Available online at www.sciencedirect.com
ScienceDirect
Journal of Policy Modeling 30 (2008) 619–626
Journal of Policy Modeling
www.elsevier.com/locate/jpm

A review of the productivity resurgence☆

John B. Taylor*

Department of Economics, Stanford University, Stanford, CA 94305, USA

Available online 22 April 2008

Keywords: Productivity resurgence; Long boom; Productivity growth; Wage growth

1. Introduction

A dozen years ago at policy panels like this one today, economists were focused on the reasons for the great U.S. productivity slowdown which had begun 20 years earlier. The policy objective was obvious: to end the slowdown, raise productivity growth, and thereby to increase the resources available for both private and public use. Numerous policies were proposed from larger tax incentives to increased spending on R&D. Some proposed setting a long-term national goal of increasing labor productivity growth by a certain amount, say, by one percentage point per year (Taylor, 1998). Others calculated the benefits that would flow if the dream of higher productivity growth ever came true.

As we all know now, that dream did come true. The productivity resurgence was actually underway while the slowdown was still being discussed. In retrospect this accomplishment started around 1995. As shown in Fig. 1, the increase in productivity growth was 1 percentage point, about the same as the goal that some had set.

Now that we are a dozen years into the resurgence, economists are doing retrospectives on its causes, effects, and likely longevity. (See Dew-Becker & Gordon, 2005; Jorgenson, Ho, & Stiroh, 2007; Lazear, 2006; Kroszner, 2006; Oliner, Sichel, and Stiroh, 2007). Surprisingly, the resurgence is not receiving the universal acclaim that one might have expected a dozen years ago, and it is even receiving some scathing criticism. Dew-Becker and Gordon (2005) write, for example, that: "A basic tenet of economic science is that productivity growth is the source of growth in income per capita. Productivity is the seed that creates the flower of a nation's standard

☆ Remarks at a Panel on Productivity at the Annual Meetings of the American Economic Association New Orleans, Louisiana, January 2008.

* Tel.: +1 650 723 9677; fax: +1 650 725 5702.
E-mail address: john.taylor@stanford.edu.

0161-8938/$ – see front matter © 2008 Published by Elsevier Inc. on behalf of Society for Policy Modeling.
doi:10.1016/j.jpolmod.2008.04.005

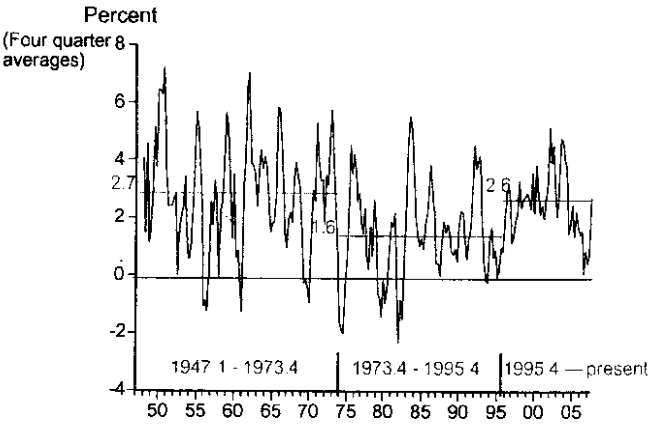

Fig. 1. U.S. labor productivity growth: slowdown and resurgence.

of living. But our results raise doubts, that we find surprising and even shocking, about this ancient economic paradigm." Such discouraging views have apparently been formed by observing the growth of labor income, which by some measures did not appear to increase with the resurgence as theory would predict and, moreover, appear to indicate that the income distribution widened.

In these remarks I take another look at the productivity resurgence and at some of the related economic developments that have taken some of the luster off this major economic accomplishment. I compare these developments with what happened during the period of the productivity slowdown. While one can be discouraged that the resurgence did not solve every problem, as I show here there is much about the resurgence that we can be encouraged about.

