

# FRBSF ECONOMIC LETTER

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## Monetary Policy in a Global Environment

*This Economic Letter is adapted from remarks by Janet L. Yellen, President and CEO of the Federal Reserve Bank of San Francisco, delivered at the conference, "The Euro and the Dollar in a Globalized Economy" at the University of California, Santa Cruz on May 27, 2006.*

My topic tonight is globalization and the conduct of U.S. monetary policy. At issue is whether globalization has altered the inflation process in the United States and, if so, whether such changes impair the Fed's ability to assess the state of the economy or to conduct monetary policy to achieve its dual objectives of price stability and full employment.

Proponents of the view that globalization *has* affected U.S. inflation commonly claim that it has resulted in disinflationary pressures over the last decade. For example, Alan Greenspan (2005) made precisely this argument in Congressional testimony last year, citing the massive new "army" of workers that has become available to engage in the world's markets—some 100 million plus from the former Soviet bloc, some 750 million from China, and the growing powerhouse of talent that India's workers represent.

Beyond its direct impact on the *level* of U.S. inflation, proponents of this "new view" contend that globalization has altered the *dynamics* of inflation—the linkages between current inflation, lagged inflation, domestic unemployment, and supply shocks that are summarized by the Phillips curve. In particular, their view is that globalization has weakened the traditional link between domestic resource utilization and inflation: With prices increasingly set in global markets, firms have less room to pass on higher costs—whether due to wages, energy, or materials prices; instead, they have to do what they can to control costs, identify productivity improvements to offset cost increases, and ultimately absorb any fluctuations in unit costs in their profit margins. As *The Economist* (2005) recently opined: "This makes a non-sense of traditional economic models of inflation, which virtually ignore globalization...." Some observers go even further, arguing that the slack that matters to inflation is not domestic slack but global slack (see, for example, Fisher 2005).

My objective in these remarks is to discuss several conceptually distinct channels through which glob-

alization might affect the process of inflation in the United States, to assess some empirical evidence bearing on the strength of such linkages, and to reflect on the implications for monetary policy.

To preview my conclusions, some very tentative evidence supports the proposition that increasing global capacity, on balance, has held inflation down over the last decade. But, the magnitude of the dampening effect appears to be modest, and exchange rate fluctuations, possibly related to other shocks, have played a significant role. There is also evidence that the (price-price) Phillips curve has become flatter—a phenomenon that may be related to globalization.

With respect to monetary policy, I find nothing either in theory or the existing empirical evidence to overturn the conclusion that a country like the United States, operating under a flexible exchange rate regime, can ultimately achieve the inflation target of its choice. That said, global factors may impact inflation in the medium term, just as higher productivity growth is now widely recognized to have put downward pressure on inflation during the second half of the 1990s. And insofar as globalization has affected the dynamics of inflation—through changes in the slope of the Phillips curve or the NAIRU (non-accelerating inflation rate of unemployment)—it may require some recalibration of policy responses.

### Linkages between globalization and inflation

In discussing how globalization potentially affects the inflationary process, it is common to focus on a number of distinct channels, and I will follow that approach here. However, I want to emphasize that, at least in some cases, these channels represent partial effects that may have repercussions on other variables—such as the exchange rate—in a fully specified model. Movements in these other variables may materially affect one's views on the impacts of globalization. However, I will defer that consideration until I turn to assessing the interpretation of the empirical results in the literature.

The first channel is the most obvious one—the direct effect of the reductions in the prices of imported goods and services that may be caused by globalization, and which are included in the indices of consumer prices that central banks commonly target.

Import prices also could have *indirect* impacts on inflation. One such indirect linkage might operate through the labor market if nominal wage demands are influenced by the prices of imported consumer goods. The argument here is that a decline in the price of imports raises the real reward to work, namely, the purchasing power of a given nominal wage. Such real wage increases may raise labor supply. Alternatively stated, lower import prices could reduce workers' demands for nominal wage increases.

