Globalization and Global Disinflation

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Over the past ten years, global inflation has dropped from 30% to 4%[1]. Without question, a large part of this breathtaking drop in inflation has to be attributed to improved central bank institutions and practice: enhanced central bank independence, a greater prevalence of more conservative anti-inflation oriented central bankers, better communications strategies and improved monetary control capabilities. Also, the greater awareness, in central bank boards, and among politicians and the public that higher inflation is the wrong instrument to deal with deep-seated structural and fiscal problems has, no doubt, encouraged central bank efforts. Yes, central banks rightly deserve a lot of credit for today's low inflation rates, but do they deserve it all? Have tailwinds made the political economy of disinflation, in the last decade or two, easier than commonly recognized? Will factors that may, for a while, have been exceptionally supportive of anti-inflation efforts be reversed ? Improved fiscal policy and the technology revolution are examples of such factors, popular in many explanations of the recent disinflation trends. I focus, instead, on the increased level of competition -in both product and labor markets- that has resulted from the interplay of increased globalization, deregulation and a decreased role for governments in many economies.

Obviously, since competition tends to drive down prices, such an interplay should have some direct impact on inflation. However, I argue here that the major influence of competition on prices works through the political economy process that governs long-term

[1] According to 2003 and 2004 average global inflation projections from the IMF's *World Economic Outlook*. Country inflation rates are weighted by PPP GDP weights; see *WEO*.

inflation trends. Competition not only tends to reduce the overall level of prices, but also, it tends to make prices (and wages) more flexible. As a consequence, the real effects of unanticipated monetary policy become smaller and more transitory. Hence, there is less cause for central banks to inflate, and less incentive for politicians to pressure them to do so. Perhaps no less important, output and employment tend to be higher in an economy with greater competition. This, too, undermines potential pressures on the central bank to inflate. The net effect of these reduced pressures is that the central bank's anti-inflation credibility is enhanced, and trend inflation falls.

In what follows the discussion is mostly non-technical. Towards the end of the paper though, I sharpen my central point with a small mathematical model. Technically adept but impatient readers may wish to turn immediately to section II F. By no means is this the *only* model of how globalization may affect trend inflation. Dollarization, for example, in many emerging markets, forces inflation-prone governments to temper their behavior for fear of having residents flee to other currencies. Regardless, the remarkable breath of disinflation's shadow and the sweeping range of countries it has touched, strongly suggest that there must be deeper political economy causes at work than is commonly recognized.

Whatever the explanation of global disinflation, the raw data are stunning. In recent years, inflation around the world has dropped to levels that, only two decades ago, seemed frustratingly unattainable. If one takes into account technical biases in the construction of the CPI, as well as central banks' desire to maintain a small amount of padding to facilitate relative price adjustment and avoid deflation then, disinflation has already run its full course

in most industrialized countries. In the developing world, if current trends persist, -with the emphasis on "if"- inflation will be tamed within a decade. Can the current situation be regarded as stable into the indefinite future? Has the inflation process changed fundamentally?

The story in the advanced countries is well recorded: inflation averaged 9% in the first half of the 1980s, versus 2% since the beginning of this decade. Far less well known is the remarkable performance of the developing countries, with inflation falling from an average of 31% in 1980-84 to an average of under 6% in 2000-03. Early in the 90's, from 1990 to 1994, average inflation exceeded 230% in Latin America and 360% in the Transition economies, while it hovered around 40% in Africa. Average inflation in all three regions is projected to approach single digits in 2003.

Along with the aggregate decline in inflation, outlier cases have virtually disappeared as well. In the 1970s, 1980s and 1990s, episodes of very high inflation and hyperinflation abounded, especially in Latin America, Africa and the Transition economies. Argentina's price level has increased a 100 trillion times since 1970, Brazil's a quadrillion (thousand trillion), and the Democratic Republic of the Congo's 10 quadrillion.[2] Today, only three of the 184 IMF members -Myanmar (40%), Angola (over 75%) and Zimbabwe (over 400%) - are expected to reach, or pass the 40% mark, the threshold above which most researchers find

[2] See Reinhart and Rogoff (2002).

inflation acutely damaging.[3] Only 11 countries are projected to have inflation over 20% in 2003, and only 6 over 30%; inflation at these levels is still problematic but a far cry from the problems of a decade ago.

The first section of the paper, documents the broad global trend towards lower inflation, and asks whether the time series properties of inflation have changed. In theory, inflation should be more stable at lower levels, but do the data in fact show it to be better anchored? The evidence in favor of this view for industrialized countries is mixed, and, more so for emerging markets.

The second section takes a look at the forces that may have been driving the disinflation process. With little controversy that improved central bank design has been a major factor behind improved inflation performance, I make no attempt here to examine in depth the workings of its different components (greater independence, better communication strategies, improved techniques, etc.) Instead, I focus on whether other factors, such as more prudent fiscal policies, higher productivity growth, deregulation, and increased globalization may have also contributed to make disinflation both less painful and more successful.

The paper first turns to fiscal policy. Since the invention of money, pressure to finance government debt and deficits, directly or indirectly, has been the single most important driver of inflation. It is not at all clear, however, that improved fiscal policy has

[3] See Bruno and Easterly (1995).

been the main driver of the recent *dis*inflation. True, the data suggest that primary surpluses have risen (or deficits fallen) sharply in both Latin America and in Africa. But in other regions, the trends are more ambiguous. In the industrialized countries, primary surpluses had increased until the recent downturn, but if one takes account of the long-term fiscal implications of deteriorating demographic profiles, the picture is at best mixed. Elsewhere, in many emerging market and developing economies the public debt has increased sharply relative to income over the past fifteen years.[4]

The next section of the paper examines briefly global productivity trends, another factor that is sometimes cited as having contributed to disinflation. While the productivity story neatly fits the US experience of the second half of the 1990s, its generalization to other regions, e.g., Europe, is far from obvious.

I then turn to discussing the political economy model of globalization, competition and inflation alluded to in the opening paragraph of the introduction, including a small analytical model. The concluding part of the paper briefly speculates on the how likely it is that inflation might return in the foreseeable future, despite recent improvement in central bank design and function.

I. **THE NEAR UNIVERSAL FALL IN INFLATION**

[4] See Reinhart, Rogoff and Savastano (2003).

We now turn to look more closely at the global taming of inflation over the past decade - two decades for most industrial countries-. Different countries, facing significantly different institutional, political and historical circumstances have taken diverse routes to achieving lower inflation. The vast majority have succeeded, and dramatically so.

A. Global inflation trends

Table 1 reviews the twenty-five year period from 1980 to 2004, providing (purchasing power parity) GDP-weighted average inflation rates by major groupings of countries. Global inflation averaged 15% in the 1980s, with Latin America having far and away the highest inflation rates, rising from 82% in the first half of the decade to 186% by the latter part of the 1980s. Global inflation peaked at 30% in the first half of the 1990s, thanks to soaring inflation throughout the developing world, and especially in the newly formed transition countries. Even developing Asia, with its generally far more stable macroeconomic policies, had inflation going into double digits.

Since one or two very high or hyperinflation countries may bias the regional averages, it is helpful to break down the data by country. We proceed to do this in two ways. Table 2 lists all countries that had inflation below zero or above 10% in 1992, or are projected to for 2003. Countries with inflation rates between zero and 10 percent are omitted from this table, but all countries' inflation performance is given in detail in Appendix table A1 for the years 1970-2003. In 1992, 44 countries had inflation over 40%. While the transition countries accounted for just over half the total, the high inflation group had

representatives from every major region in the world in 1992.[5] In 2003, as we have already noted, only Myanmar, Angola and Zimbabwe are projected to have inflation over 40%, down from six in 2002.[6]

If anything, deflation threatens more countries today, than does very high inflation (over 40%). Taking into account the well-known upward bias of the CPI (e.g., due to new goods and new retail outlets), and delineating deflation at .5% or 1%, deflation becomes a very large category (See Figure 1).[7]

Figures 2a-2b give a broader time series perspective on individual country inflation by developing country region since 1980. The thick, dark, line in each of the charts gives the percent of countries, for the corresponding point in time, with inflation between zero and 10 percent. In Latin America, the percent of low to very low inflation countries has risen from under 10% in 1980 to almost 80% in 2003. In the Middle East, only a third of countries had low to very low inflation in 1980, but today the share is again over 80%. In developing Asia, the rise is from under 20% to 70% (not including countries with deflation.) The pattern is reversed for very high inflation.

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[5] In 1987, before most of the transition countries began to exit communism, twenty four countries had inflation over 40% -- far over 40% in many cases.

[6] In 2002, Angola, Belarus, Iraq, Myanmar, Turkey and Zimbabwe were the countries with over 40% inflation.

[7] Figure 1 is based on Kumar *et. al*. (2003).

