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THE IMPACT OF GLOBALIZATION ON THE U.S. BUSINESS CYCLE

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This paper investigates whether the U.S. has become more globalized and if so whether that increased globalization has helped hold down inflation and prolong the current economic expansion. We find that U.S. globalization, which has been rising significantly over the past four decades, surged beyond its earlier trend in the 1990s. Import prices exert a greater impact on prices of products in industries faced with greater import penetration. High foreign excess capacity accounts for much of the recent decline in U.S. inflation. Finally, the degree of business cycle synchronization appears to influence the duration of business cycles. Synchronized cycles are shorter than asynchronized cycles. Our findings suggest that foreign recessions have enhanced the role of globalization in sustaining the current expansion; however, globalization alone could have shortened, not lengthened, the current expansion if it were synchronized with foreign expansions.

1. INTRODUCTION

Has globalization prolonged the U.S. expansion of the 1990s? Two hypotheses have been proposed for how the rise in globalization may have held down inflation and therefore deterred the Fed from tightening monetary policy and prolonged the current U.S. expansion. The first is the so-called "competing-goods effect" hypothesis which contends that greater competition from foreign producers has limited the ability of domestic producers to raise prices. The second hypothesis maintains that excess capacity abroad has helped U.S. manufactures meet the robust domestic demand in the U.S. without straining domestic resources and pushing up inflationary pressures.

This paper first lays out a general framework that integrates these two hypotheses, and then investigates each of them empirically. We find evidence in support of both hypotheses. To examine the competing-goods effect hypothesis, we estimate panel data regressions to find whether import prices have indeed exerted a greater impact on product prices in industries that are faced with greater import penetration. The results are affirmative.

We study the second, and more general, hypothesis by making three inquiries. First, has the rise in globalization coincided with the breakdown of the traditional Phillips curve's ability to predict inflation that began in early 1990s? That is, has the United States become considerably more open in the 1990s than in previous years when the Phillips curve tracked inflation with reasonable accuracy? Second, has foreign capacity utilization played an important role, along with traditional explanatory variables, in predicting inflation? Finally, have U.S. expansions tended to be longer when foreign economies have larger excess capacity, and shorter when foreign economies have smaller excess capacity?

Our empirical evidence suggests that the answers to all three inquires are also positive. Most striking is the finding that, by including foreign capacity utilization in the estimation of a Phillips curve equation, almost all of the missing inflation—the difference between actual inflation and predicted inflation based on the traditional Phillips curve—since 1994 disappears.

Our findings suggest that the interaction of slack foreign economic conditions and greater openness to trade may have helped prolong the current U.S. expansion, but globalization alone has not permanently reduced the threat of recession or inflation. Indeed, greater globalization may even help shorten expansions or lengthen recessions when those economic conditions are synchronized with conditions abroad.

No single researcher has looked at all of the questions posed in this paper but each question has been investigated separately before. Krugman (1994,1995) and Irwin (1996) have looked at whether the U.S. has become more globalized over the past decade. They find that trade with the rest of the world is not a significant or rapidly growing influence on the U.S. economy. The question of whether prices of foreign goods influence domestic prices through the competing-goods effect has been investigated by Swagel (1997). He finds a statistically significant but small impact in 10 of the 19 industries in his sample. Similarly, Slaughter and Swagel (1997) find that increased globalization has had only a modest impact on wages in industrialized economies. Finally, Orr (1994) and Tootel (1998) find very little or no impact of foreign capacity utilization on domestic inflation.

The rest of the paper is organized as follows. Section 2 discusses how globalization may affect the length of the U.S. business cycle through capital and trade-flow effects. Section 3 looks at whether the U.S. has become more globalized, in terms of the volume and diversity of trade as well as the volume of capital flows, in the 1990s. Section 4 investigates whether the rise in the U.S. integration with the rest of the world has led to an increase in import prices' influence on manufacturing prices through competing-goods effects. Section 6 examines whether, and to what extent, U.S. inflation is influenced by foreign capacity utilization. Section 6 investigates whether the durations of U.S. business cycles have been affected by the degree of cyclical synchronization around the globe. Section 7 concludes.

2. HOW DOES GLOBALIZATION AFFECT THE BUSINESS CYCLE?

Numerous academic articles have been written about how foreign growth affects the *strength* of domestic economic growth through trade flows. Few papers have examined how foreign economic conditions may affect the *duration* of domestic expansions and contractions as the U.S. becomes increasingly integrated with the rest of the world. In this section we investigate how globalization may affect the *duration* of U.S. business cycles.

Our maintained hypothesis is that most (if not all) of U.S. expansions after World War II have ended with the Federal Reserve's tightening of monetary policy in response to the threat of (or actual) increase in inflation (see Romer and Romer, 1989). An implication of this hypothesis is that expansions that are accompanied by modest inflation are likely to last longer than those accompanied by higher inflation. Thus, our analysis here focuses on how globalization provides the channels through which foreign conditions affect domestic inflation.

The impact of globalization on U.S. inflation will depend on the economic conditions in the U.S. relative to those abroad. For example, if a U.S. expansion is accompanied by deflationary pressures abroad, globalization is likely to help lengthen the U.S. expansion (relative to autarky) by dampening inflation. On the other hand, if the U.S. expansion is synchronized with foreign expansions, then the impact of increased globalization on the U.S. business cycle will depend on the relative strength of the two economies. Globalization will shorten a U.S. expansion if foreign growth is relatively stronger, but lengthen a U.S. expansion if foreign growth is relatively weaker.

This section will focus on the cases when the U.S. is in the expansion phase of a business cycle. The cases where the U.S. is in recession can be inferred by symmetric reasoning.

Foreign influences on the U.S. inflation rate could operate though trade-flow and capital-flow channels. To illustrate how these channels operate we consider a world with two economies: domestic (the United States) and foreign. We further assume that the exchange rate floats freely to clear currency markets.

The U.S. consumer price index (p) can be thought of as a weighted average of three components—the dollar price of imported goods (p^m), the price of import-competing goods (P^c) and the price of other goods and services in the consumption basket (p^o):

$$p = \alpha p^m + \beta p^c + \gamma p^o, \qquad (2.1)$$

where α, β, γ represents, respectively, the shares of imported, import-competing, and other goods and services in the consumption basket. All shares are positive and sum to one.

We assume that the price of other goods is a positive function of the cost of capital (i), the unit labor cost (u) , and the price of imports (p^m):

$$p^o = p^o[i, p^m, u, z], \quad p^o{}_1 > 0, p^o{}_2 > 0, p^o{}_3 > 0. \qquad (2.2)$$

The vector z represents other factors that could influence p^o.

We further assume that the price of import-competing goods is a positive function of the cost of capital (i), the unit labor cost (u) , the price of imports (p^m), and the profit margin (λ):

$$p^c = p^c[i, p^m, u(p^m), \lambda(p^m), x] \qquad (2.3)$$

$$u' \geq 0, \lambda' > 0, p^o{}_1 > 0, p^o{}_2 > 0, p^o{}_3 > 0, p^o{}_4 > 0.$$

The vector x represents other variables that affect p^c.

Equations (2.2) and (2.3) embody the assumption that prices are determined by a mark-up over the long-run marginal cost. The long-run marginal cost is a function of the cost of capital, unit labor costs, and the cost of imported inputs. An increase in the cost of capital (i) will raise p^c and p^o by increasing the long-run marginal cost. An increase in either u or p^m will raise p^c and p^o by raising the variable cost of output.

We assume that, given the marginal cost schedule, producers have the pricing power to adjust the mark-up (or, profit margin) to maximize profits, and that the pricing behavior of producers in the import-competing industries is affected by the competitive pressure coming from imports so that λ is a positive function of p^m. This assumption is consistent with the standard pricing theory in monopolistic competition models where an increase in the perceived price elasticity will induce firms to lower the profit margin (λ), and vise versa[1]. An increase in p^m thus will increase the profit margin by lowering the perceived price elasticity for import-competing goods.

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1. To see that firms' strategic mark-up is an inverse function of price elasticity, recall that a monopolistic firm will aim to maximize profits by producing and selling a target quantity Q*. At Q*, unit price (P) is equal to marginal cost (MC) plus the profit margin (λ), and λ is equal to $-P/\eta$, where η is the price elasticity of demand.