Another indirect channel reflects the possibility that lower import prices may restrain the prices charged by domestic producers of competing products. Increased global competition, as the "new view" emphasizes, may have made the demand curve facing American producers more elastic, resulting in larger feedbacks from lower import prices into core inflation. The now standard practice of including import prices in the price-price or wage-price Phillips curve provides a way to capture both direct and indirect linkages from import prices to domestic inflation.

In addition, this constraint on pricing ability could affect other parameters in Phillips curves. This effect might operate in a couple of ways. First, when lower domestic unemployment leads to higher wage demands, firms may not be able to pass through the higher costs, but must absorb them in their markups. As a result, a Phillips curve that expresses inflation as a function of slack, lagged inflation, and other variables (the so-called price-price Phillips curve) would become flatter—with a smaller response of inflation to measures of slack—as the "new view" emphasizes.<sup>1</sup> This result would hold even if the response of wage growth to slack were unchanged.<sup>2</sup>

However, it is also possible that globalization could reduce the sensitivity of domestic wages to changes in domestic labor market slack—in other words, it also could make the wage-price Phillips curve flatter. Suppose, for example, that globalization has enhanced the opportunities for firms to substitute imports for domestic output. This could occur in part because firms operating plants in several countries may be able to shift production from plants in the U.S. to those in lower-cost countries. As such opportunities for substitution increase, firms might become less willing to grant wage increases that would impair their cost competitiveness, even in the face of tight domestic labor markets. Such substitution effectively increases the degree of competition between domestic and

foreign workers. In the limit—when such substitution in effect creates a single global labor market—it could be that global, not domestic, labor market slack explains changes in U.S. wages and inflation.

A distinct but related possibility is that globalization may be undermining the bargaining power of U.S. workers, making them more fearful of job loss, thus lowering wage demands and holding inflation down. This might show up as a downward shift in the Phillips curve, similar to the impact of more rapid productivity growth in the second half of the 1990s. However, globalization is but one of several structural shifts that may have deepened worker insecurity, especially among less-skilled workers.<sup>3</sup> These shifts include increased use of domestic outsourcing and skill-biased technological changes that have decreased the demand for less-skilled workers and constrained their wages in most sectors of the U.S. economy. Alternatively, globalization, coupled with technological change, may simultaneously have raised the bargaining power of many skilled workers with opposite effects on the Phillips curve.

A final linkage from globalization to inflation worth noting pertains to productivity. Some have argued that increased global competition has raised firms' incentives to innovate and their ability to achieve productivity improvements in part via foreign outsourcing of intermediate goods, IT services, and back-office functions. Productivity growth (or its change), as we saw during the boom of the 1990s, may affect the dynamics of inflation. In essence, faster productivity growth matters to inflation, at least for a time, because it holds down cost pressures. Stated differently, more rapid productivity improvements make it easier for firms to satisfy workers' aspirations for real wage gains. Faster productivity growth thus tends to lower inflation unless or until workers' real wage aspirations rise to match the productivity gains.

### **Evidence from import prices**

Several recent studies, employing different empirical strategies, have attempted to assess the magnitude of direct and indirect linkages between import prices and inflation for the U.S. and other industrial countries.

For example, a recent IMF (International Monetary Fund 2006) analysis estimates (price-price) Phillips curve relations for a panel of eight industrial countries, including the U.S. The study finds that the slower rise in relative import prices in recent years has had

<sup>1</sup> As a result, markups would show stronger cyclical variation.

<sup>2</sup> For an analysis of how greater openness and increasing elasticity of substitution can affect the slope of the Phillips curve, see Clarida, Gali, and Gertler (2001).

<sup>3</sup> A model that captures many of the factors described here is in Bean (1994).

only a fairly small impact on overall inflation.<sup>4</sup> For the U.S., the study estimates that a 1% decline in relative import prices lowers CPI inflation by only 15 basis points after one year and 6 basis points after three years. Based on such estimates, the IMF calculates that non-oil import price reductions lowered U.S. inflation by an average of 1/2 percentage point a year over 1997 to 2005.<sup>5</sup> These results are in line with those from a recent analysis at the Federal Reserve Board that estimates that lower (core) import prices have reduced core U.S. inflation by an annual average of 1/2 to 1 percentage point over the past 10 years (Kohn 2005).