B. Persistence

Virtually any plausible political economy theory of the inflation process suggests that low inflation ought to be a more stable state than high inflation. Several cross-country empirical studies support this hypothesis. For instance, Ragan (1994) showed a clear positive relationship between the rate of inflation and its standard deviation for 22 OECD countries over the period 1960-1989, confirming evidence which had accumulated since the early studies by Okun (1971) and Logue and Willett (1976). More refined measures of inflation volatility, and extension of the analysis to emerging market countries, yield similar results.[8]

In augmented Dickey-Fuller tests, using monthly data for the period from 1960 to 2003, we cannot reject the hypothesis of a unit root (loosely speaking, a random walk component) in inflation for any of the G-7 countries. The picture is slightly more mixed for smaller industrial countries. Inflation in Austria, Switzerland, Netherlands, Norway and Portugal appears to be better characterized by a stationary process.

However, in the case of the G-7 economies, as Table 3 indicates, splitting the sample in the early 1980s, we obtain a more nuanced, and more interesting picture. For all countries except Japan, we fail to reject the unit root hypothesis, in the early period of the sample. In contrast, we can reject this hypothesis for all the G7 countries without exception for the

[8] See for example Evans (1991), Brunner and Hess (1993), and Darrat, Franklin and Lopez (1988).

1981-2003 period, and at a fairly high level of significance. These results, while admittedly sensitive to the choice of breakpoint, are broadly consistent with the view that during the 1970s, inflation was adrift, whereas in recent years, expectations have become better anchored; when there is a shock to inflation, markets expect that it will eventually dampen out. That view is also corroborated by survey data and expectations derived from inflation indexed bonds. These suggest that inflation in many industrialized countries has become more firmly anchored in recent years, and less sensitive to fluctuations in short-term inflation movements.[9]

For most developing countries and emerging markets, the time period over which inflation has been stable is a relatively short one, as is clear enough from Figures 2a and 2b. For the small number of developing countries for which a moderately long stable inflation period is available, it is possible to test for increased stability in a manner analogous to our approach for industrialized countries. For emerging market countries such as Chile, Israel and South Africa, the results support the view that inflation over the recent period is mean-reverting; if inflation spikes, agents should expect the effects to fade away.

Of course, one cannot read too much into tests based on a relatively limited time period – even a few decades – given the historical evidence that inflation cycles tend to run in very long waves [see Figure 3].

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[9] A small number of other studies have looked at the time series evidence on whether inflation has become more stable in industrialized countries, including Pivetta and Reis (2003), Batini (2002) and Levin and Piger (2003).

II. FACTORS UNDERPINNING THE GLOBAL REDUCTION IN INFLATION

One view of the past fifty years is that the monetary authorities just got bamboozled by bad Keynesian theories in the 1960s and 70s. The great inflation of the 1970s and 1980s was the by-product of macroeconomic teaching malpractice. Once the world's central bankers started coming to their senses in the 1980s, ending inflation was just a matter of communication and technique.[10] Perhaps, but this interpretation probably gives too little credit to previous generations of policymakers, and too much credit to modern day monetary authorities, not to mention 1980s monetary theory.[11] Academic economists, for example, remain widely divided on the magnitude of the costs of inflation once below, say, 10%. Are we really so sure that 2% is dramatically better than 3% or 4%? How did Japan become mired in deflation for the last five years if we have it all figured out? While I fully agree that improved institutions and more sophisticated policymakers – not to mention a more sophisticated public – have played pivotal roles, the fact that inflation has fallen everywhere – even in countries with weak institutions, unstable political systems, thinly-staffed central banks, etc., invites us to open our minds to the possibility that other factors have also been significant. But I begin by showing that central bank independence does indeed seem to have

[10] Romer and Romer (1996), Blinder (1998).

[11] It is easy to forget that the leading monetary theorists of the 1980s were ever so sure that their theories proved that any attempt at discretion in monetary policy would prove counterproductive – a dogma that has now been roundly rejected even by their most fanatic followers.

been on the rise throughout the world; there is a solid core of truth to the conventional wisdom.

A. Greater Central Bank Independence

A number of academic studies attempt to measure central bank independence (see, for example, Berger, Eijffinger and de Haan (2001) for a survey), though most aim at comparing independence across countries rather than across time. One widely-used statistic, key to many indices, is the rate of central bank head turnover.[12] Table 4 shows the turnover index by region for the sub-periods 1970-89, and 1990-99.[13] In developing countries the turnover rate dropped sharply from the first sub-period to the second, signifying greater independence. Latin American and the Middle East recorded particularly marked improvements.[14] In the industrial countries, there is little change in this independence measure over the two sub-periods. However, a plethora of other information, e.g., the granting of legal independence to the Bank of England and the Bank of Japan, not to mention the creation of the ECB, suggests that even for these countries, institutional change has been deep and widespread.

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[12] The low rate of turnover may not be a perfect proxy for central bank of independence—turnover of the membership of the central bank's policy making committee is equally important - but it nevertheless appears to track the degree of continuity and independence reasonably well.

[13] The underlying data used to construct Table 4 are drawn from Ghosh, Gulde and Wolfe, 2003, and are also used by Tytell and Wei, 2003.

[14] An exception for transition countries where, evidently, there was relatively less turnover under communism!

It is more difficult to quantify other trend changes in central banks. I would argue that there has been a shift in emphasis towards appointing central bankers with greater inflation focus and awareness, and arguably greater technical skills. Others believe that good performance requires very specific mixes of policies, e.g., that certain narrow interpretations of inflation targeting work much better than other policies. Skeptics, however, can point to the fact that many different approaches appear to have worked.[15] One way to illustrate how the recent global disinflation has transcended narrow interpretations of monetary regimes is to look at inflation performance across different exchange rate regimes.

Figure 4 sorts countries' exchange rates regimes into five groupings according to the "Natural Classification Scheme" of Reinhart and Rogoff (2004). Loosely speaking, the Natural Classification scheme sorts countries' exchange rate regimes according to statistical measures of exchange rate movements, rather than according to the government's officially declared policies. The Figure is based on the "coarse" version of the Natural Classification, which groups countries in increasing order of flexibility as pegs, limited flexibility, managed floats, freely floating and "freely falling" (the last category essentially includes countries with inflation over 40% or countries that have recently experienced an exchange rate crisis). As one can see, limited flexibility and freely floating currencies have the best inflation

[15] See Ball and Sheridan (2003) who argue that inflation targeters have not necessarily performed better than other central banks, either in achieving low inflation or achieving macroeconomic stability, with the supposed superior performance of inflation targetters deriving mainly from those countries with very weak starting points.

performance, but the gap is fairly narrow over the various categories except, of course, for freely falling.

Disaggregating by major economic or regional grouping of countries, as illustrated in Figure 5, yields a similar conclusion.[16] Since the Natural Classification closely mirrors the monetary regime (most of the freely floating and managed floating countries look closely at domestic inflation in determining monetary policy), the fact that the exchange rate regime does not terribly impinge on inflation performance supports the view that there has been no "one size fits all" approach to achieving and maintaining inflation.

B. Tighter Fiscal Policy

Many countries improved their fiscal positions during the 1990s, not only within the group of industrial economies, but also in Africa and Latin America. As Table 5 indicates, industrial countries averaged general government primary balances of 2.8% during the period 1990-2002 compared to -0.1% for 1970-1989. The picture is even better if one excludes the last two to three years, when activity was sub-par in most industrialized countries (though, as already noted, if one incorporates the creeping costs of the demographic time bomb, the picture is less cheery). Emerging markets and developing countries have similarly succeeded in raising conventionally measured primary surpluses. The Latin American countries

[16] That pegged exchange rate regimes should perform relatively well in stabilizing inflation for developing countries should come as no surprise, especially since, in the construction of Figure 5, high inflation after the collapse of a peg is attributed to the post-peg regime.

averaged primary surpluses of 1.3% versus -0.1% in the earlier periods. African countries had deficits of –1.6% from 1990-2003, but this was a considerable improvement over -3.4% from the pre-1990 period.

There are, of course, notable examples of countries where inflation has been coming down despite rising deficits and debt ratios. India has been recording general government deficits of roughly 10% of GDP for almost half a dozen years now, yet inflation has declined. Recession-ridden post-1980s-bubble Japan, with sustained deficits of 6-7% of GDP and a debt/GDP ratio exceeding 150%, is actually experiencing deflation. More generally, Reinhart, Rogoff, and Savastano (2003) document that many emerging market and developing country economies have seen a substantial buildup in market-based debt over the past fifteen years.[17] Financial liberalization, (e.g., paying market interest on debt formerly forced on banks at sub-market interest), lower tariff revenue, and, in some cases, higher government budget deficits, are some of the factors behind this trend. Yet most of these economies have succeeded in lowering inflation.

