An hourglass-shaped graphic with a globe inside. The top bulb is dark blue, and the bottom bulb is light blue. The globe is a darker shade of blue. The hourglass is centered on the page.

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Is High Productivity Growth Compatible With Employment Growth?

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Abstract. Productivity growth does not affect all industries equally and may not lead to employment growth in the same industry in which it has occurred. This has been the case with manufacturing in recent decades. But while productivity growth changes the composition of employment, there is no theory or evidence indicating that it changes the overall level of employment. Thus, productivity-enhancing policies intended to raise living standards are unlikely to have negative side effects.

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Is High Productivity Growth Compatible With Employment Growth?

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Summary

There is a popular perception that the recent sluggishness in employment growth is caused by the acceleration in productivity growth. Annual labor productivity growth has increased from 1.4% from 1974 to 1995 to 2.5% from 1996 to 2001 and to 4.2% from 2002 to the present. Neither economic theory nor empirical evidence supports this perception — there has been virtually no correlation between productivity growth and employment growth since 1948. Higher productivity growth does change our perceptions of what comprises a strong economic recovery, however. With higher productivity growth, what was formerly an economic growth rate consistent with rising employment is now symptomatic of inadequate aggregate spending.

Productivity growth does not affect all industries equally and may not lead to employment growth in the same industry in which it has occurred. This has been the case with manufacturing in recent decades. But while productivity growth changes the composition of employment, there is no theory or evidence indicating that it changes the overall level of employment. Thus, productivity-enhancing policies intended to raise living standards are unlikely to have negative side effects. This report will not be updated.

A recent puzzle among economists, policymakers, and the general public has been the sluggishness of the labor market. Employment declined from March 2001 to August 2003, easily the longest (although not nearly the deepest) decline in employment in the post-World War II era. Since then employment has increased slowly, and as of October 2004 it remains far below its previous peak.¹ A popular explanation for the sluggish labor market has been the recent surge in productivity growth, which measures the change in output per hour worked.² For example, a recent *Business Week* article was subtitled, “The

¹ For more information, see CRS Report RL32047, *The “Jobless Recovery” From the 2001 Recession*, by Marc Labonte and Linda Levine.

² For more information, see CRS Report RL31428, *Productivity Growth: Recent Trends and Prospects*, by Brian Cashell.

drive for productivity gains is the real culprit behind anemic job growth.”³ As a recent *Financial Times* article describes it,

Productivity is a simple concept: widgets produced, divided by input. Labour often dominates the input figure. It is therefore difficult to generate high productivity and substantial employment increases at the same time. The very phrase ‘jobless productivity’ is close to a tautology.⁴

Interestingly, in the late 1990s some observers attributed the rapid *increases* in employment to rapid productivity growth.⁵ From 1974 to 1995, labor productivity growth averaged 1.4% a year. From 1996 to 2001, productivity growth increased to 2.5% a year. From 2002 to the second quarter of 2004, it has increased further still to an annualized average of 4.2%. Why have rapid productivity gains occurred both in periods of high and low employment growth?

A Popular Explanation of Productivity Growth’s Effect on Employment

The popular story focuses on the link between productivity and employment at the firm level. Imagine that a firm makes 100 widgets a year with 10 workers. If productivity were to double and product demand remained the same, the firm would lay off five of its workers and still be able to produce 100 widgets. Extrapolating the firm’s experience to the economy as a whole, higher productivity leads to lower employment, according to the story.

But the popular story is incomplete because it does not explain how the economy adjusts to the change in productivity. If the firm has now reduced its payroll by 50%, its net income has risen by that much. That additional net income must accrue to the firm’s owners/stockholders or workers. As their incomes rise, they will purchase more goods and services than they were purchasing before.⁶ This will raise the demand for workers to produce goods and services in other sectors of the economy.⁷ Higher productivity

³ James Cooper, “The Price of Efficiency,” *Business Week*, issue 3875, Mar. 22, 2004, p. 38.

⁴ Amity Shlaes, “Don’t Be Sentimental, Mr. Bush,” *Financial Times*, Sept. 23, 2003, p. 23.