Another empirical strategy that has been used to identify possible *indirect* effects of globalization on pricing by domestic producers involves the use of sectoral data. The IMF study I mentioned is representative. It finds that a 10% increase in a sector's import ratio—that is, the ratio of imports to domestic production—reduces its price relative to an index of aggregate producer prices by 1%. There is also some limited evidence that manufacturing sectors with rising import shares experienced lesser increases in domestic unit labor costs and intermediate goods costs than the average industry. This result is consistent with the hypothesis that globalization is holding down wages in some industries and outsourcing may be lowering the costs of intermediate goods. Nevertheless, the estimated magnitude of the effects of openness on producer prices is still rather small. Thus in manufacturing, which has perhaps been most impacted by globalization, the IMF estimates that increased trade openness has reduced relative producer prices by 0.3% per year between 1987 and 2003.

In light of China's rapidly growing economy and exports and the limited flexibility of its exchange rate against the dollar, proponents of the "new view" commonly single that country out as a source of global disinflationary pressures. However, a Federal Reserve Board study focusing on the specific impact

of China on U.S. prices finds only modest effects (Kamin, Marazzi, and Schindler 2004). It estimates that a rise in China's share of imports in a particular sector lowers U.S. import prices, but this effect is not substantial. The results imply that the roughly 0.6 percentage point per year rise in China's share of U.S. imports since 1993 has lowered U.S. import inflation by about 0.8 percentage point per year. With imports now only about 16% of U.S. GDP (in nominal terms), this translates into an annual decline in U.S. consumer prices of about 0.1 percentage point. This study finds no evidence of indirect effects of Chinese import prices on U.S. producer prices.

The array of evidence I have summarized thus far suggests that foreign factors have had some impact on U.S. prices—an impact that may be increasing—but overall it has been rather limited. Such findings should not come as a great surprise. Despite the growing trend toward integration, the U.S. is far—very far—from being fully integrated with the rest of the world's markets. As I just mentioned, imports still amount to a fairly small fraction of U.S. GDP. In addition, many U.S. goods are not traded, and despite stories about U.S. firms hiring programmers in Bangalore and typesetters in Beijing, they still have to "buy American" when it comes to a host of other services and trades, such as health care, entertainment, and construction. The prices of these nontraded goods and services, which represent the large majority of domestic consumption, are not directly affected by foreign price developments. Therefore, domestic price developments arguably still weigh far more heavily in the overall domestic price level than do foreign price developments.

Moreover, the evidence of small foreign effects that I've discussed may actually overstate the true effects of globalization. The reason has to do with exchange rate adjustments. It might seem obvious that if low-wage countries like China and India have a growing capacity to supply labor-intensive goods to global markets, that would produce a persistent downward trend in the dollar prices of U.S. imports. However, the dollar prices of imported goods reflect not only the selling price of these goods in foreign currencies but also movements in the value of the dollar vis-à-vis those currencies. In many theoretical models of an open economy with flexible exchange rates, however, a country's real exchange rate and its import prices are not ultimately determined by foreign price trends. In simple models, changes in the foreign currency prices of imports tend to be offset by movements in the exchange rate, leaving domestic import prices unchanged. In other words, a flexible exchange rate hypothetically shields a country from the direct effects of globalization.

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<sup>4</sup> Since the 1960s, U.S. import prices, both core and overall, have risen at about the same annual rate as consumer prices—roughly 4%. But since 1997, core import prices (excluding petroleum, natural gas, computers, and semiconductors) have risen only 0.4% per year, versus 1.7% for core consumer prices (PCE price index).

<sup>5</sup> The IMF's counterfactual calculations assume that relative non-oil import prices moved during the 1997–2005 period in line with an historical trend decline of 1.6% per year. Note, however, that this decline reflects the inclusion of computers and semiconductors; if those elements are removed, as they are in the Federal Reserve Board's measure of core import prices, then there is no trend decline.