Also, whereas many industrialized countries experienced an improvement in their debt/GDP ratios during the 1990s, up until the 2001 recession, few countries made significant net forward progress on dealing with their retirement bulge, which has been creeping ever closer. For many countries, the imputed long-term fiscal effects of bringing the

[17] See also chapter III of the September 2003 World Economic Outlook (IMF 2003b), that extends the analysis of Reinhart, Rogoff and Savastano (2003).

demographic shock one step closer each year, is quantitatively a more serious problem than the typical year's budget deficit. On net, then, fiscal policy is likely to have been broadly supportive of the disinflation process, but outside of a couple of developing country regions (most notably parts of Latin American and Africa), fiscal policy cannot be considered a universal and decisive factor in the broad global disinflation we have documented in the first section.

C. Productivity Growth and the Technological Revolution

Another plausible factor that might have helped support disinflation is productivity growth. Unexpected productivity growth, at least temporarily, reduces the pressure on the central bank to inflate, both because growth strengthens fiscal positions, and because any short-term tradeoffs between disinflation and growth become more politically palatable. True, the productivity story works well for the United States since the latter half of the 1990s.[18] In its simplest form, though, the productivity hypothesis falls far short as an explanation for global disinflation. In the case of Europe, for instance, the simple correlation goes the wrong way; inflation was falling through most of the period, while trend productivity growth was declining as well. Indeed, as Figure 6 highlights, productivity growth slowed substantially in the second half of the 1990s, continuing the trend decline among the largest European economies. In the developing world, productivity – especially in

[18] See, for instance, DeLong (2002).

traded goods – probably has been a factor in many cases. It is hard, though, to separate its impact from that of globalization, to which we will turn to next.

D. Globalization, Deregulation and Declining Monopoly Power

While, admittedly, hard evidence is still limited, the mutually reinforcing effects of globalization, deregulation and widespread reduction of the role of government, have, no doubt, sharply increased competition, and lowered "quasi-rents" to monopolistic firms and unions, throughout much of the world. Blanchard and Philippon (2003), drawing on results from a broader OECD study of deregulation (Nicoletti et. al., 2000, 2001), argue that quasi-rents in the OECD have fallen steadily since the 1970s. In that case, goods and capital market integration in Europe provided an important initial impulse. Production then was shifting to lower cost countries, just as today production is shifting towards the EU accession countries of central Europe.

During the 1980s, the speed of deregulation increased markedly in the United Kingdom, New Zealand, Australia and Canada. It eventually brought these countries to levels close to that of the United States, where de-regulation had began a decade earlier. Continental Europe followed the deregulation bandwagon of the Anglophone countries, making significant progress in the 1990's. Still, though, this region has retained higher regulatory barriers and barriers to entrepreneurship (Nicoletti et. al., 2000, 2001). Markups of price over marginal cost – a standard measure of monopoly rents -- remain much higher on the continent compared to the United Kingdom and the United States (about .40 versus .15

according to estimates used in the IMF's April 2003 *World Economic Outlook*). In developing countries, opening to trade has typically led to sharp drops in monopoly rents for domestic firms (often the strongest opponents of trade). Though far from always the case - especially where countries failed to put needed regulation in place - widespread privatization has increased competition as well.

A reduction in monopoly pricing power per force leads to lower real prices, holding monetary policy constant. Monetary authorities can, of course, suitably adjust monetary policy to offset such nominal price level effects. As I elaborate below, however, they will choose, in general, to let some of the effects pass on to lower inflation.

Of course, in parallel with the indirect effects stressed above, globalization can also have a direct impact on prices. Trade with emerging Asia has certainly put downward pressure on the real cost of goods; workers in most countries can now buy more with a given income than prior to globalization.[19] Although China alone accounts for 5% of world trade, emerging Asia combined accounts for almost 20%. The simultaneous workings of direct and indirect effects make it difficult to assess accurately the quantitative impact of Emerging Asia's growing trade on global prices. For example, even though traded goods constitute at most 20-25% of the US GDP (Obstfeld and Rogoff, 2000), sharp reductions in their prices

[19] In passing, it is worth mentioning that global commodity prices were on a steady downward trend for much of the period since the 1990s, again providing a favorable environment for price reduction in commodity importing countries. Arguably, this factor may be more important than I am giving it credit here, and bears further consideration.

are bound to create spillover effects on other sectors. Many of the traded goods are intermediate goods (e.g., computers), or, to some degree, substitutes for non-traded goods.

Does it matter if trade and deregulation increase competition and push down real prices? Isn't, after all, inflation about *nominal* price levels not *real* price levels? How can globalization lead to disinflation in countries where the central bank is not firmly committed to an exchange rate target, and free to aim for its own domestic inflation target?

E. Increased competition and anti-inflation credibility

In recent years, a number of authors have pointed out that modern new Keynesian and New Open Economy macroeconomic models, where monopolistic competition is typically a crucial feature, can be used to provide micro foundations to the classic Kydland-Prescott-Barro-Gordon model of credibility and monetary policy. In this new analytical framework, monopoly in both the product and labor markets creates a wedge between the monopoly level of employment and the corresponding benchmark competitive level. Such an imperfection provides the crucial motivation for the Central Bank to inflate in order to drive employment above its "natural" market determined rate. *As the wedge becomes smaller, there is less to gain from unanticipated inflation. Central bank anti-inflation credibility is enhanced, even without any institutional change. As a consequence, average equilibrium inflation falls.* (See Obstfeld and Rogoff, chapter 10, for example, or Ireland (1996)) Thus, an increased level of competition in the economy – due either to globalization or deregulation – not only lowers the *real* prices of goods, but also tips coordination towards a lower inflation equilibrium. .

A second closely related causal mechanism works from greater competitiveness to lower inflation through higher price flexibility. According to a large theoretical and empirical literature, in very competitive sectors, like agriculture or semi-conductors, prices are significantly more flexible, than in sectors that are highly unionized and/or have a small numbers of industries.[20] Where prices are more flexible, the impact of monetary policy on the real economy becomes less potent. In turn, then, the lower gains from unanticipated inflation make the commitment of the monetary authorities to low inflation more credible.

Certainly, many other factors affect the credibility of anti-inflationary policy across countries, including debts and deficits as we have already discussed above. And as noted in the introduction, my desire to isolate and formalize the effects of globalization on inflation leads perhaps to a narrower portrayal of the effect than is likely the case. Other channels outside the model, such as dollarization, are almost surely also significant.[21]

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[20] See Taylor and Woodford (1999).

[21] For example, globalization and increased openness also harden a central banks' anti-inflationary resolve through a third, interrelated channel. In theory, at least, an unanticipated monetary expansion would tend to depreciate the exchange rate. Such a depreciation would imply that a given level of monetary stimulus affects inflation more and employment less (due to wage indexation and higher costs of intermediate goods) the more open the economy is. Openness, in other words, tempers the incentives of monetary authorities to inflate. (See Rogoff, 1985 and Romer, 1992; the latter provides cross-country empirical evidence).

In sum, globalization, acting in synergy with deregulation and privatization, puts downward pressure on real prices, and weakens the incentives that central banks may have to produce unanticipated inflation; thereby, it also leads to lower nominal price inflation over the long run.

F. A Simple Mathematical Formalization of the Effects of Increased Competition on Equilibrium Trend Inflation

Though many readers will be quite familiar with the Barro-Gordon model of inflation, a limited mathematical digression might nevertheless be useful. Assume a very simple world in which the central bank directly sets the inflation rate, π. The private sector makes decisions – including setting nominal wage and price contracts that embody expectations π^e about what the central bank will do. Output, in turn, is an increasing function of $\pi - \pi^e$. The private sector guesses right about inflation on average, despite the fact there is a wedge k between the socially optimal rate of output and the market-determined rate of output. In the original Barro-Gordon formulation, the authors appealed to income taxation as one factor that might create such a wedge, but newer formulations that derive the whole setting from micro foundations, stress that this wedge is inversely proportional to the degree of monopoly power in the economy. Overall, in the simplest static formulations, and ignoring institutions and credibility (the subject of much literature), the central banks' objective function is given by

$$(\pi - \pi^e - k - z)^2 + \chi(\pi - \pi^*)^2$$

where the first term is meant to capture the central banks' desire to stabilize output around its natural rate (assumed proportional to $\pi - \pi^e - k - z$) and where z is mean zero productivity shock, π^* is the central banks' preferred rate of inflation (say 2.5%), and χ is the weight (priority) it puts on inflation stabilization versus output stabilization. As is well known, if private agents are rational and understand the central banks objectives, then the expected inflation rate will be

$$\pi^e = \pi^* + k/\chi$$

The actual inflation rate the central bank will select is

$$\pi = \pi^* + (k - z)/\chi$$

Since the productivity shock is zero on average, private sector agents are right on average about the inflation rate. Without going into further details -- since there are many places to find related analyses (e.g., Obstfeld and Rogoff, 1996, chapter 9) -- this short analysis allows me to reinforce a couple points. First, when globalization and deregulation make the economy more competitive, they reduce the wedge k, causing expected inflation to fall *permanently*. The decline in inflation here is not caused by the fact that monopoly prices are higher than competitive prices, as usually discussed in the popular press. The relative price effect need not have any effect on inflation unless the central bank chooses so. Rather, the smaller wedge systematically lowers the central banks' incentives to inflate, so that it

will, on average, choose a smaller π. A positive productivity shock has only a *temporary* impact on inflation and no effect in the long run, unless it affects the wedge *k*. Potentially, a large enough positive productivity shock can even throw an economy into deflation if target inflation π^* is too low. (In a richer model, a demand shock could produce a similar result).