We also assume that falling import prices could result in lowering the unit labor cost of domestic firms by forcing them to enhance productivity, so that u is a non-negative function of p^m. This assumption makes sense since the inevitable pressure on wage inflation in a tightening labor market, which is a normal byproduct of a continuing expansion, will give domestic firms a strong incentive to improve their productivity to prevent profit margins from being completely eroded.

Now we can proceed to discuss how foreign conditions affect the duration of the U.S. business cycle.

2.1 The U.S. and Foreign Are Asynchronized

Suppose the U.S. economy is expanding while the Foreign economy is in a recession. That is, the U.S. has stronger final demand, higher interest rates, higher inflation, higher capacity utilization, and stronger currency than the Foreign economy does. In this case, the increasing trade and capital flows between the Foreign and the U.S. economies will unambiguously help prolong the U.S. expansion relative to autarky through several effects.

The capital-flows effects

a. The cost-of-capital effect: Foreign capital will flow into the U.S. in search of higher rates of return. This inflow of capital will help hold down the long-term interest rate and push up equity prices, thereby lowering the cost of capital. This decrease in the cost of capital will help spur business investment. The increase in business investment will expand productive capacity, helping to lower the long-run marginal cost of production. This will help dampen the pressures on P^c and P^o to rise in the midst of continuing strength in demand.

b. The wage-setting effect: U.S. firms will have better bargaining power (than in autarky) in wage negotiation, since they can choose to move their production abroad to take advantage of lower wages there. Consequently, wage pressures on inflation will be more mild than in an autarky. Holding productivity unchanged, this will lower the unit labor cost relative to what it might have been in autarky. This in turn will help mitigate the inflationary pressure coming from rising labor costs, making it easier for the expansion to go on without invoking a monetary policy tightening.

The trade-flows effects

a. The net-export effect: The dollar will strengthen as the higher U.S. interest rates increase the demand for dollar-denominated assets. A stronger dollar will lower U.S. import prices while raising export prices. U.S. goods will become less competitive internationally, thereby mitigating U.S. growth by reducing the U.S. trade surplus or by widening the deficit. Meanwhile, a weak Foreign economy will also reduce foreign demand for U.S. exports through the income effect. The cooling effect of the net-export drag on the domestic economy, by itself, will help dampen inflation, making the expansion more sustainable—thus longer—than in autarky.

b. The import-price effect: The lower prices of imports will help hold down domestic prices directly and indirectly. It is easy to see from equations (2.1) through (2.3) that

$$dp/dp^m = \alpha + \beta\,(dp^c/dp^m) + \beta\,(dp^c/du)\,(du/dp^m) + \beta\,(dp^c/d\lambda)\,(d\lambda/dp^m) + \gamma\,(dp^o/dp^m) > 0. \qquad (2.4)$$

As import prices fall, U.S. consumer prices will fall *directly* in proportion to α (the share of imports in the consumption basket) plus $\beta\,(dp^c/dp^m)$ and $\gamma\,(dp^o/dp^m)$. Since both $\beta\,(dp^c/dp^m)$ and $\gamma\,(dp^o/dp^m)$ are positive, the direct effect of changes in import prices on U.S. inflation is unambiguously greater than α. This point is worth emphasizing, since it clearly refutes the view held by many economists that import prices' impact on U.S. inflation is limited to reflect the modest size of α[2]. Even if the indirect, or competing-goods, effect is negligible, the direct effect alone is already greater than α. Changes in import prices will directly affect consumer price inflation not only because imports are a component of the consumption basket, but also because imports are used as inputs of other consumption goods and services.

Moreover, falling import prices can also lower U.S. prices *indirectly* through the competing-goods effect. As imports become more price-competitive, U.S. firms in import-competing industries will have to either enhance their productivity, or lower their profit margins to stay competitive, or both. Either way, the total magnitude of the competing-goods effect is captured by the second and third terms of equation (2.4), $\beta\,(dp^c/du)\,(du/dp^m) + \beta\,(dp^c/d\lambda)\,(d\lambda/dp^m)$. Since $\beta > 0$, $(dp^c/du) > 0$, $du/dp^m \geq 0$, $(dp^c/d\lambda) > 0$, and $d\lambda/dp^m > 0$, the competing-goods effect is always positive theoretically. Through the combination of these direct and indirect effects, a decrease in import prices will unambiguously dampen the inflationary pressure relative to the case in autarky, thereby helping to prolong the domestic expansion by deterring the Fed from tightening.

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2. It is not easy to have a precise measurement of α. The imports/GDP ratio is usually used as a rough proxy for α. But, mainly because non-consumption final demand as a share of GDP is much larger than it as a share of imports, that ratio tends to underestimate α. The imports/GDP ratio was around 13% in 1997.

2.2 The U.S. and Foreign Are Synchronized

Suppose both the domestic and foreign economies are expanding. Both the U.S. and Foreign economies have strong final demand, high interest rates, high inflation and high capacity utilization. In this case, the link with the Foreign economy may help shorten or prolong the U.S. expansion relative to autarky, depending on the relative strengths of the two economies and their positions relative to capacity. If the foreign economy has less capacity utilization than the US, then we have a mitigated case of the complete asynchronized situation discussed in section 2.1. In this case, globalization may still help prolong a U.S. expansion, though to a lesser extent than in a complete asynchronized scenario, relative to autarky. If Foreign has higher capacity utilization than the U.S., however, globalization will shorten, rather than prolong, the U.S. expansion through the capital-flow and trade-flow channels.

The capital-flow channel:

a. The cost-of-capital effect: U.S. capital will flow out in search of higher rates of return. The outflow of capital will help push up the long-term interest rate and lower equity prices, thereby increasing the cost of capital. A rise in the cost of capital will squeeze business investment and increase the long-run marginal cost of domestic output. If demand for consumption goods continues to be strong, this will either result in rising inflation or shrinking corporate profits. If it results in rising inflation, the Fed may raise the interest rate and end the expansion sooner than in autarky. If it results in lowering corporate profits, unemployment may rise, disposable income may fall and the economy may enter a recession sooner than it would if it were an autarky.

b. The wage-setting effect: Higher foreign wages will undermine U.S. firms' bargaining power (relative to autarky) in wage negotiation, as foreign firms choose to invest in the U.S. to take advantage of the relatively lower wages here and push up wage inflation even further. Consequently, the wage pressure on inflation could be greater than in autarky. If this leads to higher inflation (again, relative to autarky), it could induce the Fed to raise interest rates sooner, thereby shortening the expansion.

The trade-flow channel

a. The net-export effect: Capital outflows will weaken the dollar, making U.S. goods more competitive. A weaker dollar and a stronger foreign economy will result in increases in net exports. As the U.S. is already operating near full capacity, however, the increase in net export demand will only add to the domestic inflationary pressure. The resultant higher inflation could induce the Fed to step on the brakes sooner, thereby shortening the expansion relative to the autarky case.

b. The import-price effect: A weaker dollar will also increase the dollar price of imports. Higher import prices will contribute to inflationary pressure in the U.S. both directly and indirectly as discussed in Section 2.1. The rise in inflationary pressure could prompt the Fed to tighten, thereby shortening the U.S. expansion relative to autarky.

3. HOW MUCH MORE GLOBALIZED HAS THE U.S. BECOME?

The preceding discussion suggests that the impact of foreign economic conditions on the U.S. economy depends on the degree of openness or "globalization" of the U.S. economy. Many economists, notably Paul Krugman (1994, 1995) claim that the U.S. economy is still "effectively insulated" from foreign competition, since imports and exports, respectively, only represent slightly over 10% of U.S. GDP (Figure 1).

It is misleading, however, to rely *exclusively* on trade flows as a share of GDP to gauge the degree to which the U.S. is globalized (or, integrated with the rest of world). These conventional measures tend to mask greater depth and diversity of trade that have taken place since the mid 1970s.

For example, goods imports as a share of total goods purchased (by firms and households) shows a much sharper increase in the depth of U.S. reliance on trade than suggested by the imports/GDP ratio. Goods imports, which have constituted less than 10 percent of U.S. goods purchased for several decades since the great depression, have risen sharply since the mid-1970s and now represent nearly 30 percent of total goods purchased (see Figure 2). The dramatic rise in the ratio of goods imports/goods purchased suggests that imports have indeed become an increasingly important component of the domestic household and firm purchases of goods. The discrepancy between the imports/GDP ratio and the goods import/goods purchased ratio stems from the fact that services—a mostly non-tradeable sector—have been a growing component of GDP.