Furthermore, the fluctuations that we have observed in import prices—fluctuations which the Phillips curve studies I’ve discussed implicitly attribute to greater world capacity—may actually have resulted from conceptually distinct causes, such as “capital account shocks” affecting global capital flows. For example, an appreciation of the dollar, and a corresponding reduction in import prices, would be expected in the aftermath of a shock that widens the gap between desired foreign saving and investment. Such a shock arguably occurred in the wake of the global financial crisis in 1997–98 and as a consequence of Japan’s banking crisis. An increase in the return to investment in the U.S. could similarly have induced capital inflows that appreciated the dollar.<sup>6</sup>

In support of the view that import price movements have actually been driven at least in part by factors unrelated to “globalization,” the Board study I mentioned (Kohn 2005) finds that movements in exchange rates have been at least as important as movements in the foreign currency prices of imported goods in accounting for fluctuations in U.S. import prices. The importance of exchange rate fluctuations as a source of variation in import prices explains why the IMF study finds large year to year variability in the impact of import prices on inflation. According to its estimates, significant declines in non-oil import prices, largely due to the appreciation of the dollar, held down U.S. inflation by about 1 percentage point during 1998–1999, following the Asian financial crisis, and by  $\frac{3}{4}$  percentage point during the 2001–02 global slowdown.<sup>7</sup> Such movements in the dollar are neither simply nor obviously related to the growing global capacity often cited by proponents of the “new view.”

### Other findings

I have thus far summarized the findings of studies that attempt to gauge the direct and indirect effects of import price movements on inflation. As I noted earlier, globalization could also affect the Phillips curve in other ways. Unfortunately, research bearing on some of the linkages I discussed is scanty. But a review of the literature suggests that there is substantial empirical evidence supporting the “new view” conclusion that the (price-price) Phillips curve has

flattened. The evidence pertains to the U.S. and also to other industrial countries.

For example, a study at the Federal Reserve Board finds that the responsiveness of U.S. inflation to measures of domestic capacity has fallen by roughly a third since the mid-1980s (Roberts 2004). The IMF study cited earlier finds a similar result for the eight advanced countries, including the U.S., in its sample. While the empirical finding of a flatter Phillips curve appears pervasive, this result could be open to differing interpretations. The IMF study presents evidence suggesting that greater openness explains over half of this reduced sensitivity.

A BIS (Bank for International Settlements) study attempts to sort out the relative importance of domestic and global capacity pressures by including both measures in Phillips curve equations for a sample of 16 countries (Borio and Filardo 2006). It finds that a measure of world capacity is significant in explaining inflation and reduces the effect of domestic capacity on inflation. Taken at face value, this analysis implies that inflationary pressures could remain contained in countries where domestic resources are fully or more than fully employed as long as there is excess capacity in the global economy.

However, I would need to see more evidence to be convinced of this result. The use of aggregate Phillips curve methodology to analyze national wage and price trends is commonly justified by the assumption that labor and capital are sufficiently mobile across localities and regions in a single country to justify the vastly simplifying assumption of a single national labor market. Measures of sectoral shifts are sometimes included as an additional variable in the Phillips curve because such an assumption is stretched, even in the case of a single country. But if the assumption of perfect labor mobility seems stretched at the national level, it remains far, far less plausible at the global level. I would urge additional research to assess its robustness and clarify its appropriate interpretation.

Moreover, San Francisco Fed staff found that measures of world capacity are not significant when added to the Phillips curves that they use to forecast inflation, and that the usual measures of domestic labor and product market slack retain their significance. In addition, the staff examined a wage-price Phillips curve and found no change in the coefficient on the unemployment rate in recent years. In other words, this exercise also suggests that domestic slack plays about the same role in the inflation process as it did previously. As I indicated in my discussion of possible linkages from globalization to U.S. inflation, the result also suggests that, insofar as globalization has led to a flatter price-price Phillips curve, it is more likely

<sup>6</sup> For a fuller discussion of these points and their implications for the U.S. current account deficit, see Bernanke (2005).

<sup>7</sup> It should be noted that in the case of the U.S. the impact of lower foreign prices during this time was augmented by an appreciating dollar, part of which may have endogenously reflected currency depreciations by emerging markets needing to improve their current account balances.

to have done so through changes in firms' ability to mark up costs in setting prices than through changes in the effects of domestic slack on wage growth.