2. Basic economic theory and the productivity resurgence

First observe, as shown in Fig. 2, that the higher growth of productivity during the resurgence did lead to higher growth of average compensation per worker hour, just as predicted by basic

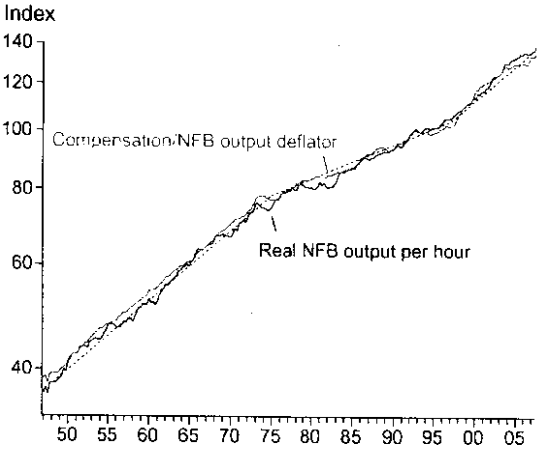

Fig. 2. Basic economic theory of productivity and labor compensation has held up well during the resurgence.

economic theory. The theoretical relationship between productivity and labor compensation is based on the firm's demand for labor decision. Under competition, the theory says that the marginal product of labor is equal to the real wage, defined as total labor compensation divided by the price at which the firm sells its output. Assuming that marginal productivity can be approximated by average productivity, this implies a link between labor productivity and compensation, with the relevant deflator being a price index for output. Fig. 2 plots labor productivity for the non-farm business sector, so the relevant deflator is the implicit price deflator for non-farm business product. Pencavel (2007) uses the producer price index, another measure of firm's output, and gets results essentially the same as Fig. 2.

There are three things to keep in mind when you consider Fig. 2. First, if labor compensation was measured only by its wage component, then it would decline relative to productivity, unlike the close relationship in Fig. 2. Workers' benefits are about 30% of total compensation on average, including 7% for paid leave, 8% for insurance, and 4% for retirement saving. Hence, if the cost of health insurance rises more rapidly than wages, then compensation will rise more rapidly than wages. During recent years health insurance costs have grown especially rapidly, but this has occurred both during the productivity slowdown and the resurgence. But from the perspective of economic theory, both benefits and wages should be included in labor compensation when evaluating the predictions of the theory.

Second, note that the price of consumption goods has departed from the deflators for non-farm business product. Fig. 3 shows that the CPI has grown more rapidly than the output deflator because the price of goods that workers consume, weighted by the market basket has increased at a higher rate than other goods and services. Hence if you deflate compensation by the CPI you get a larger departure than shown in Fig. 2.

Third, despite the close long-term relationship shown in Fig. 3, there are some temporary departures of productivity and labor compensation. In the next section I examine these in more detail.

3. Changes in the temporary departures of labor compensation from productivity

Fig. 4 zooms in on the departures of labor compensation from productivity in Fig. 2. It plots the ratio of compensation to productivity, a measure of the proportional gap between real com-

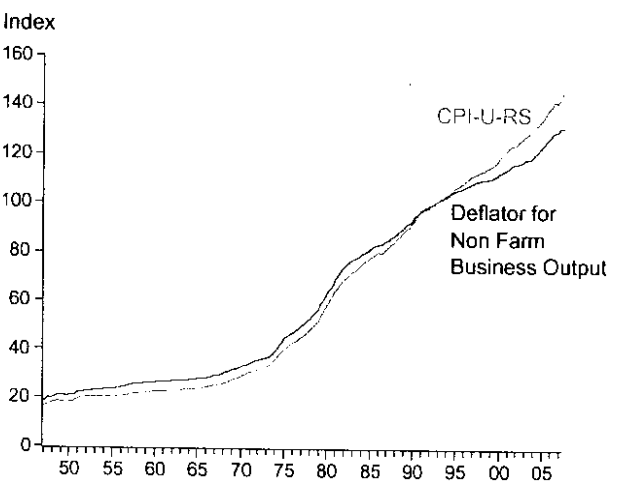

Fig. 3. Consumer prices have been rising more rapidly than the output deflator since before the resurgence.

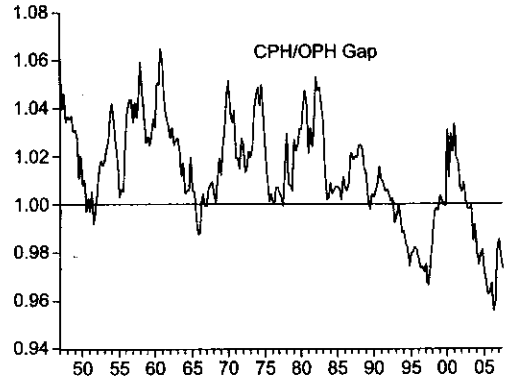

Fig. 4. Temporary departures of labor compensation from productivity are larger during the resurgence.

pensation and productivity. Observe that the size and the persistence of the deviations appear to be larger in more recent times. Regressions run over different time periods show this change. Below are the results of simply regressing the gap on its own lag—a first-order autoregression. There are three periods corresponding to the trend growth rate of productivity. The slowdown is the second period and the resurgence is the third period.