Indeed, the new breed of micro-founded models suggests that reduced monopoly will have a further effect; arguably, more important and universal than the one we have already stressed. If greater competition makes prices more flexible, then one can reformulate the central banks' objective function as

$$[\mu(\pi - \pi^e) - k - z]^2 + \chi(\pi - \pi^*)^2$$

where μ is inversely proportional to the degree of price flexibility in the economy. Equilibrium expected and actual inflation are now given by

$$\pi^e = \pi^* + \mu\, k/\chi \quad \text{and} \quad \pi = \pi^* + \mu\,(k - z)/\chi$$

A higher μ reflects a greater proportion of inflexibly priced goods in the economy, and a greater temptation to inflate. In such a setting, since an increase in competitiveness also decreases μ in addition to *k*, the argument that greater competitiveness makes anti-inflation policy more credible is strengthened.

The basic point made here generalizes to virtually all variants of the Barro-Gordon model. In principle, it may be generalized to more dynamic models as well, as long as

imperfect monetary policy credibility remains an issue, as I, for one, believe it will always be.

Hopefully, this short mathematical detour has clarified some of the basic points made earlier:

(1) In thinking about trend inflation, what really matters is the central bank's incentives to inflate. Shocks to relative prices, which many confuse with inflation, are of secondary importance.

(2) Unexpected productivity (technology) shocks can lower inflation, but only temporarily. An explanation of the deeper trend must lie elsewhere, in factors such as greater competition or price flexibility.

G. Reduced conflict

Though the modern era has witnessed a number of peacetime inflations, it is war, or, civil conflict that has caused many of history's high inflation episodes. We already see this in Figure 3 for the G7 countries. Inflation spikes during World War II and its aftermath, and then again in the 1970s, sparked at least in part by Vietnam-era US budget deficits. If the data were extended back to World War I, the effect would be even more dramatic. Many of today's few remaining high inflation countries labor under a legacy of conflict; if new very high inflation cases appear over the next year or two, conflict is likely to be one of the major

reasons behind them. Though the 1990s witnessed many terrible wars, the overall situation was milder than in previous decades, especially for the larger economies. Of course, the post 9/11 era has seen some rollback of the peace dividend of the 1990s.

III. WILL INFLATION COME BACK??

The huge success of monetary authorities around the globe in reducing inflation over the past decade owes much to more effective and independent central banking institutions, as well as to a generation of policymakers determined to establish and maintain low inflation. But the task has been made easier by a number of supporting factors, including relatively low debt accumulation, technological advances, de-regulation and a reduced role of government in the economy and, perhaps most importantly, globalization. It is clear that the relative role of these diverse supporting factors has differed across countries but overall, the global environment has been favorable. One central point of this paper is that increased competition in an economy not only has a one-off effect on relative prices, but through the political economy of the inflation process can lead to a sustained reduction in inflation rates.

Can inflation, which has been largely eradicated in the industrialized countries, and is now being tamed if not exterminated in one developing country after another, make a comeback in the next decade or two? Though institutions and understanding are much improved, it is not hard to imagine that the present historical wave of low inflation, like others, will someday end.

For example, I have argued that globalization and de-regulation have been powerful forces supporting the political economy of low inflation. These engines of higher competition and productivity will most likely continue to strengthen in coming decades, but long reversals are possible. After all, globalization was a dominant theme in development in the 19th century, too, but the process came to an abrupt halt and was even reversed for the four decades following the outbreak of the First World War. As already noted, conflict has the potential to interfere with globalization in the modern era. An admittedly melodramatic example illustrates the point: if terrorist threats ever reach the point where ships entering, say, the United States, ever need to be searched and scanned like passengers in an airport, the resulting delays and frictions would deal a blow to the complex global supply chain, with both one-off and dynamic effects. If events forced sharp cutbacks in global trade for a sustained period, domestic political and economic dynamics would likely allow firms and unions to recover part of their monopoly power; one could envision then circumstances of greater price inflexibility with greater pressures on the central banks to inflate.

Also, while there are few countries today where fiscal policy is an immediate threat to monetary policy, it is not hard to find industrialized or emerging market countries where debt levels are a looming problem. Countries facing immediate adverse demographic shocks are particularly at risk. Although old age retirement payments are indexed to inflation in most countries, some governments may still find that the easiest way to back out of unsustainable systems is via some combination of "surprise" de-indexing and inflation.

The greatest threat to today's low inflation, of course, would be a reversal of the modern trend towards enhanced central bank independence, particularly if trend economic growth were to slow, owing, say, to a retreat in globalization and economic liberalization. The favorable economic climate is also supportive of a favorable political climate. As long as central bank independence remains strong, and it is widely accepted that low inflation should be one of the central bank's main aims, today's virtual zero inflation can potentially be maintained for a long time. Still, overall, one must acknowledge that any pronounced or widespread relapses in the relatively favorable backdrop of globalization, deregulation, productivity increase and relatively benign fiscal policies could begin to rollback the extraordinary achievement of recent years.

Table 1. World CPI Inflation

(Percent per annum)

	1980-84	1985-89	1990-94	1995-99	2000-03	2000-04	2003
World	14.1	15.5	30.4	8.4	4.1	3.9	3.9
Industrial economies	8.7	3.9	3.8	2.0	2.0	1.8	1.9
Developing countries	31.4	48.0	53.2	13.1	5.7	5.6	6.0
Africa	16.8	17.9	39.8	20.6	11.8	11.0	10.7
Asia	9.0	11.5	10.5	7.3	2.3	2.4	2.6
Latin America	82.4	185.9	232.6	17.2	8.2	7.9	10.9
Middle East	18.6	22.5	30.4	29.6	16.4	15.3	13.4
Transition economies	6.2	7.7	363.2	53.9	14.5	13.4	10.0

Source: IMF, *World Economic Outlook.*

Table 2. Inflation Thresholds: 1992 and 2003

	Inflation=0		10<Inflation=20		20<Inflation=30		30<Inflation=40		40<Inflation		
	1992	2003	1992	2003	1992	2003	1992	2003	1992	1992 (continued)	2003
Industrial Economies		Hong Kong, SAR Japan	Greece Israel								
Africa	Burkina Faso Central African Rep. Chad Comoros Congo, Republic of Gabon Mali Niger Senegal Togo		Botswana Cape Verde Gambia, The Ghana Guinea Lesotho Madagascar Mauritania Namibia South Africa	Ethiopia Gambia, The Kenya Mozambique Nigeria Somalia Zambia	Ethiopia Malawi Tanzania	Ghana	Algeria Kenya São Tomé & Príncipe Somalia		Angola Congo, Dem. Rep. of Guinea-Bissau Mozambique Nigeria Sierra Leone Sudan Uganda Zambia Zimbabwe		Angola Zimbabwe
Middle East	Bahrain, Kingdom of Kuwait Saudi Arabia		Syrian Arab Republic	Iran, I.R. of	Egypt Iran, I.R. of	Turkey		Iraq	Iraq Lebanon Turkey Yemen, Republic of		
Transition Economies			Czech Republic	Romania Russia Tajikistan Turkmenistan	Hungary	Belarus Uzbekistan			Albania Armenia Azerbaijan Belarus Bulgaria Croatia Estonia Georgia Kazakhstan Kyrgyz Republic Latvia Lithuania	Macedonia, FYR Moldova Mongolia Poland Romania Russia Slovenia Tajikistan Turkmenistan Ukraine Uzbekistan	
Asia		Maldives	Bhutan India Maldives Nepal Solomon Islands Sri Lanka	Afghanistan, Islamic State Of Lao People's Dem.Rep Papua New Guinea Solomon Islands Tonga	Myanmar		Vietnam	Myanmar	Afghanistan, Islamic State Of Cambodia		
Latin America			Bolivia Chile El Salvador Guatemala Mexico Paraguay	Argentina Brazil Costa Rica Dominican Republic Paraguay Suriname	Argentina Colombia Costa Rica Guyana Haiti	Uruguay	Venezuela, Rep. Bol.	Haiti Venezuela, Rep. Bol.	Brazil Jamaica Nicaragua Peru Suriname Uruguay		

Source: IMF, *World Economic Outlook*.