The U. S. trade with the rest of the world has also increased in breadth, or diversity. This is most obvious from looking at the rise in the number of industries that are faced with greater import competition. In 1970, only 27 industries (out of 431 industries at 4-digit SIC level) were faced with import penetration ratios greater than 20%; by 1994, that number had risen to 151 industries (Table 1).

Measures of U.S. engagement in intra-industry trade also indicates a noticeable increase in the diversity of U.S. trade with the rest of the world. Figure 3 shows the evolution of two measures of U.S. engagement in intra-industry trade: the intra-industry trade index[3], and the cross-industry correlation between imports and exports. Both measures indicate that the extent to which the U.S. imports and exports similar (as defined by the 4-digit SIC codes) goods has increased noticeably since the late 1980s. In particular, the correlation coefficient between imports and exports, which had averaged about 0.5 over the 1960-80 period, rose sharply since the early 1980s to nearly 0.9 by 1994.

The increase in both the depth and breath of U.S. trade has important implications for the inflation and unemployment trade-offs. As explained in the previous section, changes in import prices not only have a *direct* effect on U.S. consumer prices, but also *indirect* effects by changing competitive pressures on domestic producers. The rise in the *depth* of U.S. globalization implies that import prices will have a greater *direct* impact on U.S. prices, while the rise in the breath implies that import prices will have a greater *indirect* impact on U.S. prices as more industries will adjust their prices in response to changes in import prices.

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3. The index of intra-industry trade (IIT) is defined as follows:

$$IID = 1 - \left[\sum_{i=1}^{n} |X_i - M_i| \, / \sum_{i=1}^{n} (X_i + M_i) \right]$$

If industry i is exclusively an export or an import industry, then IID is zero. If the exports and imports in this industry are equal in size, then $|X_i - M_i| = 0$, and IID=1. Therefore, IIT takes a value between 0 and 1. A higher IIT indicates a higher degree of intra-industry trade.

In addition to broader and deeper exposures to trade with foreign countries, the U.S. has also become more globalized in terms of capital flows across its borders. Both outward and inward capital flows have soared relative to GDP since 1992 (Figure 4). U.S. private capital outflows, which averaged about 2 percent of GDP ($80 billion) per year during the 1980s, surged to nearly 6 percent of GDP ($500 billion) by 1997. The surge in private capital inflows is even more pronounced. After averaging roughly 3 percent of GDP ($140 billion) per year during the 1980s, private capital inflows increased to over 9 percent of GDP ($700 billion) in 1997.

The removal of barriers to capital flows in many industrial as well as emerging countries has contributed greatly to the increase in both inflows and outflows of capital across the U.S. border. As argued in section 2, the increase in international capital mobility implies that foreign economic conditions will have a greater influence on the duration of U.S. business cycles through capital-flow channels. If a U.S. expansion is accompanied by a foreign recession, we will likely see net capital inflows become a more important source of financing for U.S. investment. Indeed, Figure 5 shows that, while net capital inflows played no role in financing U.S. private investment before 1981, it has become a significant source of financing for investment since then.[4]

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4. National accounting identity dictates $I = S^p + S^g + NCI$, where I is domestic private investment, S is private savings, S^g is net government saving (or dissaving if the government runs a budget deficit), and NCI is net capital inflow. In a closed economy where the only source of financing for investment is domestic and government saving, NCI equals zero. However, in an open-economy with capital mobility, NCI can be positive and a source of financing domestic investment.

4. EVIDENCE OF THE COMPETING-GOODS EFFECT

The preceding section indicates that the U.S. has become increasingly more globalized since early 1980s, and in particular during the 1990s. As discussed in section 2, the increasing link with foreign economies means that asymmetric shocks originating abroad could be transmitted to influence U.S. cyclical adjustments more quickly, broadly, and deeply through several channels. One channel is through trade flows. Through trade, changes in import prices not only will affect U.S. price inflation directly through the U.S. consumption of imports, but also could influence U.S. inflation indirectly through the competing-goods effect.

In this section we test the hypothesis that import prices affect prices of domestic goods through the competing-goods effect. The competing-goods hypothesis posits that falling import prices will induce domestic firms in import-competing industries to lower the price of their output to stay competitive. Domestic firms can do so either by enhancing their productivity or by lowering their profit margins. Conversely, an increase in import prices will induce profit-maximizing producers in the import-competing industries to raise the strategic mark-up over marginal cost to exploit the decrease in the price elasticity of demand for their goods. That is, rising import prices, by lowering competitive pressures on import-competing goods, will lead to an increase in the prices of domestic goods.

To test this hypothesis, we examine the impact of changes in import prices on domestic prices for a panel of 3-digit SIC code industries. We do so in three stages. We begin by investigating whether domestic price changes are positively related to import price changes, we estimate the following simple equation:

$$\pi_{it} = \alpha + \beta\pi_{it}^{mp} \tag{4.1}$$

where:

$\boldsymbol{\pi_{it}}$ is the percent change in the relative price of output in industry *i* at time *t*; or, the percent change in p_{it}/p_t, where p_{it} is the price of industry *i*'s output at time *t*, and p_t is the producer price index at time *t*[5].

$\boldsymbol{\pi_{it}^{mp}}$ is the percent change in the import price in industry *i* at time *t*.

According to the competing-goods hypothesis, the greater the foreign competition faced by a particular industry, the greater the positive impact of import price changes on domestic price changes in that industry. Therefore, we should expect the greater is import penetration—one measure of globalization—in an industry, the greater the impact of import prices on that industry's price. This is because in a monopolistically competitive framework, a firm can increase its competitive edge by increasing its reach to those consumers that prefer the

5. This specification for the dependent variable assumes that the nominal price of domestic goods responds to the overall price level and import prices. By dividing the domestic price by the overall price index we implicitly constrain the response to the overall price index to be one-for-one.

uniqueness of its differentiated product. In a world that is still not completely globalized and still encumbered by transaction costs, one uniqueness offered by domestic firms is of course their geographical dominance over foreign firms. From this perspective, products of foreign firms that have not yet entered a distribution network to reach American consumers will not constitute as much of a competitive threat to domestic firms as those that have.[6]

To test this hypothesis, we re-estimate equation (4.1) by replacing β with a function of import penetration (IPR). That is, we substitute $\beta_{it} = \delta + \gamma IPR_{it}$, so that (4.1) becomes:

$$\pi_{it} = \alpha + \delta\, \pi_{it}^{mp} + (\gamma\, IPR_{it})\pi_{it}^{mp} \qquad (4.2)$$

where, both δ and γ should be positive, and $\boldsymbol{IPR_{it}}$ is the import penetration ratio for industry i (defined as M/[M+S-X], where M is imports, S is shipment, and X is exports) at time t.

Finally, we estimate a third specification in which we allow the import penetration ratio to enter equation (4.3) independent of its interaction with π_{it}^{mp} *:*

$$\pi_{it} = \alpha + \delta\, \pi_{it}^{mp} + (\gamma\, IPR_{it})\pi_{it}^{mp} + \varphi\, IPR_{it} \qquad (4.3)$$

6. Mann's finding (1997) that a loss of market share to imports is associated with gains to productivity growth in the United States also gives support to this view.

In both equations (4.2) and (4.3), we are in essence testing whether it is true that (1) for each percent decrease in import prices, the competitive pressure faced by a domestic industry is greater the greater is the import penetration ratio—the ratio of imports relative to consumption—in that industry, and (2) for each level of import penetration, the competitive pressure is greater the greater is the fall in import prices.

4.1 The Data

We use industry level data on domestic producer prices, import prices, and import penetration ratios. Annual data for import prices by 3-digit SIC code industry are from Robert Feenstra (1996). Data on the domestic producer price index for 3-digit industries are from the Bureau of Labor Statistics and the import penetration ratio is constructed from data available from the Bureau of Economic Analysis.

By matching the industries in Feenstra's data set with the PPI data from BLS we obtained a set of 44 industries (see Table 2) covering the period 1986 through 1992. After transforming the prices to percent changes we had 6 annual observations on 44 industries for a total of 264 time-series cross-sectional observations.

