

# POLICYNOTE

## PRODUCTIVITY AND UNEMPLOYMENT IN THE SHORT AND LONG RUN

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The relationship between productivity growth and unemployment has been debated since the birth of classical economics. Most economists maintain that long run technical progress has led to a rising standard of living in advanced countries. But others claim that technical progress and productivity growth lead to unemployment due to a reduced demand for labor. The latter claim is often made with respect to European economies, which have experienced high unemployment rates since the end of the 1980s.<sup>1</sup>

Building on a previous study of Okun's Law—the relationship between output growth and unemployment, where productivity is assumed to be constant—this SCEPA Policy Note discusses productivity changes and their effect on unemployment over the short and long run. Although unemployment rates may be affected by population growth, demographic shifts, changing labor market participation rates of certain segments of the population and so on, the demand of labor is the essential factor driving the unemployment rate. Most of the empirical research has examined the effects of productivity growth on employment (in terms of hours worked), but in trying to assess the relationship of productivity to Okun's Law, we shift the emphasis to unemployment.

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### PATTERNS IN PRODUCTIVITY GROWTH AND EMPLOYMENT

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Over the last one hundred years, total employment in the U.S. grew rapidly; in 2002, it was 6.5 times greater than in 1889, corresponding to an annual growth rate of 1.6 percent.<sup>3</sup> At the same time, labor productivity increased by 2.4 percent a year and was 13.5 times higher in 2002 than in 1889. Real output expanded in this period by an annual growth rate of 3.4 percent and was 67 times higher in 2002 than in 1889.

These changes have been significant, but it is important to note that such broad changes have been neither smooth nor constant. There were also sweeping structural changes—in particular, there was a large-scale employment shift from agricultural to industrial dominance and then to the dominance of services. There were major shifts in industrial technologies during this period as well, from the use of coal power to electricity, for example, and from batch to mass production methods. Thus, there were significant periods of slow or negative GDP and productivity growth, with deleterious consequences. Over the course of American history, the relationship between productivity and employment differed from one time period to another, but generally our findings are consistent across time periods, that is, before and after World War II.

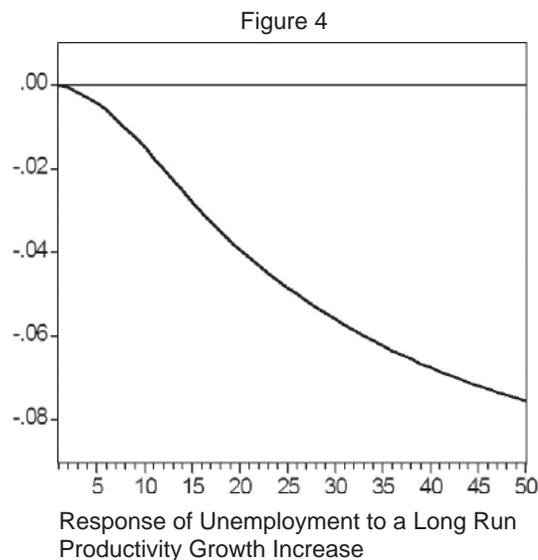
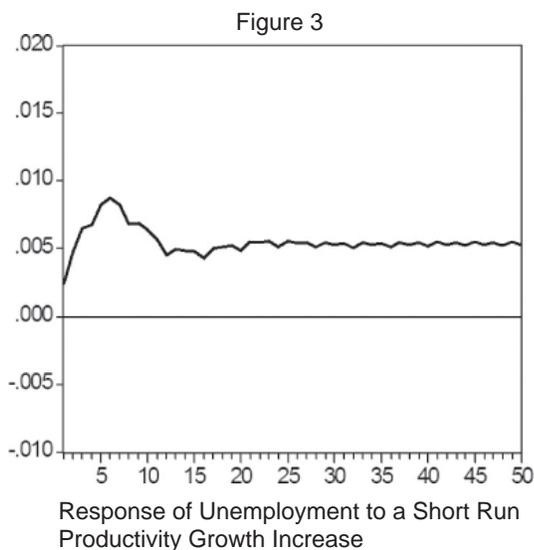
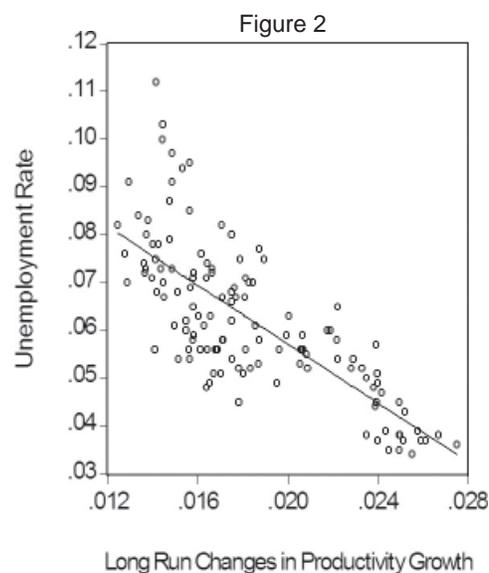
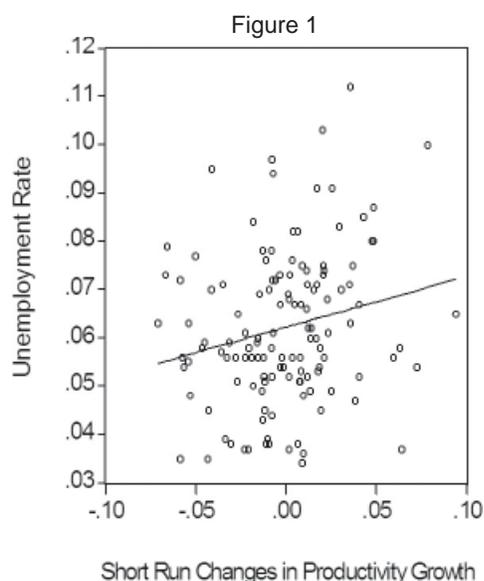
We find that the widely recognized claim that productivity growth does not increase unemployment is incorrect in the short run.<sup>4</sup> Productivity does appear to decrease unemployment in the long run. We apply a moving average to the data in order to observe the long run productivity trend. The short term productivity trend is thus defined as the difference between the actual data and its long term trend. Figures 1 and 2 are scatter diagrams that compare these short and long term trends in productivity growth with the unemployment rate for quarterly data in the period of 1959-2005.