	Time period	Coefficient on lagged gap	*t*-value
I	1947Q2–1973Q4	0.85	17.7
II	1974Q1–1995Q4	0.91	19.8
III	1996Q1–2007Q4	0.89	13.0

Note that the persistence is slightly lower in period I than in periods II and III, confirming the evidence in the chart. However, the increased persistence does not appear to be related to the resurgence, but rather to some change that occurred earlier. A possible explanation for the earlier change is a reduction in the volatility of productivity growth, which I take up next.

4. A great moderation in productivity growth

Observe in Fig. 5 that there has been a marked reduction in the volatility of productivity growth starting in the early 1980s. It is shown graphically with the green brackets, superimposed on the red lines showing the resurgence. The reduction is clearly part of the widely discussed great moderation of real GDP growth which has been attributed to monetary policy (Taylor, 1998). The standard deviation of productivity growth from 1947Q1 to 1982Q2 was 2.1%, and from 1983Q1 to 2007Q3 it was 1.3%.

The increased persistence of the gap noted in the previous section could be related to this change in volatility. Indeed the same simple regressions of the gap on its lag used in the previous section illustrate this:

	Time period	Coefficient on lagged gap	*t*-value
IV	1947Q2–1982Q4	0.85	19.7
V	1983Q1–2007Q3	0.90	22.3

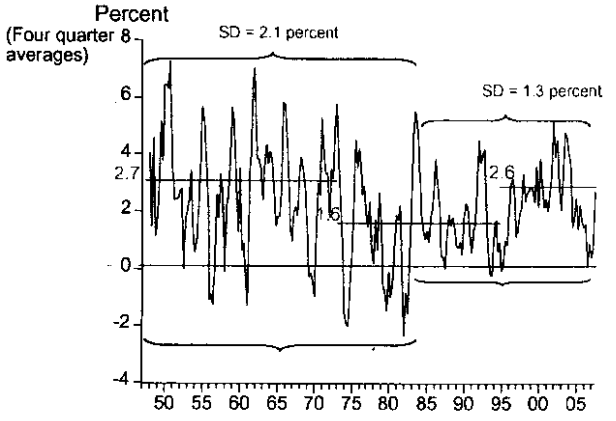

Fig. 5. A great moderation in productivity growth was associated with the productivity resurgence.

To examine this possibility, I next examine the short-run fluctuations in labor compensation.

Observe in Fig. 6 that there was no reduction in the volatility of real labor compensation during the period of the great moderation. Thus, a regression of the growth rate of compensation per hour on the growth rate of productivity results in the following:

	Time period	Coefficient on productivity growth	*t*-value
IV	1947Q2–1982Q4	.32	7.4
V	1983Q1–2007Q3	.64	6.2

Hence, at least contemporaneously, the response to compensation to productivity has increased substantially. This can be explained by the smaller short-term fluctuation in productivity.

5. Changes in the income distribution and the productivity resurgence

Many of the disappointments about the productivity resurgence seem to be related to changes in the income distribution, and in particular to the finding that the income distribution has widened,

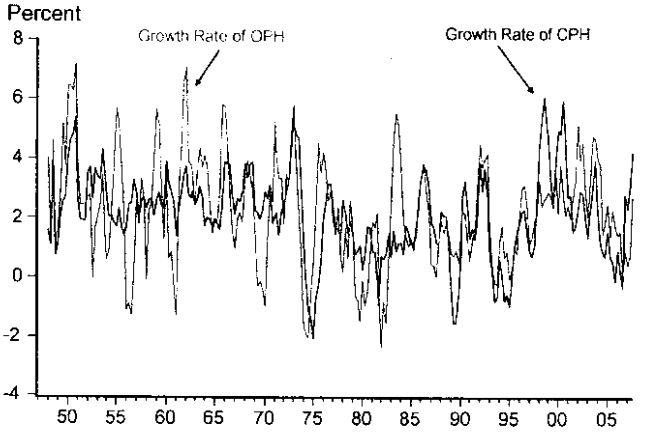

Fig. 6. No moderation of the fluctuations of labor compensation growth: short-run response of CPH to OPH doubled (.32–.65).