4.2 Estimation Results

The estimation results of equations (4.1), (4.2) and (4.3) are reported in Table 3. Each equation was estimated twice. First it was estimated using ordinary least squares (OLS). Then it was estimated with appropriate correction for serial correlation, and with 43 industry dummies and 4 time dummies to correct for industry and time period fixed effects. The results of the OLS regressions are reported on the top panel of Table 3, the results of corrected regressions are in the bottom panel of Table 3.

The results from estimating equation (4.1) show a positive and statistically significant relationship between domestic and import price inflation. The results from equation (4.2) show that the impact of import prices alone is roughly half the size of the equation (4.1) estimates. The coefficient on the interaction term, $IPR\ \pi_{it}^{mp}$, is statistically significant but appears to be small. However, if we note that equation (4.2) can be regrouped into $\pi_{it} = \alpha + (\delta + \gamma\ IPR_{it})\ \pi_{it}^{mp}$, it is clear that the responsiveness of domestic prices to a change in import prices should be measured by $\delta + \gamma\ IPR_{it}$, which could be much bigger than indicated by either δ or γ alone.

Figure 6 shows the estimated impact of changes in import prices on domestic prices, measured by $\delta + \gamma\ IRP_{it}$, for each industry in 1992. These estimates range from a low of 0.07 for the "dairy products" industry, which had an import penetration ratio of 1.5 in 1992 to a high of 0.81 for the "watches, clocks, watch cases and parts" industry, which had an import penetration ratio of 76.3 in 1992 (Table 2). The (simple) average import penetration ratio across all industries and time periods is 22.3 which yields a β coefficient of .29. At 0.29 a 1 percentage point increase (decrease) in average import price inflation leads to a 0.29 percentage point increase (decrease) in domestic price inflation.

The results from equation (4.3) show that the import penetration ratio has an independent negative influence on domestic price inflation.

5. FOREIGN CAPACITY UTILIZATION AND THE MISSING INFLATION

In his 1982 article, Robert Gordon claimed that the Phillips curve had been "prematurely buried."[7] He showed that by adding measures of aggregate supply shocks, exchange rates and dummy variables for wage and price controls he could explain the combination of high unemployment and high inflation in the 1970s. He concluded that earlier Phillips curves were mis-specified, not fundamentally flawed as had been argued by Lucas and Sargent (1978).

7. See Gordon (1982).

Beginning in 1995, Robert Gordon's “correctly specified” Phillips curve has been over-predicting inflation by a substantial amount. According to standard Phillips curve estimates, falling unemployment should be accompanied by rising inflation. The fact that inflation has actually fallen since late 1996 despite the continuing drop in unemployment therefore presents a “missing inflation” puzzle. Lown and Rich (1997) find that the puzzle is accounted for by the change in the response of compensation growth to unemployment but fail to explain the puzzling change in compensation growth. A report by the CBO (1997) attributes the missing inflation—the over-prediction of inflation by a standard Phillips curve equation—to three special, temporary factors: low medical care inflation, rapid deflation in computer prices and declining import prices. While CBO finds that import prices play a role in explaining the missing inflation puzzle, Tootel (1998) finds that foreign capacity utilization, which he uses in lieu of import prices in his Phillips Curve estimation, cannot account for the missing inflation.

The preceding discussion in this paper suggests that the standard Phillips curve could become increasingly mis-specified as the U.S. becomes more globalized. When the U.S. becomes sufficiently globalized, pressures on U.S. inflation will not only reflect the degree of excess domestic demand (relative to supply) but also that of excess foreign demand. Consequently, foreign capacity utilization should play a role in explaining and forecasting U.S. inflation. Since foreign economic conditions could affect U.S. inflation not only through the import-price effect, but also through other effects—such as the net-export effect, the cost-of-capital effect, and the wage-setting effect—foreign capacity utilization should be included in U.S. inflation equations along with import prices and other conventional domestic variables.

To test this hypothesis, we estimate a standard Phillips curve which is roughly the specification estimated by Robert Gordon (1982) and an alternative Phillips curve which includes a measure of foreign capacity utilization. The specifications are as follows:

(5.1) Alternative Phillips Curve:

$$\pi_t = \alpha + \sum_{i=0}^{3} \beta_i u_{t-i} + \sum_{i=0}^{4} f_i F_{t-i} + \sum_{i=1}^{4} \phi_i \pi_{t-i}^{mp} + \delta \pi_{t-1}^{fe} + \theta \lambda_t + \sum_{i=1}^{20} \varphi_i \pi_{t-i} + \varepsilon_t$$

(5.2) Standard Phillips Curve[8]:

$$\pi_t = \alpha + \sum_{i=0}^{3} \beta_i u_{t-i} + \sum_{i=1}^{4} \phi_i \pi_{t-i}^{mp} + \delta \pi_{t-1}^{fe} + \theta \lambda_t + \sum_{i=1}^{20} \varphi_i \pi_{t-i} + \varepsilon_t$$

where:

$\boldsymbol{\pi}$ is the inflation rate measured by either the growth of the GDP price index, the core consumer price index (CPI), or the employment cost index.

$\boldsymbol{u}$ is the unemployment rate for married males,

8. This specification is described in more detail in the Economic and Budget Outlook: Update, The Congressional Budget Office, August 1994, pp.59-63. The CBO specification is based on the specification in Gordon (1982).

F is foreign capacity utilization,

$\boldsymbol{\pi^{mp}}$ is the growth rate of (P^m/P), where P^m is import prices and P is either the GDP price index or the core consumer price index,

$\boldsymbol{\pi^{fe}}$ is the growth rate of $(P^{f\&e}/P^{ex})$ where $P^{f\&e}$ is the consumer price for food and energy and P^{ex} is the consumer price excluding food and energy products,

$\boldsymbol{\lambda}$ is the deviation of labor productivity growth from its trend, which is measured by 32-quarter moving average of past growth in labor productivity.

ε is the residual.

In both the alternative and standard Phillips curves specifications, U.S. price inflation is a function of the unemployment rate, lagged inflation rates, the growth rate of relative price of food and energy products, the deviation of labor productivity growth from its trend, and the growth rate of the relative import price.[9] The unemployment rate proxies for the demand pressure on prices, while lagged inflation rates controls for expectations of inflation. All the other variables are intended to control for supply shocks. The only difference between the alternative and the standard Phillips curves is that the alternative specification also includes foreign capacity utilization as explanatory variable.

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9. For both the standard and alternative specifications, the growth rate of relative price of food and energy is included only in the equations of GDP price inflation, not in the equations of the core-CPI inflation.

For both equations, we use data from 1971:Q1 through 1998:Q2[10]. The coefficients on the lagged inflation rate are constrained to sum to one and lie along a 3rd degree polynomial with a zero end point restriction[11]. The lag length on foreign capacity utilization is 10 and was chosen based on the Akaike-Information Criteria. Shorter lag lengths yielded almost identical results.

5.1 The Data

All domestic data and import prices are either directly from, or constructed from, data published by the Bureau of Economic Analysis. $P^{f\&e}$ is the personal consumption expenditure (PCE) index for food and energy. P^{ex} is the PCE index excluding food and energy. The core consumer price index (CPI) is CPI less food and energy prices. Foreign capacity utilization is constructed by the Board of Governors of the Federal Reserve System. The Board of Governors compiles foreign capacity indexes based on various country compositions and weighting methods. We choose to use the GDP-weighted foreign capacity utilization of all OECD countries. The results are similar using the other measures of foreign capacity utilization.

10. Because of the lag length used in the regression, the degree of freedom is smaller than that suggested by the sample period of 1971:Q1-1998:Q2.

11. The sum of lagged inflation coefficients are constrained to sum to1 to ensure inflation stability at the natural rate of unemployment.

5.2 Estimation Results

Table 4 reports the coefficient estimates of equations (5.1) and (5.2). Standard errors are presented in parentheses below the parameter estimates. Inflation forecasts based on the alternative versus those based on the standard Phillips curve are presented in Figures 7 and 8. In both figures, forecasted paths of inflation rates are compared to their actual values since the beginning of 1994. We compute the forecasts by first estimating equations (5.1) and (5.2) over the entire sample period, then applying the coefficient estimates to forecast inflation from 1994:Q1 through 1998:Q2 using the actual values for all right hand side variables except for the lagged inflation rates which were replaced by the forecasted values.