⁵ Council of Economic Advisers, *Economic Report of the President*, Feb. 2000, p. 90.

⁶ For the increase in productivity to translate into an immediate increase in income requires that it be matched by an increase in the money supply by the Federal Reserve. This is a reasonable assumption since it is consistent with the Federal Reserve’s mandate to keep inflation and the business cycle stable.

⁷ If the workers or owners decided to save their additional income instead of spending it on consumption goods, the total demand for goods and services would still increase. Higher saving would push down interest rates, and this would stimulate spending on interest-sensitive goods, such as capital investment, residential investment, and consumer durables (e.g., automobiles and appliances).

The greater demand for workers in other sectors of the economy may not occur in the same local area that lost employment to productivity growth. Thus, at the local level, the popular story may seem accurate initially. But the local experience cannot be extrapolated to the national (continued...)

might cause other factors to change as well. For instance, higher productivity at the firm may allow them to reduce the price of their widgets, which may cause sales to rise. Workers would then be needed to produce the additional widgets.

Productivity Growth and Employment in Mainstream Economics

Perhaps surprisingly, in a mainstream economic model productivity growth has no effect on employment growth. That is because, in the model, workers' compensation matches their marginal product (output), and productivity determines marginal product.⁸ (Compensation consists of wages and non-cash benefits.) When a worker's productivity rises, market forces cause his compensation to rise because there is greater demand for his services. If a firm did not increase compensation in response to higher productivity, then another firm would be willing to outbid the firm for the worker's services, since the value of output produced by the worker exceeds his compensation.

In this model, changes in employment occur when workers' compensation demands become misaligned with their marginal product. For instance, if the demand for a firm's product falls, a firm must reduce payroll to remain viable (assuming the firm was not previously earning excess profits). It can reduce payroll in two ways: by laying off some workers or maintaining its workforce but reducing compensation. In practice, laying off workers is more common than reducing compensation — apparently, when their marginal product falls as a result of the fall in product demand, workers are unwilling to reduce their compensation.⁹ In recessions, there is temporarily a widespread reduction in demand for products, and widespread unemployment results.

Employment has no relation to productivity in this model because it is assumed that workers and firms can properly identify the workers' marginal product and workers can easily switch employers in pursuit of higher compensation. Workers and firms do not have to actively evaluate their productivity because markets provide that information through prices: if a firm pays a worker less than his marginal product, the worker will be able to pursue higher paying alternatives with other firms. The original firm will be forced to raise compensation to avoid losing its employees. While the model is undoubtedly a gross simplification of reality, it nevertheless appears to conform fairly well to actual experience.

Nonetheless, a change in productivity growth does change the relationship between economic growth and employment growth. In the mainstream model, high unemployment is typically caused by inadequate aggregate demand (spending). While higher productivity growth does not cause unemployment in the mainstream model, it may change our perceptions of adequate demand. The strong productivity gains make demand seem

⁷ (...continued)
experience.

⁸ This model is supported by empirical data — over the long run, labor's share of national income has stayed virtually constant (although it fluctuates slightly in the short term). See CRS Report RL32563, *Productivity and Wages*, by Brian Cashell.

⁹ Survey research supports this observation. See, for example, Truman Bewley, *Why Wages Don't Fall During A Recession* (Cambridge: Harvard University Press, 1999).

stronger than it is in a casual comparison to the past. Economic growth is caused by increases in the labor force, which grows at a fairly steady 1% a year, and increases in productivity (due to capital investment or efficiency gains). From the mid-1970s to the mid-1990s, when productivity was growing at about 1.5% a year, the economy could grow at 2.5% without an increase in the unemployment rate. Now that the productivity growth rate seems to have increased, a 2.5% economic growth rate is no longer sufficient to keep the unemployment rate stable, and no longer indicates that demand is growing quickly enough to keep production at full employment. In the first six quarters of the current economic expansion, economic growth averaged only 2.1%, although it has since accelerated.