Table 3. P-Values of Unit Root Tests for G7 Countries[1]

Sample Period/Country	1960.1–1981.12	1982.1–2003.4
United States	0.4596	0.0016
Canada	0.7684	0.0167
Japan	0.0623	0.0848
France	0.6953	0.0033
Germany	0.3922	0.0834
Italy	0.1756	0.0180
United Kingdom	0.2656	0.0176

[1] Author's calculations based on monthly CPI data (national sources), using the Augmented Dckey-Fuller test. The null hypothesis is of a unit root in the inflation process, with the p-values indicating the probability level at which the null hypothesis can be rejected. Thus in the first period, the hypothesis is not rejected at 10% level or better for any country except Japan (for which it is rejected at 0.06 percent); for the second period it is rejected for all countries at 10 percent level or better, indicating that in this period the inflation process did not have a unit root.

Table 4. Average Central Bank Governor Turnover Rate
(Fraction per five years)

Region	1970–1989	1990–2002
Industrial economies	0.172	0.167
Developing countries:		
Africa	0.211	0.165
Asia	0.235	0.196
Latin America	0.404	0.317
Middle East	0.194	0.072
Transition economies	0.200	0.316

Source: Ghosh, Gulde, and Wolfe (2002).

Table 5. General Government Balances

(Fiscal balances as a percent of GDP)

Region	Primary		Overall	
	1970–1989	1990–2002	1970–1989	1990–2002
Industrial economies	-0.11	2.76	-2.5	-2.53
Developing countries:				
Africa	-3.58	-1.63	-6.45	-4.99
Asia	-1.29	-1.2	-3.91	-3.56
Latin America	-0.13	1.25	-4.58	-2.7
Middle East	2.53	-0.96	-7.57	-4.48
Transition economies	0.23	-1.94	-0.18	-4.33

Source: IMF, *World Economic Outlook.*

Table A1. Inflation in the World Economy, 1970–2003[1]
(Percent per annum)

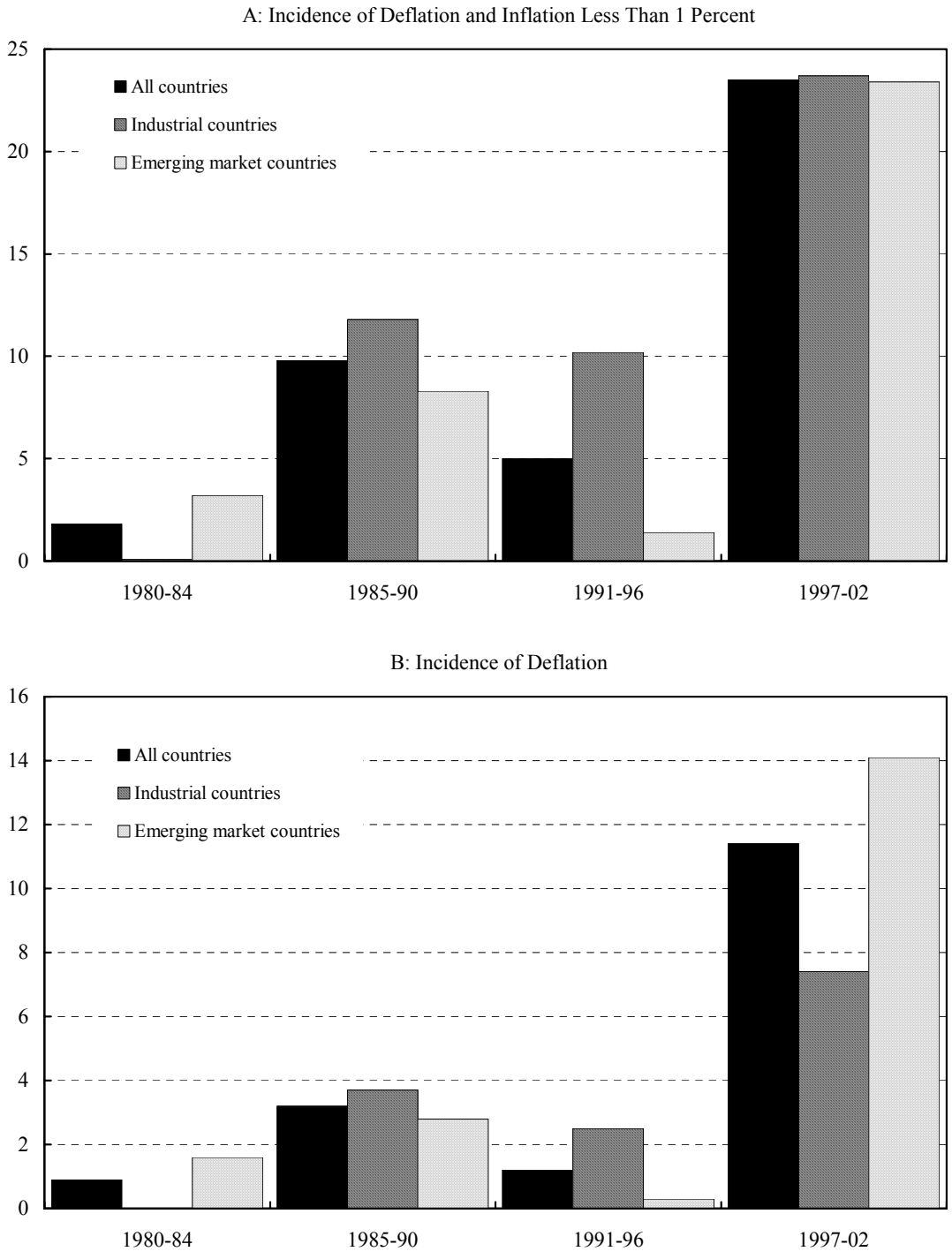
		1970-1979	1980-1989	1990-1999	2000-2003
1	Albania	0.0	0.0	44.4	2.9
2	Algeria	8.2	9.0	17.8	2.5
3	Angola	40.1	6.3	1011.0	165.5
4	Antigua and Barbuda	12.5	5.7	3.4	0.9
5	Argentina	132.9	565.7	252.9	11.5
6	Armenia	0.3	1.2	1015.4	1.4
7	Australia	9.6	8.1	2.5	3.6
8	Austria	6.1	3.8	2.1	1.9
9	Azerbaijan	0.3	1.2	424.6	2.2
10	Bahamas, The	6.9	6.3	2.8	1.7
11	Bahrain, Kingdom of	12.5	2.2	0.9	-1.1
12	Bangladesh	20.2	11.3	6.7	3.1
13	Barbados	14.0	7.3	2.9	1.4
14	Belarus	0.3	1.1	568.2	75.2
15	Belgium	7.1	4.9	2.1	2.0
16	Belize	17.2	4.6	-1.7	0.5
17	Benin	3.5	2.3	7.7	3.2
18	Bhutan	3.6	9.2	9.7	4.1
19	Bolivia	15.9	1383.1	10.4	2.4
20	Bosnia & Herzegovina	n/a	n/a	n/a	2.3
21	Botswana	9.6	13.1	10.9	6.3
22	Brazil	30.6	332.3	854.8	9.1
23	Brunei Darussalam	n/a	n/a	2.1	0.2
24	Bulgaria	0.0	2.6	187.6	6.7
25	Burkina Faso	8.1	3.5	4.5	2.6
26	Burundi	10.7	7.0	13.8	9.8
27	Cambodia	7.5	9.0	57.3	1.6
28	Cameroon	10.7	7.8	5.2	2.9
29	Canada	7.4	6.5	2.2	2.6
30	Cape Verde	10.7	11.6	7.3	1.4
31	Central African Rep.	13.3	6.1	3.9	3.6
32	Chad	8.0	5.1	4.9	6.2
33	Chile	162.0	21.4	11.8	3.3
34	China, P.R.: Mainland	1.2	7.5	7.8	0.1
35	China, P.R.: Hong Kong	7.9	7.5	6.9	-2.5
36	Colombia	19.8	23.4	22.2	7.3
37	Comoros	11.2	5.5	3.9	1.6
38	Congo, Dem. Rep. of	40.1	59.5	3369.0	236.4
39	Congo, Republic of	8.1	0.4	8.2	1.6
40	Costa Rica	8.5	25.9	17.7	10.3
41	Côte d'Ivoire	13.0	5.9	5.9	3.6
42	Croatia	16.7	191.4	299.9	4.4
43	Cyprus	6.8	5.8	3.9	3.3
44	Czech Republic	0.6	1.5	14.7	2.9

[1]Consumer price inflation.

