europe still have some way to go. He notes that both the level and the growth rate of IT equipment production is lower in Europe than it is in the U.S. By Callow's calculations, in 1999 manufacturing of information and communication technology accounted for 4.2% of GDP in the Europe, while accounting for 6.6% of U.S. GDP (both in real terms). Furthermore, manufacturing of computer hardware increased by 11.8% per year in the U.S., but only 3.5% in the Euro-11.[5]

These lower levels of European IT equipment production have been mirrored by lower levels of investment. By current estimates, U.S. IT investment accounts for 8.3% of GDP. The equivalent number for Euro area is about 7%. While the gap has been shrinking, the fact that the U.S. has been investing more in computers every year for the past decade has left a gap of over €200,000 million in the level of installed IT equipment. Callow estimates that closing this gap would require that the Euro area nearly double IT investment.

Inventory Control Policies

Evidence on inventory policies in the U.S. provide a second place where one might look for early warnings of a pickup in growth. Margaret Mary McConnell and Gabriel Perez Quiros of the Federal Reserve Bank of New York have documented a marked decline in the volatility of real U.S. GDP growth in the mid-1980s.[6] They attribute this to a change in the behavior of durable manufacturing, and suggest that this may be a consequence of changes in inventory control methods.

McConnell and Perez Quiros show that, beginning in the early 1990s *the inventory to sales ratio in durable manufacturing fell steadily from a level around 2.5 to 1.8* by the end of the decade. Aggregate inventories have declined slightly over this same period. Technology, which allowed the introduction of *just-in-time inventory control policies,* seems the most likely explanation for this phenomenon.

In the past, unintended shifts in inventory levels have some blame for overall business-cycle fluctuations. Improved inventory control could easily lead to improved cyclical performance. With prospects of more stable growth, firms face reduced sales risk and will increase their investment raising production, providing yet another mechanism for technology to increase growth.

What about Europe? We can estimate the overall inventory to sales ratio for France, Germany and Italy combined. By this measure, inventories have risen steady over the past five

[4] Callow, Julian, "The European Digital Economy," Credit Suisse First Boston Euro-11 Special, July 2000.
[5] These are manufacturing production, rather than investment numbers.
[6] Margaret Mary McConnell and Gabriel Perez Quiros, "Output Fluctuations in the United States: What has changed Since the Early 1980s?" Unpublished manuscript, Federal Reserve Bank of New York, January 2000.

years, and now stand 25% higher than they were in 1995.[7] By contrast, the ratio of inventories to sales for the U.S. economy as a whole declined by 10% over the same period.

There are several reasons to think that changes in inventory control policies are on the way, and so this pattern will be reverse. U.S. firms, such as Wal-Mart, are opening retail level outlets in Europe. In addition, European manufacturing firms have purchased U.S. firms. The merger of Daimler Benz and Chrysler is a prime example. Chrysler has very sophisticated inventory control for the parts used by its automobile assembly plants. There is reason to believe that these techniques will be transferred to Europe.

Differences in U.S. and European Computer Price Indices

In comparing the U.S. and Europe it is important to keep in mind that there are large differences in the data arising from the manner in which the national statistical agencies calculate price indices for computer hardware. Is it possible that some of the differences between American and European performance could be illusory? Could they be solely a consequence of differences in the methods used to compute the numbers?

The rate of decline of U.S. computer prices intensified during the latter half of the 1990s. The deflator for information technology equipment used by the Bureau of Economic Analysis (BEA) to calculate U.S. GDP went from an average of about -15% in the first half of the decade to an average of nearly -25% in the second half. If, in the latter half of the 1990s the hardware deflator had continued to decline at the more modest -15% rate, then U.S. growth would have averaged approximately 0.25 percentage points less than it was.

In the U.S., the Bureau of Economic Analysis (BEA) employs hedonic adjustment, which directly incorporate improvements in processing speed and memory, for example, directly into the construction of price indices. Furthermore, because these adjustments have become more important in recent years and they are not made in most European countries, the difference have increased. During the first half of the 1990s German and U.S. computer price deflators showed roughly equivalent declines. It is over the past five years that the two have diverged significantly, with the German deflator showing a decline of less than 10% on average.