Figures 7 and 8 show that the missing inflation—the gap between the actual inflation and the forecast based on the standard Phillips curve—has been rising steadily since the end of 1994, with the rise in the missing inflation being more steady and more pronounced in core-CPI inflation than in the growth rate of the GDP price index. Most strikingly, inflation rates of both the CPI and GDP price index fell despite the decline in the married male unemployment rate since 1995. By 1998:Q2 the inflation rate of actual GDP price index (1.2 percent) was roughly 1.2 percentage points below the forecasted value of the standard Phillips curve, and the actual CPI inflation rate (2.2 percent) was 1.9 percentage points below the standard forecast. Since the standard Phillips curve replicated here does control for changes in productivity, food and energy prices, and import prices, the missing inflation cannot be attributed to these supply-side shocks. This puzzling decline in the inflation rate occurred over a period of apparent mounting demand side stimulus[12] is the mystery we hope to solve by bringing in foreign capacity utilization as an additional explanatory variable.

Columns 1 and 3 in Table 4 report the estimation results of the "Standard Phillips Curve" equations, while columns 2 and 4 report those of the "Alternative Phillips Curve." In both the standard and alternative specifications, and for both the GDP price inflation and the CPI inflation equations, import prices are statistically significant. This should come as no surprise in view of our discussion in sections 2-3 and our empirical evidence in support of the competing goods effect presented in section 4. However, since the standard Phillips curve equations replicated here already include lagged import price inflation, their over-predictions of inflation suggest that the decline in the U.S. inflation since 1994 is only partly attributable to the decline in import prices.

Can foreign capacity utilization help close the inflation gap as we predicted? The second and fourth columns of Table 4 show that the sum of the coefficients on the lagged measure of foreign capacity utilization is positive and significant at the 5

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12. Roughly 0.1 to 0.2 percentage points of the decline in the inflation rate can be attributed to recent technical adjustments to the CPI which partially affect the GDP price index.

percent level in both the GDP and CPI inflation regressions. Moreover, as indicated by the "Alternative Phillips Curve" forecasts in Figures 7 and 8, when we repeat the forecasting exercise described above, the missing inflation all but disappears. These results clearly support our view that the current excess capacity in foreign countries has helped lower U.S. inflation through other effects besides the import-price effects.

Table 5 shows that adding foreign capacity utilization to the conventional wage inflation (measured by the percent change in the employment cost index for wages and benefits) also helps improve forecasts of wage inflation. The sum of the coefficients on the lagged measure of foreign capacity utilization is positive and significant at the 10 percent level. Figure 9 shows that the forecast of this alternative wage Phillips curve also outperforms that of the standard wage Phillips curve. A comparison of Figure 9 versus Figures 7-8 also confirms the findings of recent research that the wage Phillips curve has been doing a much better job in predicting wage inflation than the price Phillips curve in predicting price inflation in recent years. It is worth pointing out that this finding lends further supports to our view that the increased degree of globalization has affected firms' mark-up behaviors.

But why doesn't Tootel (1998) find that foreign capacity utilization has a significant impact on U.S. inflation? Two factors are likely to be responsible for the difference between our results and Tootel's. First, our measure of foreign capacity utilization differs from Tootel's. We use a Federal Reserve Board's measure of foreign capacity utilization which covers all OECD countries. Tootel constructs his own measure by estimating Phillips curves for six foreign economies (Canada, France, Germany, Italy, Japan, and United Kingdom), and applies import weights to get his average foreign capacity utilization. Second, our specification of the Phillips curve differs from Tootel's. We allow for both foreign capacity utilization and import prices to be included as explanatory variables. Tootel, assuming that foreign capacity utilization affects U.S. inflation only through its effect on import prices, allows only foreign capacity utilization to enter his Phillips curve specification. Foreign capacity utilization thus enters the Phillip curve as a substitute for, not in addition to, import prices, Thus, our specification is more general and allows for foreign capacity utilization to affect U.S. inflation through non-import-price effects.

6. FOREIGN ECONOMIC CONDITIONS AND THE DURATION OF U.S. EXPANSIONS

The discussion in section 2 and the evidence presented in sections 3-5 suggest that U.S. expansions will tend to be longer when foreign economies have larger excess capacity, and shorter when foreign economies are closer to, or above, full capacity utilization. To see whether this can be corroborated by data, we now examine macroeconomic conditions in foreign countries during five episodes of U.S. economic expansions.

Based on NBER dating of U.S. business cycles, the United States enjoyed five episodes of economic expansions since 1962. Table 6 shows that, out of these five episodes, the three longer expansions (1962-69, 1983-89, and 1992-1998) were accompanied by negative GDP-gaps in foreign countries, while the two shorter expansions (1971-73, 1976-79) were accompanied by positive foreign GDP gaps. The average foreign GDP gap is -0.75% during the three longer expansions, and 0.82% during the two shorter expansions.

Unfortunately, Table 6 has an obvious shortcoming: only Germany and Italy have GDP gap data available during 1962-69. We do not know the extent to which these two countries' economic conditions are representative of the rest of the major foreign countries in this period. It is quite possible that the ten major foreign countries as whole had a positive, rather than negative, GDP gap during this period. Such a view would seem compelling in light of the fact that all ten countries were growing quite briskly during this period (Table 7). On the other hand, however, the high growth rates of major foreign countries during this period could simply be the result of these countries' continuing to catch up after the devastation of WWII. Given the mass destruction of the war, high growth rates during the 1962-69 period could very well have been accompanied by negative GDP gaps. Table 8 suggests this may indeed have been the case: foreign inflation during the 1962-69 high growth period was actually quite modest at 3.6 percent per year. Indeed, the story presented by Table 8 is consistent with that presented by Table 6: U.S. expansions tend to be longer when foreign inflation is mild (i.e., when foreign countries operate sufficiently below its full capacity), and shorter when foreign inflation is high (i.e., when foreign countries operates near or above full capacity).

The broad-stroke picture presented by Tables 6 and 8 lend support to the natural inferences of our open-economy Phillips curve regression results: increases (decreases) in foreign capacity utilization will add to (lower) U.S. inflationary pressures. When U.S. expansions occur amid foreign recessions, these expansions are more likely to be accompanied by lower (than otherwise) inflation. As the Fed is less likely to raise the interest rate to end expansions that are attended by modest inflation, these expansions will then tend to last longer than those synchronized with foreign expansions.

7. CONCLUSION

This paper shows that the United States has become substantially more integrated with the rest of the world since the late 1980s. We find that the sharp rise in globalization of the United States makes foreign conditions an important variable to be included in explaining the magnitude and duration of U.S. inflations and U.S. business cycles. However, our findings caution against the view that globalization per se has ushered in a new age in which the United States will never again be plagued by inflation or recession. Globalization makes it possible for excess foreign capacity to help dampen U.S. inflationary pressure in the midst of a strong recovery, thereby prolonging the recovery. However, if foreign condition were different, globalization alone is unlikely to have done the job of holding down U.S. inflation in this recovery. In fact, globalization alone could have even shortened, not lengthened, the current expansion if it were synchronized with foreign expansions.

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Table 1. The Number of Industries Faced with Import Competition over Time (Total of 431 4-digit SIC Industries)

	Year 1958	1970	1980	1990	1994
Import Penetration (IP) in %					
IP = 0	17	6	1	3	4
0 < IP ≤ 10	381	356	301	184	166
10 < IP ≤ 20	19	42	75	119	110
20 < IP ≤ 30	9	16	24	56	61
30 < IP ≤ 40	2	4	14	25	31
40 < IP ≤ 50	1	3	9	18	26
50 < IP ≤ 60	2	4	5	12	11
60 < IP ≤ 70	0	0	0	7	9
70 < IP ≤ 80	0	0	2	2	6
80 < IP ≤ 90	0	0	0	4	4
90 < IP ≤ 100	0	0	0	1	3

Source: Import and Export data are from Robert C. Feenstra (www.nber.org/~feenstra/), Shipments data are from Annual Survey of Manufacturers, by the Census Bureau.

Note: $IP_i = M_i/(S_i - X_i + M_i)$, where M_i is imports, S_i is shipments, X_i is exports, in industry i.