		1970-1979	1980-1989	1990-1999	2000-2003
45	Denmark	9.3	6.9	2.1	2.5
46	Djibouti	12.3	5.1	4.4	1.9
47	Dominica	13.3	7.7	2.3	0.7
48	Dominican Republic	9.2	21.4	15.3	9.1
49	Ecuador	n/a	-1.7	2.3	12.5
50	Egypt	7.7	17.4	10.9	2.7
51	El Salvador	9.1	18.6	10.4	2.7
52	Equatorial Guinea	10.4	21.7	7.5	8.6
53	Eritrea	n/a	n/a	n/a	19.3
54	Estonia	0.3	1.2	151.6	4.4
55	Ethiopia	10.6	5.2	7.4	-1.4
56	Euro Area	n/a	n/a	n/a	2.3
57	Fiji	9.1	7.5	4.2	2.3
58	Finland	10.4	7.3	2.1	2.5
59	France	8.9	7.3	1.9	1.9
60	Gabon	11.1	6.4	5.5	1.2
61	Gambia, The	9.9	17.2	5.8	4.6
62	Georgia	0.3	1.2	1993.3	4.8
63	Germany	4.9	2.9	2.4	1.7
64	Ghana	38.8	48.3	27.6	21.1
65	Greece	7.1	12.3	11.0	3.6
66	Grenada	18.7	7.1	2.3	1.9
67	Guatemala	8.8	10.5	15.3	6.3
68	Guinea	6.3	33.7	8.7	4.6
69	Guinea-Bissau	9.3	61.1	37.5	4.5
70	Guyana	9.2	27.9	25.3	4.4
71	Haiti	8.9	7.7	20.6	11.6
72	Honduras	6.6	7.6	19.7	9.2
73	Hungary	3.8	8.9	22.2	7.4
74	Iceland	29.7	39.3	4.2	4.7
75	India	7.4	9.1	9.5	4.0
76	Indonesia	17.5	9.7	14.5	9.0
77	Iran, I.R. of	11.2	19.8	14.2	14.1
78	Ireland	12.8	9.3	2.4	4.6
79	Israel	32.5	129.7	11.2	2.7
80	Italy	12.5	11.4	4.2	2.6
81	Jamaica	16.5	17.2	27.5	7.3
82	Japan	9.1	2.5	1.2	-0.8
83	Jordan	10.8	7.0	3.1	1.7
84	Kazakhstan	0.3	1.2	540.3	8.5
85	Kenya	11.0	11.5	16.9	5.6
86	Kiribati	7.5	4.6	3.4	3.5
87	Korea	15.2	8.4	5.7	3.2
88	Kuwait	8.2	3.6	9.7	1.9
89	Kyrgyz Republic	0.3	1.2	204.7	7.9

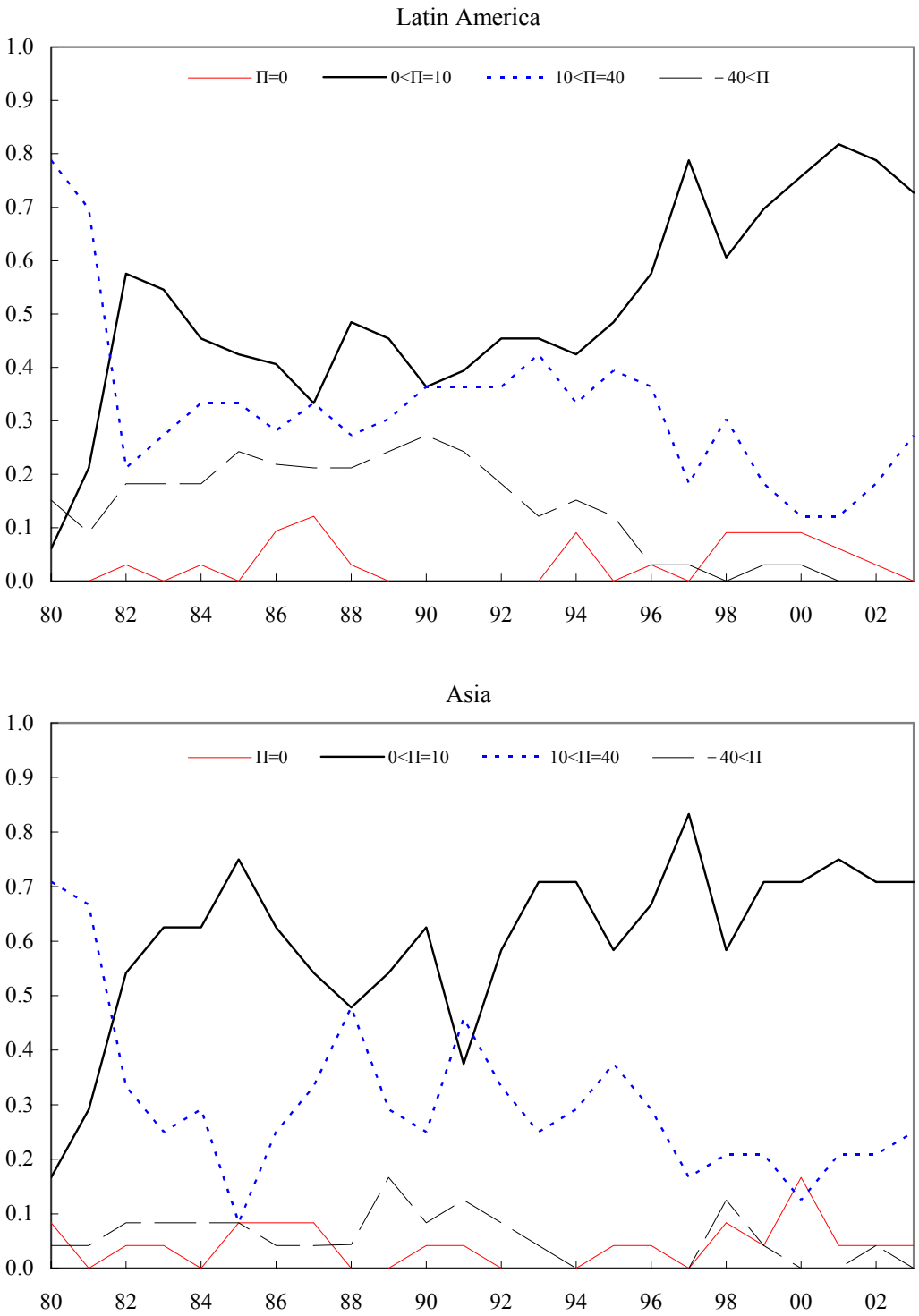
		1970-1979	1980-1989	1990-1999	2000-2003
90	Lao People's Dem. Rep	25.1	61.3	28.7	12.2
91	Latvia	0.3	1.5	127.7	2.5
92	Lebanon	12.6	96.6	30.4	0.8
93	Lesotho	14.2	14.2	11.1	8.5
94	Liberia	8.8	7.5	10.0	10.0
95	Libya	5.5	8.9	7.0	-1.8
96	Lithuania	0.3	1.3	120.7	1.2
97	Luxembourg	7.0	4.7	2.2	2.5
98	Macedonia, FYR	16.7	191.4	294.6	4.2
99	Madagascar	7.9	18.6	17.3	6.2
100	Malawi	9.0	17.0	30.5	19.0
101	Malaysia	5.5	3.6	3.7	1.8
102	Maldives	10.8	7.4	7.7	1.0
103	Mali	13.8	4.2	4.2	3.6
104	Malta	5.6	3.6	2.9	2.4
105	Mauritania	9.9	8.4	6.2	4.0
106	Mauritius	10.5	11.6	7.8	5.4
107	Mexico	14.7	69.1	20.4	6.3
108	Moldova	0.3	1.2	267.4	12.7
109	Mongolia	0.0	0.2	73.6	6.2
110	Morocco	7.8	7.6	4.5	1.8
111	Mozambique	2.0	41.8	33.6	11.8
112	Myanmar	11.1	10.4	27.2	29.9
113	Namibia	10.6	13.1	10.3	9.8
114	Nepal	8.3	8.4	10.2	3.2
115	Netherlands	7.1	2.8	2.3	3.5
116	Netherlands Antilles	8.3	4.9	2.4	1.9
117	New Zealand	11.5	11.9	2.4	2.5
118	Nicaragua	22.3	2098.8	1100.8	6.3
119	Niger	10.6	4.1	5.0	2.5
120	Nigeria	15.7	20.7	31.8	13.5
121	Norway	8.4	6.1	2.4	2.6
122	Oman	6.7	1.9	1.5	-0.1
123	Pakistan	12.0	7.3	9.7	3.6
124	Panama	6.0	3.1	1.1	0.9
125	Papua New Guinea	7.6	6.3	8.7	9.5
126	Paraguay	11.1	20.5	16.5	11.5
127	Peru	26.5	481.5	808.3	2.1
128	Philippines	15.2	14.5	9.5	4.4
129	Poland	8.0	59.9	84.8	4.7
130	Portugal	7.1	16.4	5.9	3.5
131	Qatar	17.6	4.0	2.9	1.9
132	Romania	0.8	3.0	122.3	29.7
133	Russia	0.3	2.5	339.2	17.7
134	Rwanda	12.4	4.7	17.3	3.1