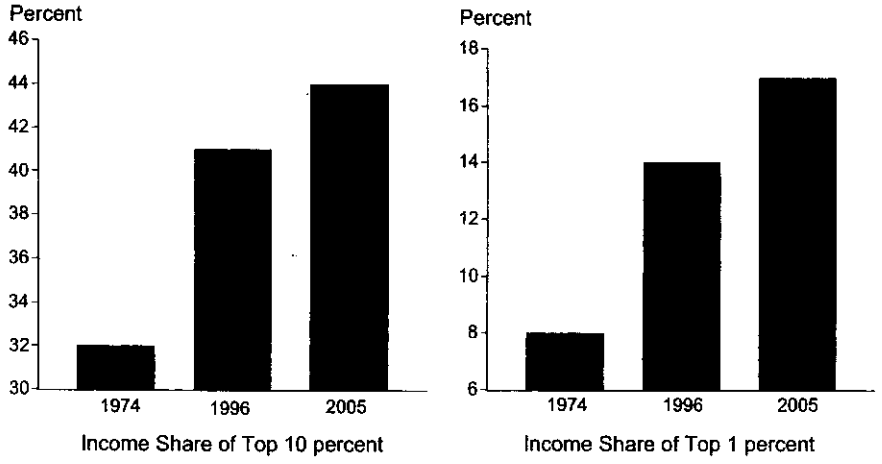

Fig. 7. Income distribution widened less during productivity resurgence than during productivity slowdown.

thereby concentrating the productivity gains on people with higher incomes. This is the primary justification given by Dew-Becker and Gordon for their view quoted at the start of my remarks.

However, the widening of the income distribution was much greater during the productivity slowdown period than during the resurgence. From 1974 to 1996 the share of income in the top 10% rose from 32% to 41%. From 1995 to 2005 it rose from 41% to 44%. See Fig. 7. The income distribution widened, but that began back during the period of low productivity growth. These data are drawn directly from the latest updates of Saez (2007), whose work has been widely cited in recent discussions of change in the income distribution.

Similar results are found if you look at other percentiles. The share of income earned by the top 1% rose from 8% in 1974 to 14% in 1996. From 1996 to 2005 it increased from 14% to 17%. See Fig. 7.

6. Income mobility and the productivity resurgence

Of course these static income distribution figures miss the movements of people from one part of the income distribution to another. Hence, the income distribution over time or over the life cycle is much different from that at a single point in time.

Has that income mobility diminished as a result of the productivity resurgence? A Treasury report completed in November 2007 shows that the answer is no. Mobility has largely remained unchanged when you compare the period of the productivity slowdown with the resurgence. For example, the degree of upward mobility from the lowest quintile was 61.1% from 1987 to 1996 compared with 62.2% from 1996 to 2005. In sum relative income mobility was about the same during the resurgence as it was during the period before. See Fig. 8. Indeed, absolute income mobility may have actually increased during the resurgence. The median income of people in the lowest quintile increased by 81% from 1987 to 1996; it increased by 109% from 1996 to 2005. (U.S. Treasury, 2007).

7. Total production as a measure of the gains from the resurgence

Another way to assess the impact of the productivity resurgence is to look directly at the increased production of goods and services that it made possible, and imagine what would have

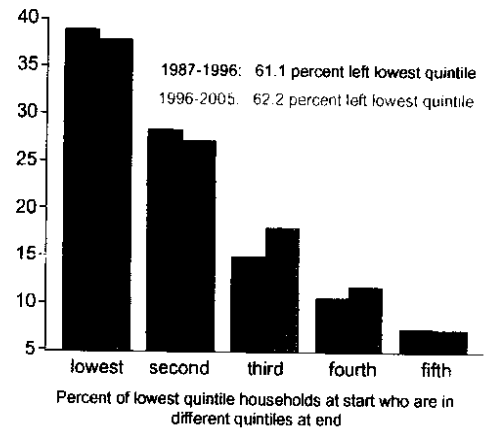

Fig. 8. Income mobility has not declined during the productivity resurgence.

happened without the resurgence. Consider therefore a counterfactual in which the productivity slowdown continued for another 12 years rather than surging in 1995. As shown in Fig. 9, over the whole period from 1995 to 2007 GDP would have been $8.4 trillion less. For 2007 alone GDP would have been reduced by $1.6 trillion per year, which is nearly three times the national defense budget.