Most analysts believe that sustainable growth in the Europe is between 1½and 2 percentage points lower than it is in the U.S. Of this, nearly a full percentage point is due to faster long-term U.S. labor force growth,[8] while the rest is attributed to higher productivity growth. Switching to the U.S. deflator would increase measured European growth by about one-quarter of one percentage point per year for the past five years *and that if Eurostat were to change the methods used to construct real Euro area IT investment, we would discover the beginnings of a growth*

[7] Data on the stock of inventories is not available for central European countries, and so we cannot compute the ratio of inventories to sales in a straightforward way. It is possible to take data on the change in real inventories from the national income and product accounts and use it to estimate inventory levels. To do this, we begin by assuming that the 1991 inventory to sales ratio is the same in Europe as it is in the U.S. This allows us to calculate a base level of inventories, and then cumulate the changes in order to construct a time series for the level. This can be done using national income and product accounts data on the change in inventories for the decade of the 1990s.

[8] From 1994 to 1999, annual labor force growth averaged 1.3% in the U.S. and 0.4% in the Euro area.

acceleration in Europe as well.[9] The remaining difference of one-quarter to three-quarters of a percentage point per year growth comes from a combination of acceleration of multifactor productivity in the U.S. and the fact that information technology investment and production remain a much smaller portion of European GDP.

Conclusions

Where does this leave us? Nearly everyone now agrees that U.S. trend growth has risen substantially since the early 1990s, and that this has come along with a dramatic reduction in unit labor costs and a rise in corporate profits. But much of this measured improvement in U.S. performance can be tied to estimates in the decline in prices of computer hardware, which are not present in European data because of a difference in methods used by national statistical agencies.

Contrary to the comments made by ECB President Wim Duisenberg to the European Parliament on 5 July 2000, there is also a consensus that investment in information technology has played an important role in the recent American experience. There is also evidence that changes in inventory control policies have stabilized growth, leading to higher levels of output.

Importantly, it seems likely that the labor market flexibility has played an essential role in the performance of the U.S. economy over the past decade. Employment practices are credited both with the fall in the unemployment to 30 year lows and with allowing for the rapid introduction of new technologies into production processes. Without structural reforms aimed at reducing European labor market rigidities, it is unlikely that technology will diffuse throughout the Euro area as quickly as it has in the U.S.[10]

The conclusion is that there are three places to look for early signs of a pickup in growth that would mirror that in the U.S. over the past five years. They are (1) falling unit labor costs, (2) increases in computer hardware investment, and (3) a falling ratio of inventory to sales in durable manufacturing. But to quote Prof. Dr. Hermann Remsperger, "computers and the Internet alone will not create a new economy … by themselves. Only structural reforms will reduce the impediments to growth."

[9] The differences in computer price indices only have a material impact on real investment and GDP growth. Because of the miniscule weight of computer hardware in consumer purchases – e.g., approximately 0.1% in the U.S. CPI – changing computer price indices has virtually no impact on consumer price inflation.

[10] A speech by Prof. Dr. Hermann Rempsperger of the Deutsche Bundesbank, makes this point. See "Is there a New Economy in Germany?" Lecture held at the American Institute for Contemporary German Studies, 20 March 2000. Available in English at www.bundesbank.de/index_e.html.

Table 1
Contributions to Growth of Real Nonfarm Business Output, 1974 to 1999

	1974-90	1991-95	1996-99
Growth of Output	3.13	2.82	4.90
Contributions from:			
Information Technology	.51	.54	1.08
Hardware	.28	.24	.62
Software	.11	.23	.31
Communication Equipment	.12	.07	.15
Other Capital	.85	.44	.76
Labor Hours	1.15	.82	1.51
Labor Quality	.22	.44	.31
Multifactor Productivity	.44	.57	1.25
Growth rate of inputs:			
Hardware	31.4	17.5	36.0
Software	13.2	12.8	13.1
Communications equipment	7.7	3.6	7.1

Source: Ohliner, Stephen D. and Daniel E. Sichel, "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" February 2000.

Table 2
The Change in the 1990s
(Average Annual Percentage Growth)

	1991-1995	1996-1999
Nonfinancial Corporate Business,		
Labor Productivity	1.61	3.55
Unit Labor Costs	1.36	0.52
Unit Non-Labor Costs	0.75	-0.50
Real Investment in Computer Hardware*	29.0	45.9
Prices of Computer Hardware	-14.8	-23.4

* National Income Accounts Basis.