Kiel Policy Brief

Productivity Slowdown and Monetary Policy

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No. 57 | December 2012

Institut für Weltwirtschaft Kiel
Kiel Institute for the World Economy
ISSN 2195–7525

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1. Introduction

In the aftermath of the financial crisis of 2007–2008 (and the resulting *Great Recession*) policymakers became concerned about a potential long-term effect of the crisis on the wider economy. For instance, in an ECFIN Economic Brief titled "The financial crisis and potential growth: Policy challenges for Europe," Jan Koopman and Székely (2009) remark that a potential casualty of the financial crisis involves permanently lower potential growth rate of GDP. Similarly, in an OECD working paper, "The Macroeconomic Consequences of Banking Crises in OECD Countries" Haugh et al. (2009) point out that the protracted banking crisis in Japan in the 1990s may have been responsible for the reduction in the country's long-term (or trend) potential growth.[1]

This policy paper discusses the consequence of changes in potential growth for monetary policy performance and design. The discussion focuses on how the nature of the so-called Phillips curve, which is the hallmark of monetary policy, changes with changes in potential growth and what this means for designing monetary policy. It puts the discussion in historical perspectives, namely, the *Great Inflation* of the 1970s and the *New Economy* of the 1990s, as these episodes were characterized by changes in long-term productivity growth. The Great Inflation of the 1970s was accompanied by trend productivity slowdown while the New Economy of the 1990s was characterized by trend productivity pickup, which was driven by innovations in information technology. Both the Great Inflation and the New Economy are interesting episodes, as both also involved academic and policy debates as to the role of monetary policy in limiting or accentuating the effects of productivity growth.

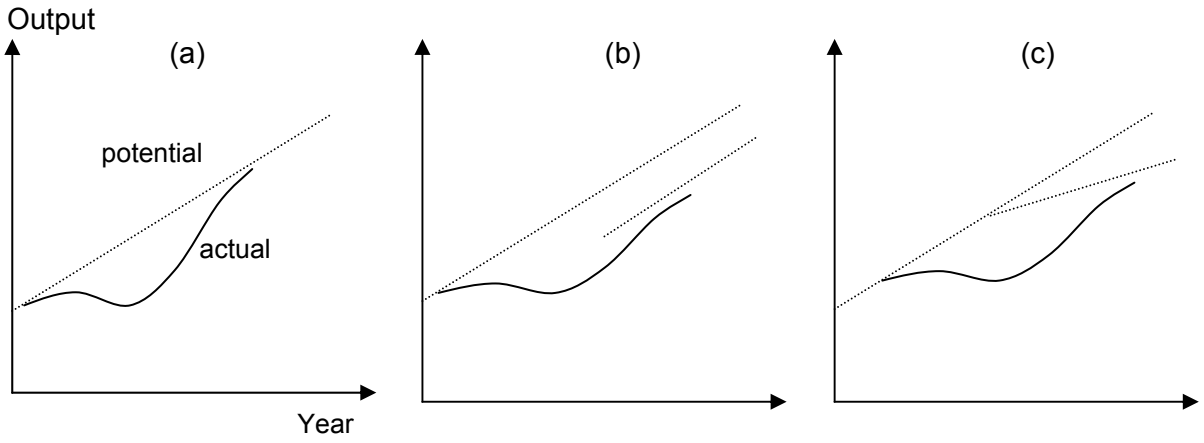
2. The Great Recession, the Great Inflation and the New Economy

Jan Koopman and Székely (2009) consider three potential scenarios regarding the path of output in Europe over the medium to long-term. The first scenario assumes full recovery following the Great Recession, in which output returns back to its pre-crisis trend after dropping temporarily. The second scenario assumes a permanent loss in potential output level while the potential growth rate remains unchanged. Thus in the long-run output grows

[1] See also OECD (2009). For an early discussion of changes in potential growth see Siebert (1992).

at its pre-crisis rate. The third scenario is more pessimistic than the first two, as it assumes a continuously widening loss in output due to permanent slowdown in potential growth. Figure 1 illustrates these three scenarios.

Figure 1:
Path of actual output and potential output: Three scenarios: (a) Full recovery scenario (b) permanent loss in potential output level and (c) continuously widening loss



As far as the Great Recession is concerned only time will tell which of the three scenarios will materialize. However, it is possible and imperative to understand what they mean and how they matter for stabilization policy. Scenario (a) basically says that the drop in output is temporary and for monetary policy it is business as usual. By contrast, scenarios (b) and (c) pose more challenges for monetary policy, as they involve changes in the structure of the economy and therefore in the policy tradeoffs facing central banks. Take for instance the Great Inflation of the 1970s in the United States, during which inflation and unemployment were high and volatile, following successive oil supply shocks and productivity growth slowdown. While the oil supply shocks are nothing new the fact that they hit the economy in times of productivity slowdown created more challenges for stabilization policies in general and monetary policy in particular.