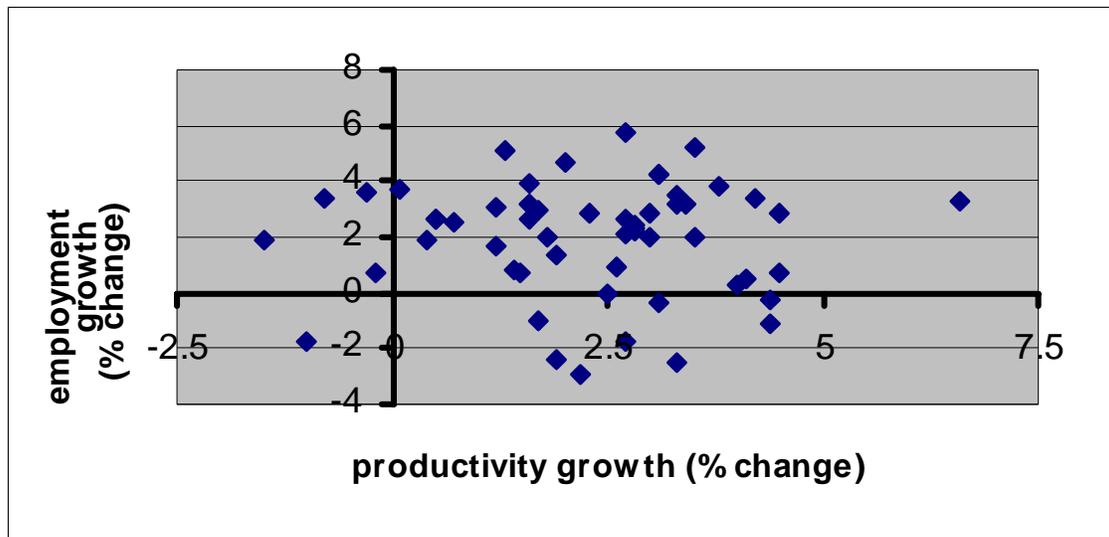
Is There Evidence that Productivity Reduces Total Employment?

Economic theories should be judged on the basis of how well they describe actual economic behavior. If the popular story is correct, then we should observe declines in total employment when productivity rises, and increases in employment when productivity falls. Alternatively, if the mainstream economic model is correct, then we should observe no relationship between the two variables. What do the data show?

A cursory glance at the data quickly dismisses the notion that higher productivity reduces employment. Productivity has risen virtually continuously throughout our nation's history. Except during recessions, so has employment. **Figure 1** takes a more sophisticated look at this proposition by comparing employment growth to productivity growth using annual data from 1948 to 2003. As can be seen, there is no clear relationship between the two variables. High productivity growth has accompanied both high and low employment growth, as has low productivity growth. The correlation between these two variables is -0.01; in other words, there is virtually no relationship between employment growth and productivity growth, just as mainstream theory predicts.¹⁰ Thus, the high productivity growth and low employment growth of the past three years is an aberration, and does not reflect a broader trend found in the data over the past 55 years.

¹⁰ If two variables are perfectly correlated, they have a correlation of 1.0 and they always move in exactly the same direction. If they are perfectly negatively correlated, they have a correlation of -1.0 and always move in opposite directions. If there is no relationship between them, they are uncorrelated and have a correlation of zero.

As a test of robustness, correlating the unemployment rate and the productivity growth rate yielded virtually the same result. The correlation between these two variables over the same time period is -0.07. Using quarterly data or splitting the data into sub-periods of 1948-1973 and 1974-1995 also failed to yield greater correlation.