Table 2. Shipment Share and Import Penetration of Industries Used in Testing the Competing-Goods Effect (%)

SIC #	Industry	Average Share of Shipment 1987-92	Import Penetration 1987	Import Penetration 1992
201	Meat Products	7.4	4.2	3.5
202	Dairy Products	4.2	1.6	1.5
203	Preserved Fruits & Vegetables	3.8	5.5	5.8
206	Sugar & Confectionery Products	1.8	8.0	8.3
207	Fats & Oils	1.6	4.9	7.0
208	Beverages	4.4	7.3	6.6
209	Miscellaneous Food & Kindred Products	2.7	5.6	6.1
221	Broad woven Fabric Mills, Cotton	0.5	16.9	16.5
222	Broad woven Fabric Mills, Manmade Fiber & Silk	0.7	9.3	11.9
229	Miscellaneous Textile Goods	0.6	12.2	13.6
231	Mens' & Boys' Suits & Coats	0.2	28.5	26.5
232	Mens' & Boys' Furnishings	1.3	24.8	31.7
238	Miscellaneous Apparel & Accessories	0.2	41.6	55.4
242	Sawmills & Planing Mills	1.7	17.7	16.2
243	Millwork, Plywood & Structural Members	2.0	7.5	8.2
259	Miscellaneous Furniture & Fixtures	0.4	11.0	12.3
261	Pulp Mills	0.5	51.5	50.0
262	Paper Mills	2.8	17.6	19.8
281	Industrial Inorganic Chemicals	2.1	15.4	18.7
289	Miscellaneous Chemical Products	1.6	5.6	6.3
301	Tires & Inner Tubes	1.0	19.5	20.6
314	Footwear, Except Rubber	0.4	65.0	67.1
317	Handbags & Personal Leather Goods	0.1	56.8	60.6
326	Pottery & Related Products	0.2	44.4	44.9
331	Blast Furnace & Basic Steel Products	5.1	16.6	15.5
333	Primary Nonferrous Metals	1.2	37.5	35.7
335	Nonferrous Rolling & Drawing	3.2	7.6	10.3
345	Screw Machine Products, Bolts, etc	0.7	12.4	13.5
353	Construction & Related Machinery	2.4	20.1	20.9
355	Special Industry Machinery	1.8	24.6	25.2
362	Electrical Industrial Apparatus	1.6	15.6	21.2
363	Household Appliances	1.5	14.2	17.0
364	Electric Lighting & Wiring Equipment	1.6	9.6	17.4
365	Household Audio & Video Equipment	0.8	64.9	71.1
366	Communications Equipment	6.5	9.7	12.6
367	Components & Accessories	5.4	27.2	32.4
369	Miscellaneous Electrical Equipment & Supplies	1.9	20.4	27.2
371	Motor Vehicles & Equipment	18.7	29.4	27.8
382	Measuring & Controlling Devices	1.8	15.4	20.0
386	Photographic Equipment & Supplies	1.8	20.3	23.4
387	Watches, Clocks, Watch cases & Parts	0.1	59.3	76.3
391	Jewelry, Silverware & Plated Ware	0.5	56.5	63.2
394	Toys & Sporting Goods	0.9	43.4	50.4
396	Costume Jewelry & Notions	0.2	32.2	36.4

Source: Import and Export data are from Robert C. Feenstra (www.nber.org/~feenstra/), Shipments data are from Annual Survey of Manufacturers, by the Census Bureau.

Note: Shipment share is shipment of an individual industry relative to total shipment of all 44 listed industries.

Table 3. Estimations of Competing-Goods Effects

1. **OLS Results**

Equation	Coefficient Estimates on π^{mp}	π^{mp} x IPR	IPR	R^2
(4.1)	0.36** (0.03)			0.30
(4.2)	0.16** (0.05)	0.01** (0.002)		0.40
(4.3)	0.015** (0.05)	0.01** (0.002)	-0.03 (0.03)	0.40

2. **Fixed Effects Results Corrected for Serial Correlation**

Equation	Coefficient Estimates on π^{mp}	π^{mp} x IPR	IPR	R^2
(4.1)	0.23** (0.02)			0.44
(4.2)	0.07* (0.03)	0.01** (0.001)		0.58
(4.3)	0.05† (0.03)	0.01** (0.001)	-0.03** (0.01)	0.60

Variables:
Dependent variable: inflation in individual industry's price relative to the producer price index.
Explanatory variable: π^{mp} is inflation in the import price, IPR is the import penetration ratio.

Notes:
Standard errors are in parentheses below the parameter estimates.
† indicates significant at the .10 level.
* indicates significant at the 0.05 level.
** indicates significant at the 0.01 level.

Table 4. Estimations of Price Phillips Curves: Standard vs Alternative

Sums of coefficients on:	Inflation in GDP Price Index		Inflation in Stripped Core CPI	
	Standard	Alternative	Standard	Alternative
u	-0.31*	-0.47**	-0.47**	-0.41*
	(0.11)	(0.17)	(0.20)	(0.21)
π^{mp}	0.11**	0.12**	0.09†	0.06
	(0.03)	(0.03)	(0.05)	(0.05)
π^{fe}	0.03	0.04†		
	(0.02)	(0.02)		
λ	-0.02	-0.01	-0.02	-0.03
	(0.03)	(0.03)	(0.06)	(0.05)
Foreign capacity Utilization		0.27*		0.34*
		(0.12)		(0.15)
Adjusted R^2	0.92	0.92	0.80	0.81

Variables:

u is the unemployment rate for married males,

π^{mp} is the growth rate of (P^m/P),where P^m is import prices and P is either the GDP deflator or the core consumer price index,

π^{fe} is the growth rate of ($P^{f\&e}/P^{ex}$) where $P^{f\&e}$ is the consumer price for good and energy and P^{ex} is the consumer price excluding food and energy products,

λ is the deviation of labor productivity growth from its trend.

Notes:

The sum of lagged inflation is not presented because it is constrained to equal 1.

Standard errors are in parentheses below the parameter estimates.

† indicates significant at the .10 level

* indicates significant at the .05 level

** indicates significant at the .01 level

Table 5. Estimations of Wage Phillips Curves: Standard vs Alternative

Sums of coefficients on:	Inflation in ECI Wage Standard	Alternative
u	-0.19	-1.9*
	(0.31)	(0.9)
π^{imp}	0.08†	0.07
	(0.05)	(0.06)
π^{fe}	0.04*	0.05*
	(0.02)	(0.02)
λ	0.001	0.03
	(0.02)	(0.05)
Foreign capacity Utilization	_____	0.44†
		(0.23)
adjusted R^2	0.46	0.58

Variables:
1. Wage is measured by Employment Cost Index.
2. See Table 4 for construction and definitions of variables.

Notes:
The sum of lagged inflation is not presented because it is constrained to equal 1. Standard errors are in parentheses below the parameter estimates.

† indicates significant at the .10 level.
* indicates significant at the .05 level.
** indicates significant at the .01 level.

Table 6. GDP Gaps in Major Industrial Countries during Periods of US Expansions (percent)

	Period I 1962-69	Period II 1971-73	Period III 1976-79	Period IV 1983-89	Period V 1992-98[c]
United States	0.48[a]	1.10	1.72	0.00	-0.05
United Kingdom			1.69	1.69	-1.18
Belgium			0.79	-0.96	-1.99
France		1.45	0.79	-1.25	-2.10
Germany	-0.64[b]	1.43	1.23	-1.59	-0.56
Italy	-0.80[b]		0.27	-0.69	-1.71
Netherlands			1.25	-0.22	-0.06
Switzerland			-3.43	-0.40	-3.17
Canada		0.25	1.66	-0.08	-2.25
Japan		1.39	-0.47	-1.12	-1.18
Australia		1.72	0.69	-1.03	-1.29
ROW (Import weight)	-0.11[b]	0.82	0.83	-0.64	-1.59

Source: OECD Main Economic Indicators and authors' calculations.

Notes: 1) US Expansions are based on NBER breakdown.
2) GDP Gap = (Actual GDP - Potential GDP)*100 / Potential GDP.
a. Data start in 1964.
b. Data start in 1963.
c. 1998 data are based on forecasts.