Nevertheless, what caused Great Inflation is subject to academic and policy debates. While some emphasize monetary policy mistakes others blame unfavorable supply shocks. Grubb, Jackman and Layard (1982) in their study of the cause of what they call stagflation (i.e. the unfavorable mix of high unemployment and high inflation) in OECD countries, emphasize the roles of adverse supply shocks (in particular, the increase in the relative prices of raw materials) and productivity slowdown while also arguing that the effect of these shocks on the exact mix of inflation and unemployment depends on monetary policy accommodation.

More recently, Clarida, Gali and Gertler (2000) argue that the Great Inflation was mainly caused by monetary policy mistakes and not by adverse supply shocks. They say “while jumps in the price of oil might help explain transitory periods of sharp increases in the

general price level, it is not clear how oil price shocks alone could explain persistent high inflation in the absence of an accommodating monetary policy." (p. 147). They present empirical evidence pointing to a weakness in monetary policy that contributed to high and volatile inflation, in particular that monetary policy appeared to have been much less sensitive to inflation expectations. Perhaps surprisingly Clarida, Gali and Gertler (2000) view is shared by Arthur Burns, former chairman of the Federal Reserve. In his 1979 Per Jacobsson Lecture Burns says "… despite their antipathy to inflation and the powerful weapons they could yield against it, central bankers have failed so utterly in this mission in recent years. In this paradox lies the anguish of central banking." (p. 7).

Indeed in a world of perfect knowledge it would be a paradox if best intentions and the powerful weapons of central banks cannot achieve macroeconomic stability. However in the real world uncertainties abound about the structure and state of the economy, both of which make a central banker's life difficult. This is the argument of Orphanides and Williams (2012), among others. They emphasize three factors that contributed to the Great Inflation. First, policymakers severely overestimated the productive capacity of the economy during the critical period of 1965 to 1975. Second, they were overly confident of their understanding of the precise linkage between measures of utilization gaps and inflation. Finally, they placed a high priority on stabilizing real economic activity relative to price stability. Thus monetary policy was accommodative. The authors' empirical analysis shows that adverse supply shocks and policy misperceptions about potential output during the 1970s caused monetary policy to become overly expansionary.

How does the Great Inflation of the 1970s compare to the productivity pickup in the 1990s in the U.S.—the so-called "New Economy"—which was accompanied, according to Ball and Moffitt (2001), by a "surprisingly benign behavior of inflation and unemployment"? To be specific, Ball and Moffitt (2001) note that the fall in the NAIRU—the non-accelerating inflation rate of unemployment—to 4.2 % by the year 2000, from its previous average of around 6 %, with minor effect on inflation, thus suggesting an improvement in the unemployment-inflation tradeoff facing policymakers. To Ball and Moffitt (200) the same process that led to the Great Inflation of the 1970s worked in reverse during the New Economy in the 1990s, which is in agreement with Grubb, Jackman and Layard (1982) in the sense that workers' wage *aspirations* adjusted slowly to labor productivity pickup in the 1990s as they did to labor productivity slowdown in the 1970s. They present evidence in support of their argument by estimating a Phillips curve relating inflation to unemployment as well as to the difference between productivity growth and real wage growth. They find statistically significant effects of productivity growth on the Phillips curve after accounting for unemployment.

According to Ball and Tchaidze (2002) a favorable shift in the Phillips curve due to higher productivity growth in the 1990s allowed the Fed to deviate from its normal behavior of raising the interest rate when economic activity picked up. The Fed kept interest rates unchanged "despite a booming economy and falling unemployment that normally would have triggered a tightening."(p. 108). They support their hypothesis by showing that estimated

Taylor rules over what they call the "old economy" period (1987–1995) differed from those estimated over the "new economy" period (1996–2000).[2]