### Implications for monetary policy

Let me now turn to the final portion of my remarks and attempt a response to the question: What implications does globalization have for the Fed's conduct of monetary policy? My main conclusion is that globalization has no impact on the Fed's ability to control inflation in the long run, although structural shifts associated with globalization could, in principle, affect the NAIRU, the level of labor market slack associated with price stability. That said, I am not aware of persuasive evidence that it has done so. However, globalization may have an effect on wage/price dynamics and, as such, may require that monetary policy be recalibrated to take these changes into account, much as was required in the latter half of the 1990s in response to the surge in productivity growth.

Since the focus of so much empirical work pertaining to globalization centers on import prices, it seems logical to begin by considering the consequences of import price shocks for monetary policy. The implications are straightforward, because changes in the prices of imported goods, whatever their cause, are akin from a policy perspective to other "supply shocks," such as a change in the price of oil. Ever since the 1970s, such "shocks" have routinely been incorporated in the Phillips curve models used to forecast inflation, and their policy implications are well understood. The consensus among economists is that "one-shot" changes in the prices of imported commodities, such as oil, impact inflation for a time, but not permanently, unless they touch off a change in inflation expectations, setting off a wage-price spiral as in the 1970s. Appropriate policy actions by the Fed—a credible commitment to price stability consistently backed by actions to anchor inflation to price stability—are essential to ensure that such supply shocks do not become embedded in inflation expectations. The Fed has learned a great deal since the 1970s about the dangers such shocks pose to inflation outcomes absent appropriate monetary policies and a commitment to price stability. Indeed, the Fed by now has established such a strong and credible record that empirical evidence suggests that there has actually been less spillover of import prices, including energy prices, into core inflation since the mid-1980s

It is conceivable, of course, that the forces associated with globalization might result not in "one-shot" type shifts, affecting the level of relative import prices over a short period, but a tendency instead for upward or downward pressures over a prolonged period. Such long-lasting shifts in the relative price of imports

would create tailwinds for policymakers—if, for example, rapid growth in global supply places prolonged downward pressure on import prices—or headwinds, if, for example, strong global growth instead produces a chronic upward trend in relative commodity prices. The possibility of prolonged downward pressure on import prices due to the integration of China and other emerging markets in the global economy is presumably what Greenspan and others have in mind when they describe globalization as a disinflationary force. As the logic of the Phillips curve makes apparent, such long-lasting shifts in import prices would indeed require the Fed to adjust its monetary policy to keep overall inflation in the vicinity of the Fed's preferred target. To combat the "headwinds" associated with chronically rising import prices, monetary policy must be tighter, which entails greater slack in the labor market. Tailwinds due to falling import prices, in contrast, lower the degree of slack required to attain a fixed inflation objective. It is in this sense that ongoing negative supply shocks raise the NAIRU, while ongoing positive supply shocks lower the NAIRU.

A continued and pronounced downward trend in relative import prices would impact the U.S. inflation process in a manner akin to the productivity speedup in the 1990s—a prolonged, positive supply shock from a Phillips curve perspective. Indeed, some have hypothesized that globalization may actually have spurred some of the innovations that caused productivity to surge. More rapid productivity growth, which the U.S. still enjoys, enabled the Fed to keep unemployment at extraordinarily low levels for an extended period while simultaneously bringing inflation down to levels consistent with price stability. The productivity speedup, coupled, in fact, with a marked reduction in import prices associated with the appreciation of the dollar in the latter half of the 1990s, made the Fed's job a great deal easier.