Table 7. US and Foreign GDP Growth Rates during Periods of US Expansions (percent)

	Period I 1962-69	Period II 1971-73	Period III 1976-79	Period IV 1983-89	Period VI 1992-98[a]
United States	4.9	4.9	4.6	4.0	2.8
Australia	5.9	4.7	3.2	4.0	3.6
Belgium	4.8	5.0	2.6	4.7	1.6
Canada	5.7	6.4	4.6	4.2	2.5
United Kingdom	3.0	4.1	2.4	3.6	2.3
France	6.0	4.9	3.5	2.5	1.7
Germany	4.4	4.0	3.8	2.5	1.7
Italy	5.5	3.8	4.8	2.8	1.3
Japan	9.9	6.9	4.8	4.1	1.0
Netherlands	6.0	4.1	3.2	2.7	2.6
Switzerland	4.0	3.6	1.2	2.6	0.4
ROW (import weighted)	6.0	5.7	4.2	3.8	1.8

Sources: National Account Statistics: Main Aggregates and Detailed Tables (United Nations); Main Economic Indicators (OECD); International Financial Statistics (IMF).

Note: a. 1998 data are based on forecasts.

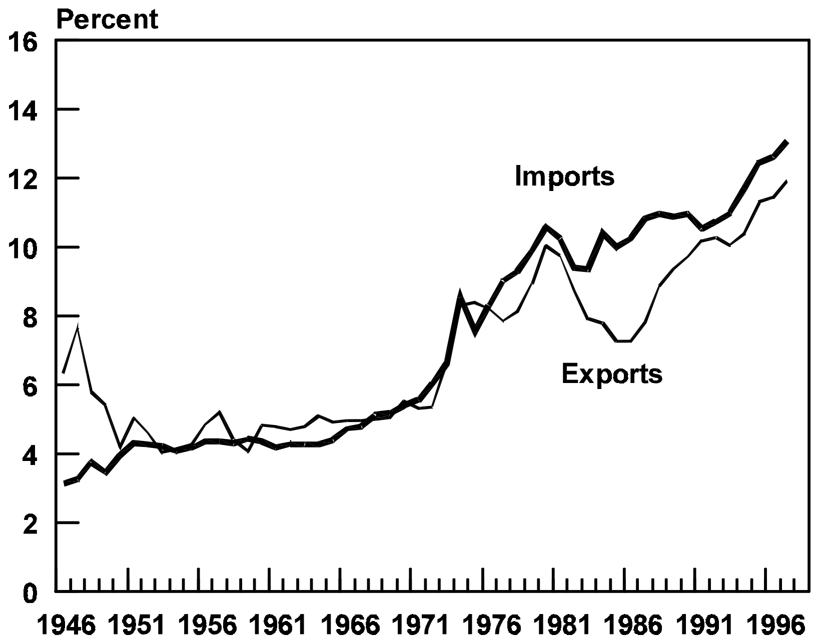
Table 8. US and Foreign Inflation Rates during Periods of US Expansions (percent)

	period I 1962-69	period II 1971-73	period III 1976-79	period IV 1983-89	period VI 1992-98[a]
United States	2.6	5.0	7.0	3.6	2.4
Australia		7.1	10.7	7.6	1.9
Belgium	3.2	5.6	6.3	3.7	2.0
Canada	2.9	5.1	8.4	4.5	1.5
United Kingdom	3.9	8.6	13.4	4.7	2.9
France	4.1	6.3	9.7	5.0	1.7
Germany	2.5	5.9	3.7	1.7	2.6
Italy	3.9	7.1	16.0	8.1	3.9
Japan	5.7	7.8	6.7	1.7	0.9
Netherlands	4.7	7.8	5.8	1.4	2.4
Switzerland	3.5	7.3	1.9	2.4	1.8
ROW (import weighted)	3.6	6.4	8.0	3.4	1.6

Source: International Financial Statistics (IMF).

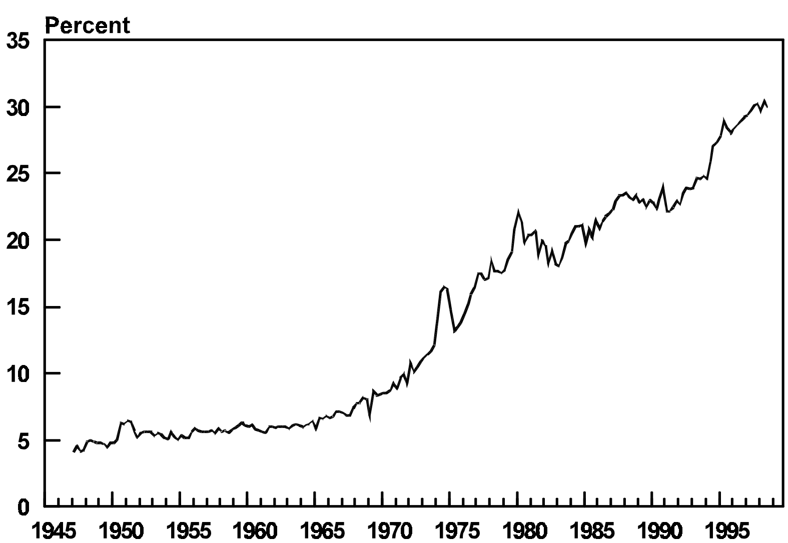
Note: a. 1998 data are based on forecasts.

Figure 1: Imports and Exports as a Share of GDP



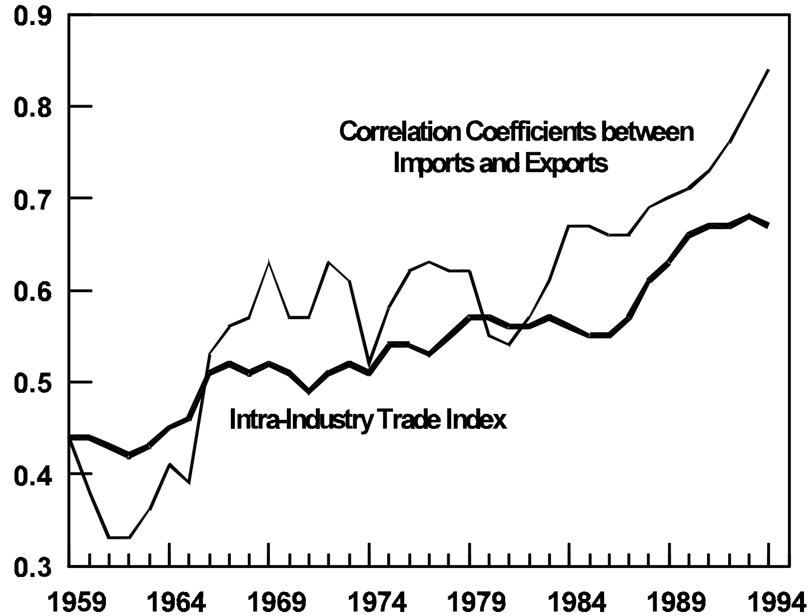
SOURCE: Survey of Current Business by the Bureau of Economic Analysis.

Figure 2: Goods Imports Relative to Final Demand for Goods



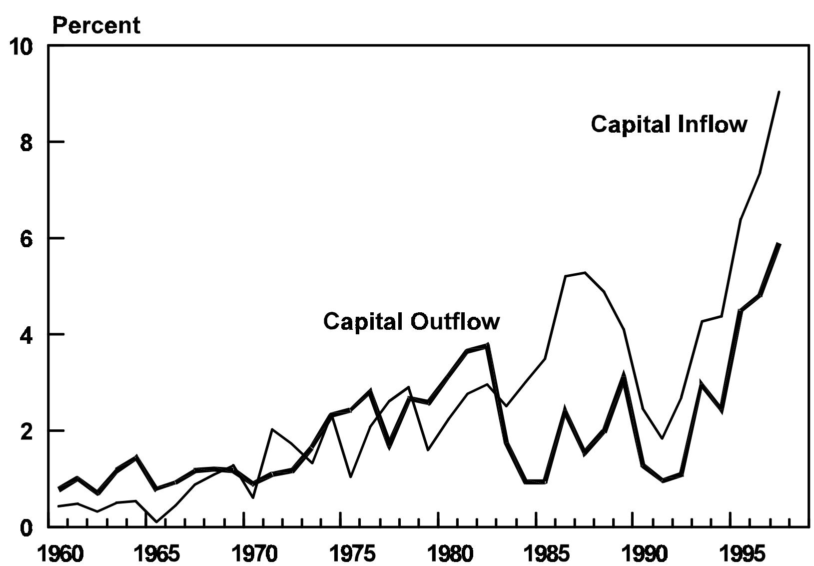
SOURCE: Survey of Current Business by the Bureau of Economic Analysis.