Figure 1. Incidence of Deflation and Low Inflation 1/



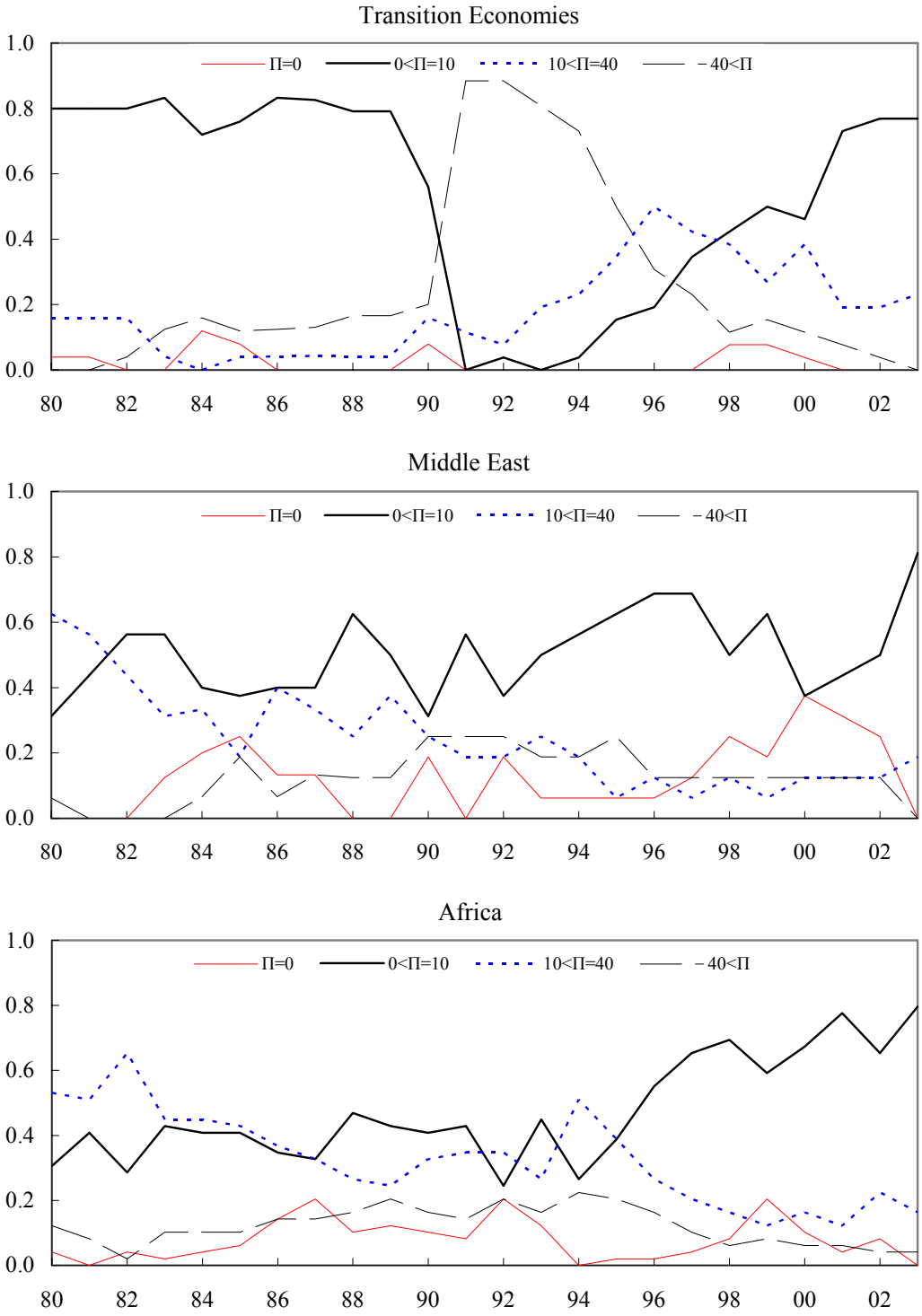
Source: Data derived from Kumar et al. (2003)
1/ Number of country months with year-on-year inflation less than 1 percent or negative, as a percent of total. Data based on 35 of the largest industrial and emerging market economies.

Figure 2a. Distribution of CPI Inflation
(*Percent*)



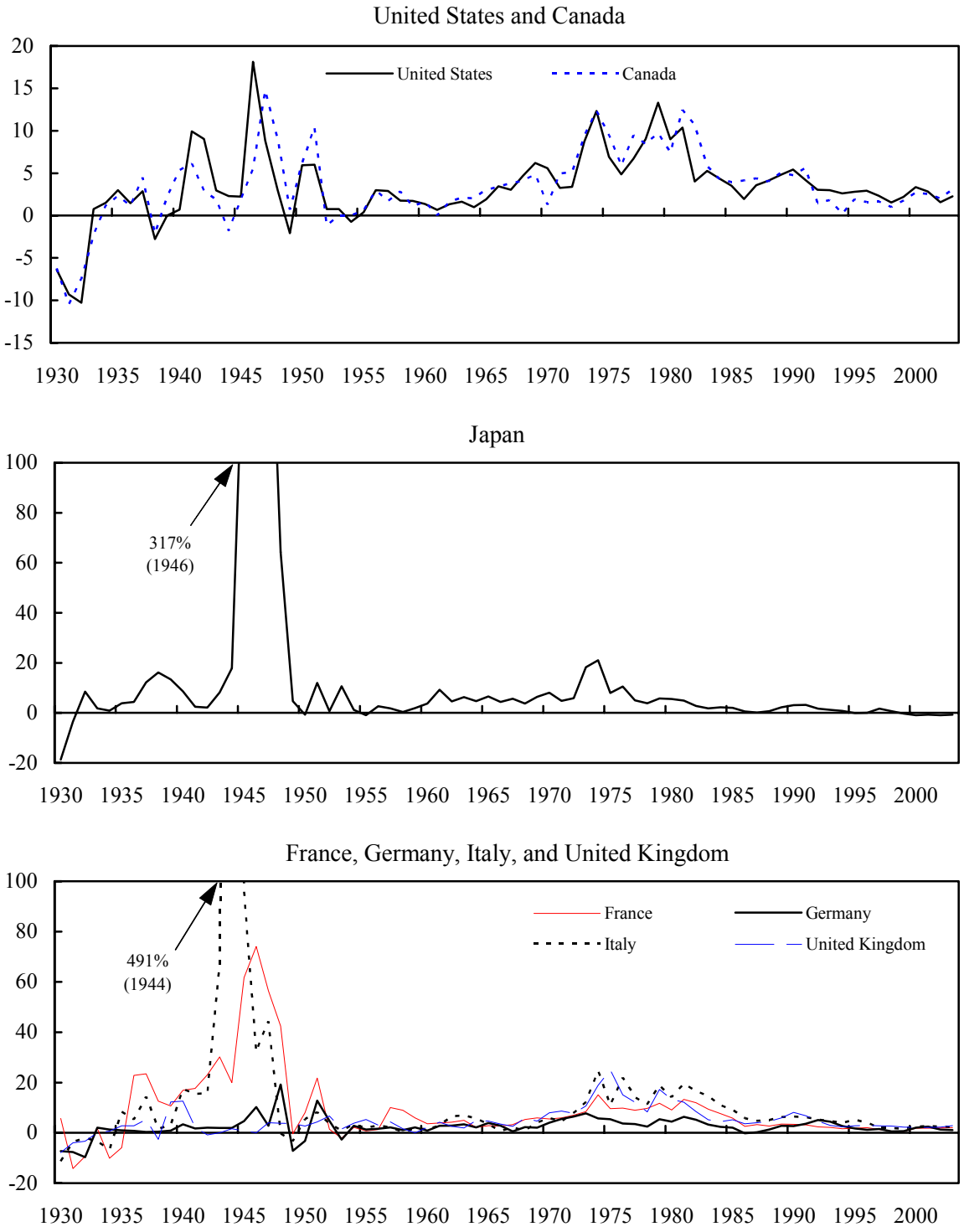
Source: IMF, *World Economic Outlook.*

Figure 2b. Distribution of CPI Inflation
(*Percent*)