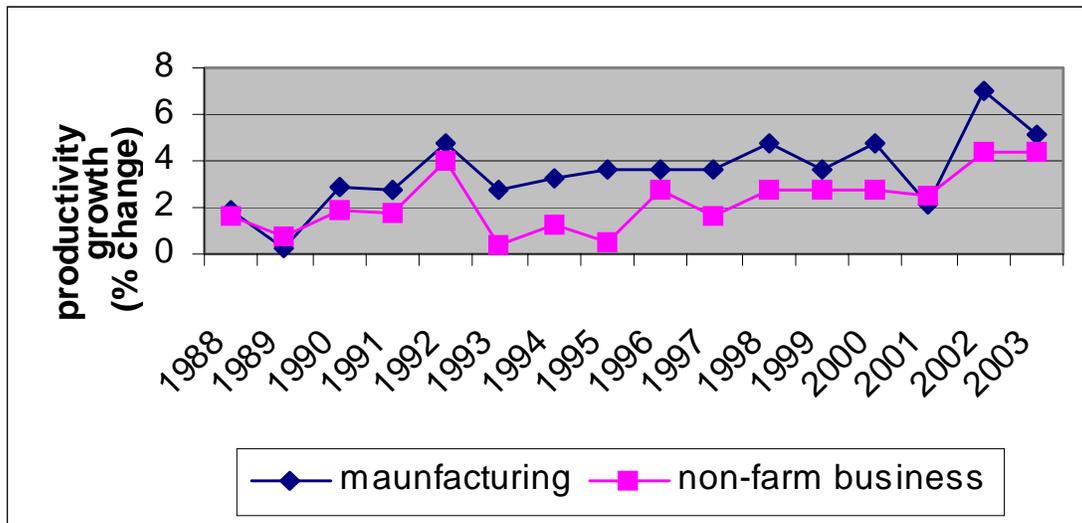
Figure 1: Annual Employment Growth and Productivity Growth, 1948-2003

Source: Bureau of Labor Statistics

Has Productivity Growth Reduced Manufacturing Employment?

As discussed above, productivity growth should not reduce employment because it expands the overall purchasing power of the economy, thereby creating new employment opportunities in the overall economy. However, there is nothing in this mainstream model that suggests that productivity growth will create employment opportunities in the same industries in which it occurs. This has been the case in the manufacturing sector.

As can be seen in **Figure 2**, manufacturing productivity growth has consistently outpaced productivity growth in the overall economy in the 25 years for which data are available. (The figure actually understates the difference in growth rates since the non-farm business sector includes manufacturing.) With productivity in manufacturing growing consistently faster than the rest of the economy, manufacturing employment would keep steady only if the demand for manufactured goods also grew consistently faster than the demand for other goods and services. Since the demand for manufacturing goods has not kept pace with manufacturing productivity gains, manufacturing employment has declined from about 25% of total employment in 1970 to about 14% in 2000 (the change in absolute employment has been much smaller). The manufacturing experience is strong evidence in favor of the mainstream model, because the decline in manufacturing employment was not accompanied by a decline in total employment. Rather, it was more than offset by rising service sector employment, so that total employment maintained an upward trend.

Figure 2: Annual Productivity Growth, 1988-2003

Source: Bureau of Labor Statistics

The relative decline in manufacturing employment has not been due solely to productivity gains; the business cycle and trade have also played a role. Nevertheless, CRS estimates that productivity gains have been the single largest factor in the decline of manufacturing employment, responsible for about 60% of the decline, from 2000 - 2003.¹¹

Conclusion

It is not unusual for economic analysis to conflict with common sense explanations of the world. This is the case with the relationship between productivity and employment. Although it may seem obvious that higher productivity means fewer workers are needed to fill an economy's production needs, both economic theory and empirical evidence reject the notion that higher productivity leads to lower overall employment, even in the short run. On the contrary, higher productivity frees up workers to produce more goods and services than the economy had previously been capable of producing, and this is the key to rising living standards. This suggests that policies conducive to high productivity are unlikely to have negative short-term consequences for employment, and thereby national welfare. On the contrary, high productivity is compatible with improved national welfare because it is the primary means by which living standards can be raised over the long run.

Productivity growth, like any change brought about by market forces, will not necessarily lead to new jobs being created in the same industry or local economy where it caused old jobs to be lost. This can be seen in the example of the manufacturing sector, where productivity growth outpaced demand, leading to a shift in jobs from manufacturing to the service sector. A challenge for policymakers is to find the right balance between ameliorating the hardship experienced by those harmed by market forces and allowing society as a whole to reap the benefits of those same forces.

¹¹ See CRS Report RL32350, *Deindustrialization: The Roles of Trade, Productivity, and Recession*, by Craig Elwell.