Figure 3: Degree of Intra-Industry Trade



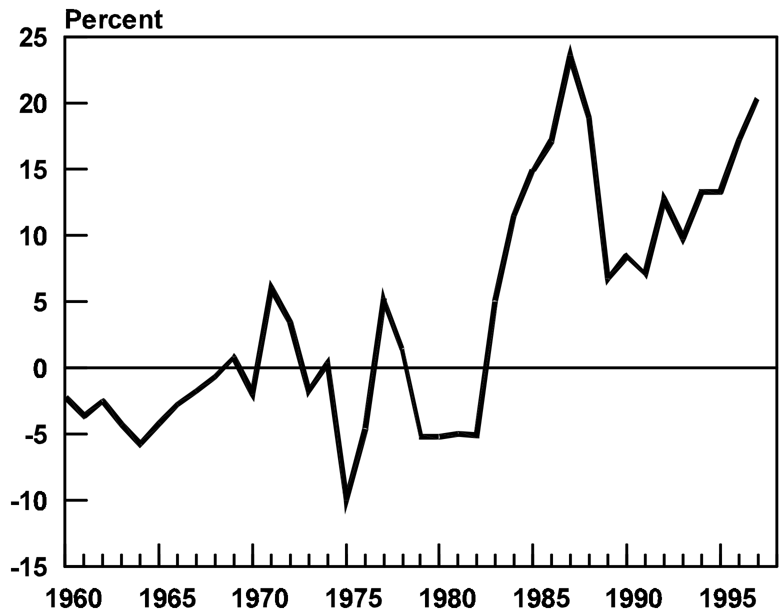
SOURCE: Import and Export data is from Robert C. Feenstra (www.nber.org/~feenstra/).
NOTE: Data for 3-digit SIC industries are used. See the text for Intra-Industry Index formula.

Figure 4: Capital Flows as a Share of GDP



SOURCE: Survey of Current Business by the Department of Commerce Bureau of Economic Analysis.
NOTE: Capital Flows include portfolio and direct investment flows, but exclude unilateral transfers.

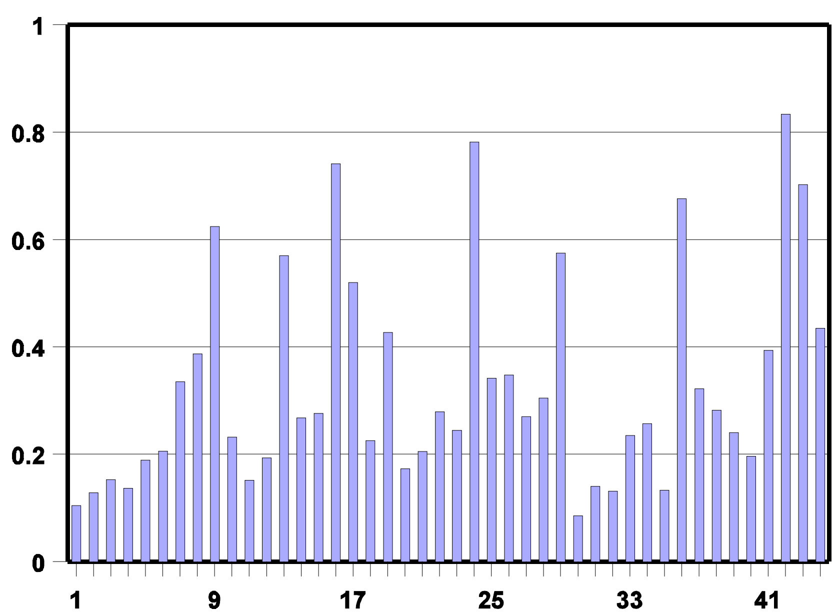
Figure 5: Net Capital Inflow Relative to Private Investment



SOURCE: Survey of Current Business by the Department of Commerce Bureau of Economic Analysis.

NOTE: Capital Flows include portfolio and direct investment flows, but exclude unilateral transfers.

Figure 6: Domestic Price Responses
by Industry for 1992



The response of domestic price inflation is β_{it} from equation (4.1), where $\beta_{it} = \delta + \gamma\ IPR_{it}$. This figure shows the variation in β_{it} across industries (i = 1 through 44) for t = 1992. The highest response (0.81) is for "watches, clocks, watch cases and parts," SIC code 387, which had an import penetration ratio of 76% in 1992. The lowest response (0.07) is for "dairy products," SIC code 202 which had an import penetration ratio of 1.5% in 1992.

Figure 7: Inflation Forecasts
year-over-year; quarterly GDP deflator

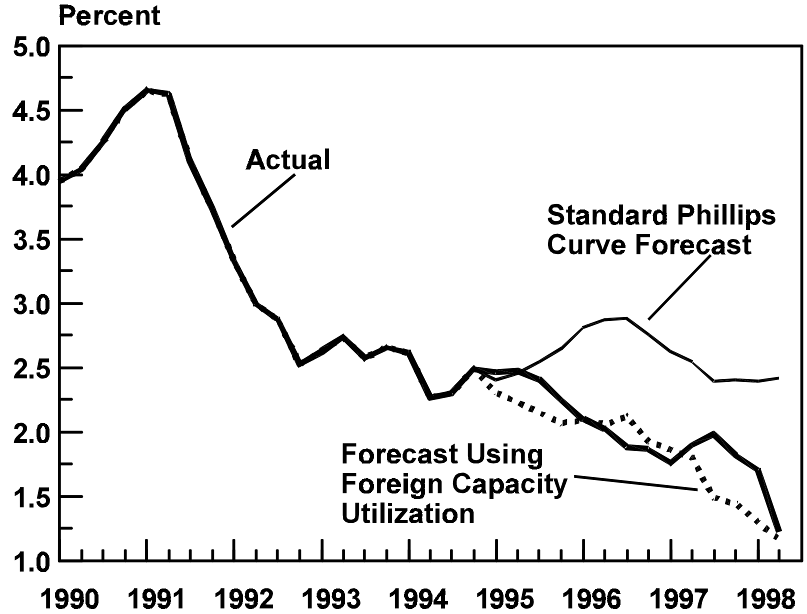


Figure 8: Inflation Forecasts
year-over-year; quarterly core CPI

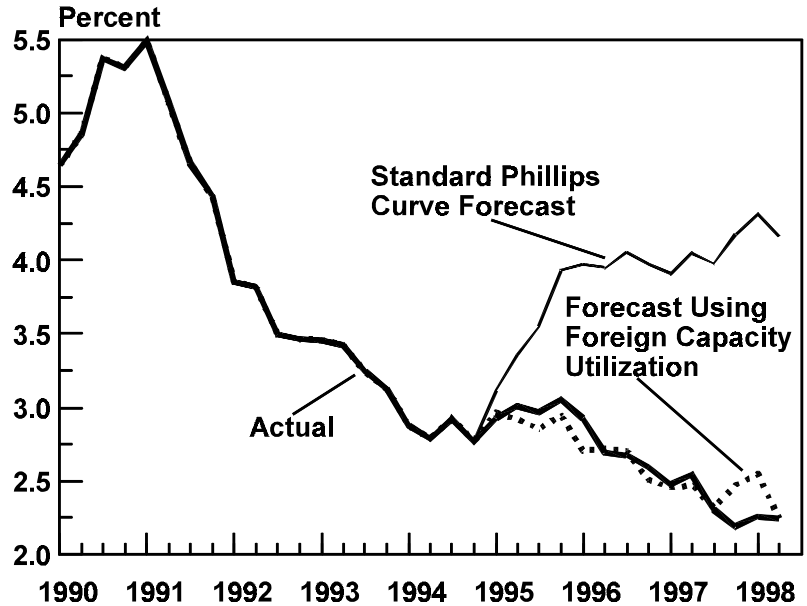


Figure 9: Wage Inflation Forecasts
year-over-year; quarterly ECI wages