## NEW FINDINGS

Figures 1 and 2 merely suggest that productivity shocks are likely to increase unemployment in the short run, and to reduce unemployment in the long run. The aim of our research was to investigate these correlations econometrically.

The dominant view is, as explained above, that productivity increases should improve unemployment in the short and the long run. But we found, in applying econometric techniques to the data, that productivity increased unemployment in the short run, if only weakly. In the long run, productivity reduces unemployment strongly.<sup>6</sup>

Figures 3 and 4 depict the responses of unemployment to short and long run productivity growth. In the short run a one percent increase in productivity increases unemployment, by 0.02%. The long run response of the unemployment rate to a one percent increase in productivity is a 2.23% decrease in unemployment. Summing up, one can see that short run productivity increases unemployment slightly, while long run productivity decreases unemployment significantly.



## CONCLUSIONS AND POLICY IMPLICATIONS

Our findings reinforce the central claim that productivity growth brings affluence to a society over time. But it can also bring short term struggle and sacrifice. A large increase in productivity may increase unemployment in the short run. Even if the increase is slight, as our analysis suggests, it is nevertheless moving in the opposite direction than has been widely predicted. Unemployment, all else equal, should have fallen.

What seems to be the case is that in the short run, workers lose jobs to productivity advances that are not compensated for immediately by the new opportunities created by the rising demand or corporate profits that result immediately from the productivity increases. Thus, there is a possible mismatch of cause and effects in terms of time.

Given our findings, there are fairly clear policy implications. Labor market institutions should be designed to accommodate those who are displaced by technological advancement. The first step in this process should be to widen and deepen the nation's safety net—in particular the unemployment insurance system. Policymakers should consider increasing benefits, expanding coverage to more unemployed workers, and lengthening the term of coverage.

Our findings also lend support to the adoption of a system of wage insurance for those who lose jobs due to technological change and are forced to take lower-paying jobs. Such insurance supplements future pay for those who have lost jobs. Wage insurance can reduce the costs of adjustment for displaced workers, but it may also increase the creation of lower-paying jobs. The latter point must be explored further. Finally, our findings support enhancing efforts for job training to enable workers to shift to new industries with different skill requirements.

There is one other conclusion to be drawn from our analysis. The attribution of rising unemployment to higher labor costs or rigid market structure, as is common in Europe today, may be misplaced. The higher unemployment may well be a short term consequence of advancing productivity. In the long run, the positive effect of productivity growth on employment, which is now evident in Europe, may render the criticism of the European labor market institutions and reforms obsolete.

## NOTES

1. Gordon, R. (1997): Is there a Trade-Off between Unemployment and Productivity Growth? In Snower, D. and De La Dehesa, G. (editors), *Unemployment Policy*, pages 433–466: Cambridge University Press, Cambridge.
2. Khemraj, T., Madrick, J. und Semmler, W. (2006): *Okun's Law and Jobless Growth*. Policy Note 3, Schwartz Center for Economic Policy Analysis.
3. Using the data set by Francis and Ramey (2004), which contains time series for productivity growth and employment from 1889 to 2002.
4. This is the view of one school of current macroeconomics, the dynamic general equilibrium theory, where productivity growth always increases employment and decreases unemployment. For details see Uhlig, H. (2006): Discussion of "The Source of Historical Economic Fluctuations: An Analysis using Long-Run Restrictions" by Neville Francis and Valerie A. Ramey. SFB 649 Discussion Paper No. 2006-042.
5. Our result of the short run effect of productivity growth on unemployment is very much in line with Francis and Ramey (2004): *The Source of Historical Economic Fluctuations: An Analysis using Long-Run Restrictions*. NBER Working Papers 10631, National Bureau of Economic Research.. A similar result is found for some Asian countries. See Dasgupta, S. and Singh, A. (2005): *Will Services be the New Engine of Indian Economic Growth?* *Development and Change*, 36 (6), 1035-1057..
6. Chen, P., Rezai, A. and Semmler, W. (2007): *Productivity Growth and Unemployment in the Short and Long Run*. SCPEA Working Paper 2007-8, Schwartz Center of Economic Policy Analysis.