In other words, it would have been possible to triple the amount spent on national defense, say from 3% of GDP to 6% of GDP without spending less on anything else. Of course, few would recommend the use of the additional resources in that way, and indeed even with the increased demands for security following 9/11 we have not increased national defense spending by that amount. There are many other possible counterfactuals to consider.

Suppose that government spending as a share of GDP had remained constant as a share of GDP without the productivity resurgence. With the share of government purchases (Federal, State, and Local) in GDP remaining constant at about 20%, government spending would have been $320 billion less per year in 2007 if the resurgence had not occurred. Over the 12 year period that is about $1.6 trillion less spending on education, roads, parks, homeland security, as well as national security.

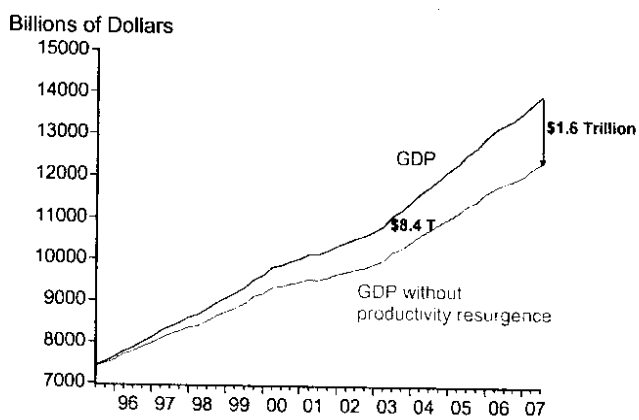

Fig. 9. The gains have been huge: $8.4 trillion and increasing at a pace of $1.6 trillion per year.

8. The productivity resurgence around the world

Finally, when we assess the gains from productivity growth resurgence, it is obviously important to consider gains around the world. With the United States near the top in terms of productivity, developing countries and emerging market countries are still catching up and have had higher productivity growth, especially in recent years. The main reason why the IMF and other forecasts project world economic growth to be 5% compared with the United States of around 3% is due to productivity growth being more than 2 percentage points higher in the rest of the world. With the productivity resurgence in the United States the rest of the world has more catching up to do and this will eventually increase productivity growth there too.

9. Conclusion

In these remarks I have focused on the period of the U.S. productivity resurgence, which began a dozen years ago in 1995. The gains from this increase in productivity growth have been huge, amounting to $1.6 trillion per year at today's pace. But during this period data show that the income distribution in the United States has widened, the relative price of consumer goods and services (including health care) has increased more rapidly than other prices, and the temporary departure of compensation from productivity growth became somewhat more persistent. For these reasons, some analysts have expressed disappointment with the productivity resurgence.

But none of these other developments can be attributed to the productivity resurgence. Indeed they all began during the productivity slowdown period which preceded the resurgence, and some were worse during the slowdown. While the increase in productivity growth has not solved all problems, it has given us the additional resources to solve many. Sustaining the productivity resurgence and even increasing it should remain a goal of economic policy in the future.

References

Dew-Becker, Ian, & Gordon, Robert J. (2005). Where did the productivity growth go? Inflation dynamics and the distribution of income. *Brookings Panel on Economic Activity, 2*, 67–150.

Jorgenson, Dale W., Ho, M. S., & Stiroh, K. J. (2007). A Retrospective Look at the US Productivity Growth Resurgence. *Unpublished working paper.*

Kroszner, Randall S. (2006). What drives productivity growth? Implications for the economy and prospects for the future. Remarks at the Forecasters Club of New York (September 27).

Lazear, Edward. (2006). Productivity and wages. *Business Economics, Journal of the National Association of Business Economics, 41*(4 (October)), 39–45.

Oliner, Stephen, D., Daniel E. Sichel, & Kevin J. Stiroh. (2007). Explaining a Productive Decade. *Brookings Papers in Economic Activity, 1*, 81–152.

Pencavel, John. (2007). *The link between labor productivity and real wages. Notes for Economics 246 Course* Stanford University.

Saez, Emmanuel (2007). Tables and figures updated to 2005 [(October), http://elsa.berkeley.edu/~saez/TabFig2005s.xls].

Taylor, John B. (November/December, 1998). *Monetary policy and the long boom.* Review, Federal Reserve Bank of Saint Louis., pp. 3–11

United States Treasury (2007). *Income Mobility in the United States From 1996 to 2005.* Report of the Department of the U.S. Treasury, November 13, 2007.