3. Productivity Growth and the Phillips Curve

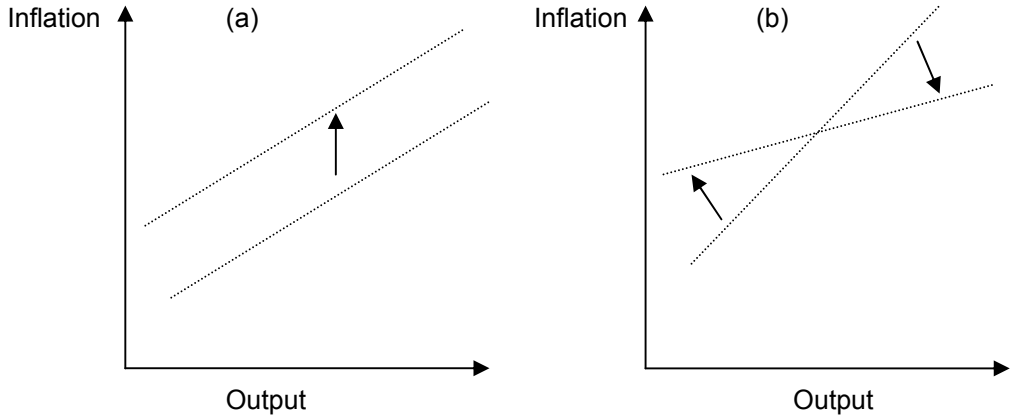
The Phillips curve is the hallmark of monetary policy. It summarizes the inflation-output or inflation-unemployment *tradeoff* in the face of inflationary shocks. That is, in order to lower inflation the central bank must accept a lower output level than potential (and correspondingly a higher unemployment rate) and vice versa. This is the reason why discussions of inflationary shocks (such as the oil supply shocks of the 1970s) are cast in terms of how these shocks affect the Phillips curve.

However, the nature of the Phillips curve (at least in academic research) has evolved overtime. To be specific, early discussions on productivity growth and the Phillips curve (such as Grubb, Jackman and Layard (1982) and Ball and Moffitt (2001)) focused on shifts in the Phillips curve while giving no attention to the role of expectations of future inflation. By contrast current research on productivity growth and monetary policy is based on the so-called New-Keynesian Phillips curve, in which inflation is determined by two key factors: expected future inflation and current output gap (defined as the gap between actual output and output that would have realized if prices were flexible—an ideal benchmark). The role of expectations about future inflation comes to light because, as empirical evidence has shown, firms change their product prices only infrequently due to various costs associated with changing them (see, e.g., ECB, 2009).

Recent research shows that when the trend productivity growth slows down the New-Keynesian Phillips curve becomes flatter, in the sense that, inflation becomes less sensitive to changes in the output gap while it becomes more sensitive to expectations of future inflation (see, e.g., Tesfaselassie, 2011). Figure 2 illustrates two potential effects of productivity growth on the Phillips curve. In panel (a) lower productivity growth shifts the Phillips curve up, implying a given output level is associated with higher inflation—thus a worsening of the inflation-output tradeoff. For example, a cost-push shock will be more inflationary and more recessionary. This is in line with the empirical results of Ball and Moffitt (2001) and Grubb, Jackman and Layard (1982). In panel (b) productivity growth slowdown rotates the Phillips curve clockwise, implying that inflation is less responsive to changes in output, as in Tesfaselassie (2011).

[2] A Taylor rule is a simple rule that describes Fed policy well in practice. The rule says that the Fed's target interest rates rises when inflation and/or when economic activity rise.

Figure 2:
The effect of productivity growth slowdown on the Phillips curve: (a) the Phillips curve shifts upward (b) the Phillips curve becomes flatter.



In terms of an econometric model, panel (a) implies that productivity growth enters as an additional explanatory variable in the Phillips curve while panel (b) implies that the coefficients of output and expected inflation in the Phillips curve change with potential growth.

4. The New-Keynesian Phillips Curve and the Performance of Monetary Policy

Rules-based monetary policy has received attention in academic and policy discussions in the aftermath of the stagflation experience of the 1970s, despite the ongoing debate about the sources of that experience. Under a rule-based monetary policy a central bank pre-announces to the public how its interest rate decisions are made. For example, the central bank may follow a simple rule where the interest rate increases with inflation or forecasts of future inflation. To proponents of monetary policy rules, the advantage of *simple* monetary policy rule is that they make communication of monetary policy more transparent.

However, the problem is that there is no direct correspondence from a monetary policy goal (say, price stability) to its implementation using the central bank's choice of the short-term interest rate in the money market. A simple policy rule can take many alternative forms, each determined by the specific information that the central bank uses in making its interest rate decisions. As recent research has shown this creates a challenge for central banks because the announcement of a simple interest rate rule does not necessarily achieve macroeconomic stability, in particular when inflation expectations are forward-looking.[3]

[3] See Bullard and Mitra (2002) for a detailed discussion.

