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Why are initial estimates of productivity growth so unreliable?

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ABSTRACT

This paper argues that initial estimates of productivity growth will tend to be much less reliable than those of most other macroeconomic aggregates, such as output or employment growth. Two distinct factors complicate productivity measurement. (1) When production increases, factor inputs typically increase as well. Productivity growth is therefore typically less variable than output growth, meaning that measurement errors will tend to be *relatively* more important. (2) *Revisions* to published estimates of production and factor inputs tend to be less highly correlated than the published estimates themselves. This further increases the impact of data revisions on published productivity estimates.

To assess the extent of these problems in practice, we detail the importance of historical revisions to the most commonly-used measures of US aggregate productivity growth, expanding on previous empirical work by Aruoba (2008) and Anderson and Kliesen (2006). We find that such revisions have contributed substantially to policymakers' forecast errors for US productivity growth.

Alan Greenspan on the measurement of US productivity growth

One would certainly assume that we would see this in the productivity data, but it is difficult to find it there. In my judgment there are several reasons, the most important of which is that the data are lousy.
Transcript: Meeting of the Federal Open Market Committee, December 19, 1995, p. 37.

The one thing we know about the official data on productivity is that they are wrong.
Transcript: Meeting of the Federal Open Market Committee, February 4-5, 1997, p. 101

The productivity numbers are very rough estimates because we are measuring a whole set of production outputs from one set of data and a whole set of labor inputs from a different set. That they come out even remotely measuring actual labor productivity is open to question....
Transcript: Meeting of the Federal Open Market Committee, March 25, 1998, p. 76

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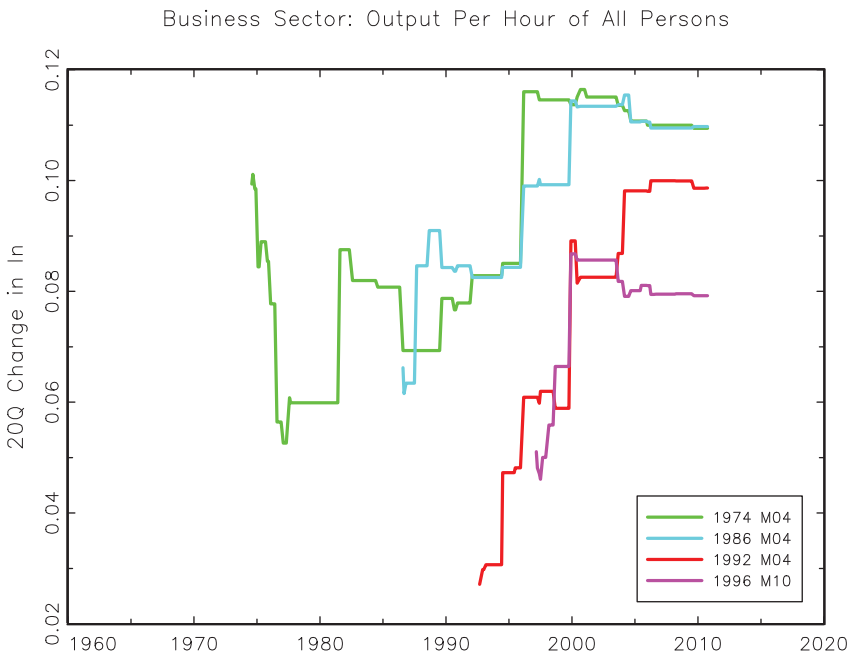

Fig. 1. Data revisions in US productivity growth.

1. Introduction

Productivity growth plays a key role in macroeconomics. Consumption and savings decisions at the core of macroeconomics depend on how perceived trends in productivity growth will affect future income streams. International differences in such trends in turn have profound influences on the balance of global saving and investment. Projected productivity growth is an important factor in forecasting long-run economic growth and therefore plays a central role in the management of public pension systems and government debt. It is an essential component in forecasting measures of economic slack and has therefore played a key role in the formulation of monetary policy.[1] The possibility of a persistent change in aggregate productivity growth casts a long shadow over many of the most important international and macroeconomic policy debates. For all these reasons, great effort is devoted to accurately measuring productivity and to the timely analysis of sources of productivity growth.

But when new productivity data are published and previously published figures are revised, conclusions about the size of productivity growth can change dramatically. For example, Fig. 1 shows the growth of labor productivity at four points in time (April 1974, April 1986, April 1992 and October 1996) and how these growth rates evolved over time as data were revised.[2] Over time, differences due to revisions become considerable, with measured productivity growth changing by a factor of two or more. As the figure makes clear, these variations are large relative to the apparent slowdown in productivity growth over time. Some of the largest changes to our estimates of the growth rate of productivity in April 1974 came more than 20 years later.

This paper investigates the statistical reliability of aggregate productivity estimates for the US. We try to explain why "recent" productivity growth estimates appear to be much less reliable than those of other series (particularly output and employment.) We argue that the importance and robust nature of revisions reflect a problem in the nature of productivity measurement. Productivity series are constructed as the residuals of cyclically-correlated measures of inputs and outputs. This causes measured productivity to be inherently less precise than either the input or output series from which it is derived.

While there is an extensive applied productivity literature, it is typically based on the most recent vintage and its emphasis is on understanding the sources of productivity growth rather than assessing the statistical reliability of productivity growth rate estimates. For example, Gordon (2000, 2010) and Jorgenson (2001) make no attempt to compare the magnitude of the effects that they find to their statistical reliability. Jin and Jorgenson (2010), who propose and apply a latent variable approach, make no mention of the precision or statistical significance of their results. As a rule their analyses effectively ignore the possibility of future data revision. The same critique applies to macroeconomic modeling exercises, such as the influential work of Smets and Wouters (2007), who ignore data revision in the estimation/calibration of their model. The studies of Field (2010) on the

[1] For example, Anderson and Kliesen (2010) argue that "The increasingly rapid productivity growth that began in the 1990s was the defining economic event of the decade and a major topic of debate among Federal Reserve policymakers." As they document in Anderson and Kliesen (2010, 2012) debates within the FOMC centered on the fact that initial estimates of aggregate productivity growth during this period were quite low and were revised upwards only many years later.

[2] Labor productivity growth is here measured by the change over 20 quarters in the natural logarithm of output per hour in the private business sector.