In addition to linkages to inflation that operate through the channel of import prices, my earlier discussion highlighted the possibility that globalization could account for the flatter (price-price) Phillips curve. To my mind, such changes in the slope of the Phillips curve have no obvious implications for the Fed's ability to achieve its dual objectives of price stability and full employment.<sup>8</sup> However, a flatter Phillips

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<sup>8</sup> In the limiting case in which domestic inflation is completely unresponsive to movements in domestic slack, Fed-engineered changes in aggregate demand would have no direct impact on inflation, nullifying the normal mechanism by which the Fed controls inflation. However, tighter monetary policy would likely still affect inflation directly, to the extent that interest rate differentials induce capital flows that appreciate the exchange rate.

curve could complicate the Fed's job by making policy errors both easier to commit and more costly to repair. Reduced sensitivity of inflation to domestic unemployment means that emerging inflationary pressures take longer to become evident and are more difficult to discern. As a consequence, the Fed might be tempted to let these pressures build up, taking comfort from the fact that the inflationary consequences appear to be small or nonexistent. Such reasoning is misguided, however, because reduced sensitivity of inflation to slack simultaneously raises the sacrifice ratio, which is the cost of restoring price stability once inflation has unacceptably risen.

I have implicitly assumed in my discussion so far that the Fed's ability to influence aggregate demand and thereby inflation is unaffected by globalization. This assumption arguably requires some defense because the growing integration of capital markets—another aspect of globalization—has increased the sensitivity of global capital flows to interest rate differentials and expectations concerning exchange rate movements. Do linkages among interest rates rob monetary policy of its power to affect demand? My answer to this question is no. I base it on both economic theory and the evidence. Of critical importance to the effectiveness of monetary policy with highly integrated global capital markets is that the U.S. operates under a regime of flexible, not fixed, exchange rates. Under a fixed rate regime, the Fed would indeed have little or no scope to influence spending. For example, a contractionary open market operation intended to decrease bank reserves and raise domestic interest rates, thereby inhibiting spending, would induce capital inflows forcing the Fed to defend its currency peg by acquiring foreign exchange. Such offsetting exchange reserve flows add to bank reserves, in effect nullifying the original policy action.

A flexible exchange rate regime makes a world of difference to monetary policy. Free of the obligation to defend any currency peg, the Fed retains control over its monetary base. Since the U.S. is a large player in the global economy and in capital markets, U.S. monetary policy commonly impacts both interest rates and the value of the dollar. Repercussions of monetary policy on the dollar typically occur to the extent that capital flows are sensitive to global interest rate differentials. The transmission mechanism for U.S. monetary policy operates through both channels of influence which work in tandem to affect aggregate demand. The tendency of the dollar to appreciate in response to a tighter monetary policy also creates a direct link to inflation via lower import prices.

From the perspective of monetary policy, there is one notable asymmetry affecting the Fed's ability

to combat any "headwinds" or "tailwinds" associated with globalization. The asymmetry results from the so-called zero bound on nominal interest rates—which sets a lower limit on the federal funds rate below which it cannot go should the Fed need to stimulate the economy to counter deflation. With sufficiently intense deflationary "tailwinds," the Fed could conceivably exhaust its scope for response, at least using conventional policy approaches. In fact such risks became palpable in 2003—for the first time in half a century. This episode stimulated not only thoughtful policy research but also a creative and constructive response on the part of the Fed.

I will conclude by summarizing the main themes in this talk and emphasizing the value of additional research. The evidence I reviewed suggests that shifts in the relative price of imports—one mechanism through which globalization might affect U.S. inflation performance—have thus far been relatively modest. Evidence also suggests that the Phillips curve has flattened, a phenomenon that could be related to globalization. There are a number of additional channels through which structural changes associated with globalization could affect labor and product markets, and these changes could, in turn, alter the NAIRU, possibly for an extended time. Unfortunately, existing evidence pertaining to the operation of these various linkages is scanty or nonexistent. To the best of my knowledge, econometric estimates of the U.S. Phillips curve provide no obvious evidence of any pronounced shift in the NAIRU in recent years.

From the perspective of monetary policy, globalization does matter. Shocks and persistent economic trends associated with America's involvement in the global economy must be factored into the design of an appropriate monetary policy. Even so, globalization does nothing to imperil the Fed's ability to attain its inflation objectives. We still have a lot to learn about the mechanisms through which globalization is impacting the U.S. economy. As the globalization trend unfolds, we policymakers will turn to you, our colleagues in the economics profession, for the best in theory and evidence to guide us.

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