Following Bullard and Mitra (2002) much of the literature on monetary policy considers three representative specifications of a simple policy rule. The first specification involves *contemporaneous data in the policy rule*,

$$i_t = \alpha_1 (\pi_t - \pi^*) + \alpha_2 y_t, \quad (1)$$

where the current quarter policy rate i_t responds to incoming information about the current quarter rate of inflation π_t (with π^* being the inflation target) and the current quarter output gap y_t. However, rules of the form (1) have been criticized because they put "unrealistic informational demands on the central bank." (Bullard and Mitra 2002, p. 1108). The second specification involves *expectations data in the policy rule*,

$$i_t = \alpha_1 (\pi^f_{t+1} - \pi^*) + \alpha_2 y^f_{t+1}, \quad (2)$$

where the current quarter policy rate responds to forecasts of the next quarter rate of inflation π^f_{t+1} and the next quarter output gap y^f_{t+1}, while the third specification involves *lagged data in the policy rule*,

$$i_t = \alpha_1 (\pi_{t-1} - \pi^*) + \alpha_2 y_{t-1}, \quad (3)$$

Here the current quarter policy rate responds to the previous quarter inflation rate and the previous quarter output gap. As rules of the form (2) or (3) are more realistic descriptions of actual monetary policy, in what follows we focus on these rules.

Much of the research that followed Bullard and Mitra (2002) has shown that the performance of simple policy rules, in terms of achieving macroeconomic stability, depends on whether the private sector has perfect knowledge or imperfect knowledge about the way the economy works. The difference is that under imperfect knowledge the private sector is engaged in *learning* based on past data and learning dynamics affects decision making and macroeconomic outcomes. Under imperfect knowledge a policy rule should help the private sector learn about the economy, thereby reducing private sector forecast errors, which may feedback into decision making and destabilize the economy. Even under perfect knowledge and individual rationality problems of coordination among many decisions makers (households and firms) may arise with the consequence that self-fulfilling expectations (i.e., irrespective of the fundamentals of the economy) can generate macroeconomic instability. It is this sense that Clarida, Gali and Gertler (2000) argue that monetary policy mistakes were part of the causes of the Great Inflation.

Using the Bullard and Mitra (2002) framework, one can analyze the relationship between productivity slowdown and monetary policy from the view point of anchoring inflation expectations (either by avoiding self-fulfilling expectations or learning instability). Although at an

early stage, available theoretical studies find that in periods of low productivity growth, the central bank has less freedom to follow an accommodative policy. What this means in terms of the policy rules (2) and (3) is that the interest rate should respond less aggressively to output or forecasts of output and more aggressively to inflation or forecasts of inflation. The reason is that by increasing the role of inflation expectations in determining inflation lower productivity growth increases the prospects for macroeconomic instability through self-fulfilling fluctuations or learning instability. In order to avoid instability the central bank needs to adapt to such changes by responding more to inflation data (or its forecasts) and less to output data (or its forecasts).

5. Concluding Remarks

Looking through the lens of monetary policy rules and the New-Keynesian Phillips curve what can one say about monetary policy design in the Great Inflation, the New Economy and the Great Recession? Our discussion shows that:

- One can reinterpret the stagflation experience of the 1970s in the following sense. By failing to recognize that inflation expectations have become more important than in the past owing to productivity slowdown, the Fed's policy stance was too accommodative, which led to an inflationary bout. This is in line with the evidence reported in Clarida, Gali and Gertler (2000) but unlike those authors, and in line with Orphanides and Williams (2012), the Fed's accommodative stance may have arisen from imperfect information about productivity growth slowdown or imperfect knowledge that the slowdown had affected the tradeoff between inflation and output stabilization in such a way to favor inflation stabilization over output stabilization.
- As the New Economy of the 1990s is a mirror image of the stagflation of the 1970s, the issue of anchoring inflation expectations is also consistent with the evidence reported in Ball and Tchaidze (2001) that a higher productivity growth in the 1990s allowed the Fed to be more accommodative than would be if productivity growth had not picked up.
- If it turns out that long-term growth slows down following the Great Recession (i.e., scenario (c) of Figure 1 above materializes) this would call for a stronger response of interest rates to inflation and weaker response of interest rates to output. In light of our discussion about the effect of productivity growth on the nature of the New-Keynesian Phillips curve, such a response acknowledges the larger role of inflation expectations for inflation determination and the need to anchor inflation expectations (either by avoiding self-fulfilling fluctuations or learning instability).

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Imprint

Publisher: Kiel Institute for the World Economy
Hindenburgufer 66
D–24105 Kiel
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Fax +49 (431) 8814–500

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Value Added Tax Identification Number: DE 251899169.

Authorised Representative: Prof. Dennis Snower, Ph.D. (President)

Responsible Supervisory Authority: Schleswig-Holstein Ministry for Education and Science