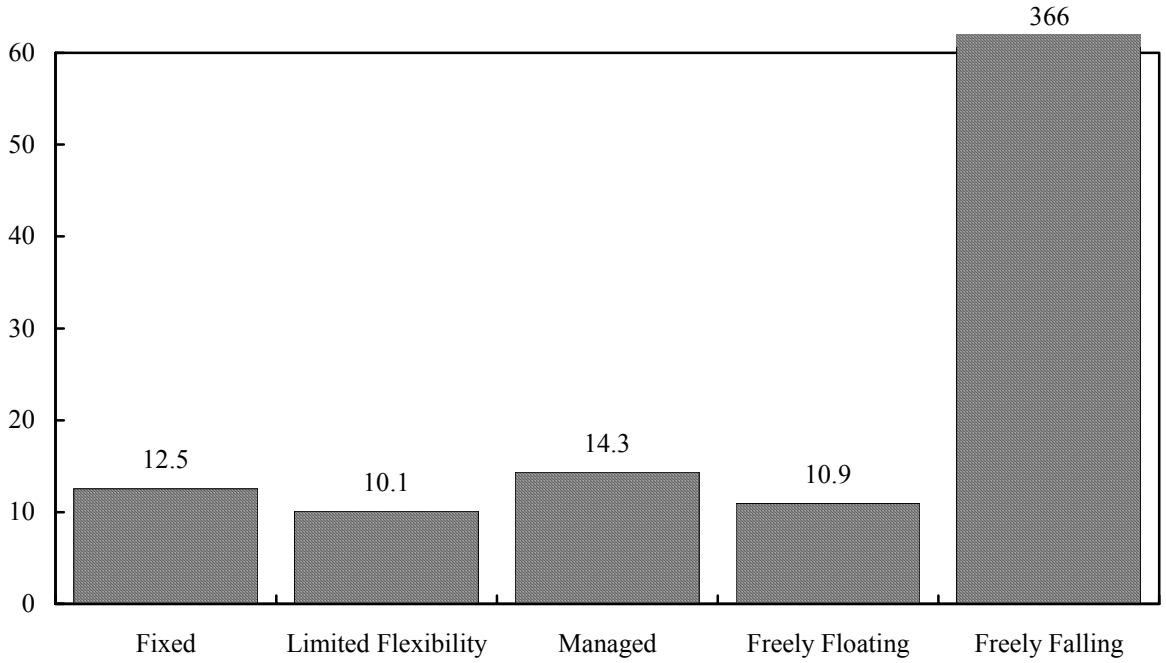
Source: IMF, *World Economic Outlook.*

Figure 3. CPI Inflation, 1930-2003
(*Percent per annum*)



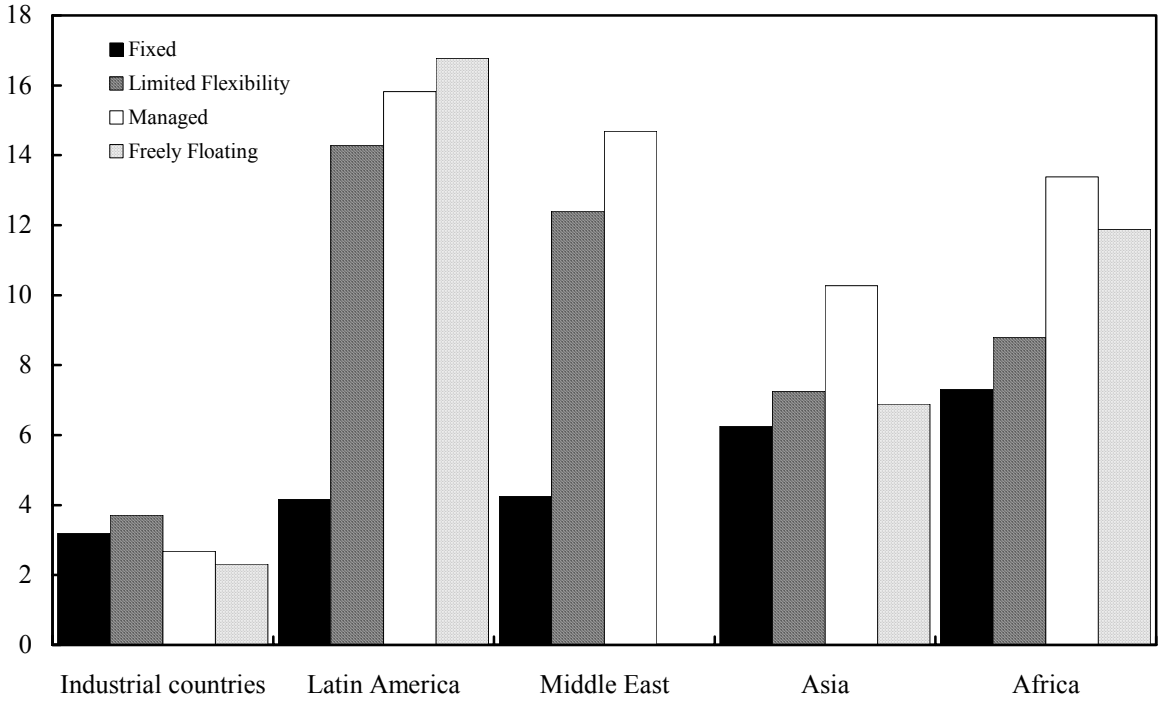
Source: Global Financial Data, Inc.; and IMF, *World Economic Outlook.*

Figure 4. Average Annual Inflation Across Exchange Rate Arrangements for 138 Countries, 1950-2002
(*Percent*)



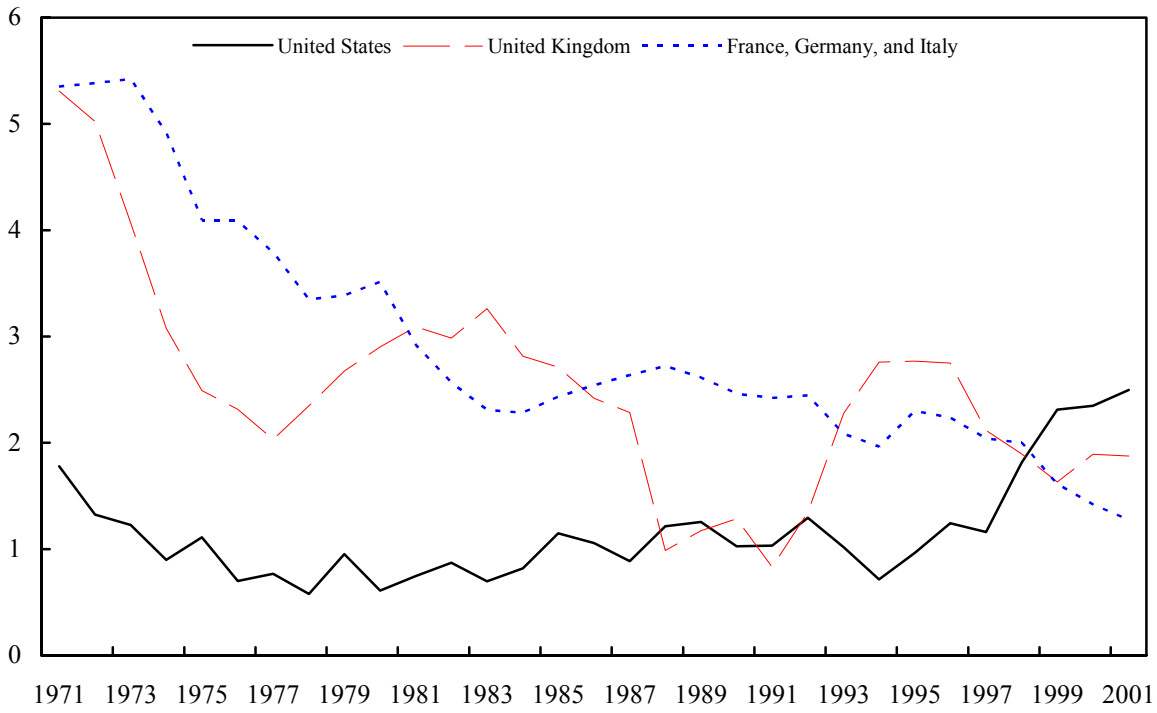
Note: CPI inflation from IMF, *World Economic Outlook;* and Exchange rate regime according to the natural classification proposed by Reinhart and Rogoff (2004).

Figure 5. Average Annual Inflation
by Exchange Rate Regime Arrangement and Region, 1991-2001



Note: CPI inflation from IMF, *World Economic Outlook;* and Exchange rate regime according to the natural classification proposed by Reinhart and Rogoff (2004).

Figure 6. Labor Productivity, 1971-2001
(*Percent; 5-year moving average; output per hour*)



Source: Organization for Economic Cooperation and Development (2002).

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