How Costly Is Disinflation?
The Historical Evidence

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$\mathbf{A}$ central goal of monetary authorities such as the Federal Reserve is to reduce inflation and ultimately to achieve stable prices in the belief that doing so will contribute to higher long-run growth. The Fed and central banks in other countries can reduce inflation by slowing the

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rate of growth of the money supply. Why then do central banks not eliminate inflation once and for all? The answer is that doing so is usually costly: efforts to reduce inflation through significantly slower money growth push up interest rates and are followed by recessions. The United States, for example, undertook major efforts to reduce inflation in 1968, 1974, and 1979. While inflation fell appreciably in each case, a recession followed within two years. Many economists believe that anti-inflationary policy, while necessary to bring inflation down, contributed to the recessions (as did other fac-

tors, such as the big jump in oil prices in 1974 and again in 1979).[1]

Thus central banks face a dilemma: they would like to reduce inflation, but they do not want the pain of a recession. Is it worth paying the price to reduce inflation? To answer this question, we first need to know just how much pain is involved. How large are the costs of reducing inflation? Is there any way that wise policies or favorable circumstances can reduce these costs? Are there ever cases when inflation is reduced without any costs at all?

This article seeks to answer these questions by examining history. For 19 major countries, I examine the data since 1960 to find episodes of significant inflation declines resulting from tight monetary policy. This search yields 65 historical episodes. I then estimate the cost of each disinflation. The cost is measured using economists' traditional concept of the "sacrifice ratio." This variable is the ratio of the total output losses during disinflation, measured as a percent of a year's output, to the decrease in inflation. One can think of the ratio as giving the price of lowering inflation: the percentage points of lost output per percentage point of inflation reduction. After estimating the ratio for each episode, I ask how costly disinflation is on average and whether the ratio varies in ways that can be explained.[2]

There are several conclusions. First, the costs of disinflation are substantial. Averaging across all countries, each percentage point decline in trend inflation costs about 1.4 percentage points of a year's output. For disinflations in the United States alone, the average loss is higher: 2.4 points of output per point of inflation reduction. It may be possible to reduce the cost of disinflating in the United States. If steps to do so are not taken, however, our average historical experience suggests that reducing U.S. inflation from 3 percent to zero would cost about 7 percentage points of lost output (which could be spread out over several years). Moreover, although the sacrifice ratio is lower in many countries than in the United States, it is almost always positive. Some disinflations are more costly than others, but completely costless disinflation is a historical rarity.

Second, the costliness of disinflation depends on how quick it is. In particular, a "cold-turkey" disinflation—one in which inflation is brought down rapidly—is accompanied by a smaller output loss than a gradual reduction in inflation. Policymakers often take a gradual approach because they fear that a deep recession will result from a sharp tightening of monetary policy. My results suggest that this strategy can raise the total output loss associated with disinflation.

Third, when looking across countries, the sacrifice ratio is lower where wage-setting institutions are more flexible. For example, the United States has many three-year labor contracts in the union sector, so that wages cannot adjust quickly to shifts in monetary policy. In addition, contract negotiations in different sectors are staggered across time, so that it is difficult to coordinate a general slowdown in wage hikes. In Japan, by contrast, contracts last only a year and are synchronized across sectors. The sacrifice ratio in flexible-wage Japan is considerably lower than in the rigid-wage United States.

SOME BACKGROUND

The effects of disinflations are highly controversial among economists. One traditional view, which is presented in many textbooks, is that reducing inflation necessarily causes a

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[1] An earlier article in this *Business Review* discusses these issues in more detail. See Ball (1993a). For a historical discussion of the Fed's major disinflation efforts, see Romer and Romer (1989).

[2] The original statistical results on which this article is based are contained in my more technical paper, "What Determines the Sacrifice Ratio?" (Ball, 1993b).

recession. Indeed, according to this view, the recession is the mechanism by which prices are forced down. The central bank slows the growth of the money supply, pushing up interest rates and thus reducing borrowing and spending. The resulting recession then induces firms to raise prices less quickly, in an attempt to maintain sales. Eventually inflation slows, and the economy returns to full-employment equilibrium.

In contrast to this traditional view, the new classical school of economics believes that the costs of disinflation can be small or nonexistent. According to Thomas Sargent (1983), disinflation is costless if it is anticipated. Suppose, for example, that the government announces its intention to reduce money growth to fight inflation and that price setters believe this announcement. Anticipating the fall in money growth, they can reduce their rate of price increases at the same time. In this case, money growth and inflation fall in tandem, so the real money supply is unchanged and there is no recession. Another version of the new classical argument stresses the idea that firms can adjust prices quickly if economic circumstances change. Even if the slowdown in money growth is unexpected, any effect on output is small and short-lived if firms can quickly adjust their rate of price increase.

Thus economists' conclusions about the effects of disinflation depend on their basic assumptions about whether shifts in monetary policy are anticipated by price setters—whether the central bank can clearly announce its policies and whether those announcements are believed—and about the speed with which prices adjust to economic shocks. Both issues are hotly contested. Apparently sincere promises from the central bank to reduce money growth are always suspect because the central bank may be tempted to choose fast money growth to stimulate the economy. New classical economists believe in quick price adjustment, while new Keynesians point to evidence

of sluggishness; neither side is likely to convince the other anytime soon.

When economists use theoretical models to estimate the costs of disinflation, their conclusions are greatly affected by their assumptions about these issues. In the May/June 1992 issue of this *Review*, Dean Croushore uses a number of formal macroeconomic models to calculate the loss in output from reducing inflation from 5 percent to zero. Robert Barro's new classical model, which assumes that shifts in monetary policy are known in advance, produces a sacrifice ratio of zero: given Barro's assumptions, disinflation has no costs. Benjamin Friedman's Keynesian model, which assumes that policies are not foreseen and prices are very sluggish, produces a sacrifice ratio of 40: eliminating inflation in the United States would cause a recession larger than any since the Great Depression. A variety of other assumptions produce a range of predictions in between.

Since economists cannot agree on their basic assumptions about expectations and price adjustment, and since these determine the cost of disinflation, is there any hope of resolving the question? In this article, I sidestep the thorny issue of choosing the right macroeconomic model and simply look to the evidence of history. I examine past episodes of disinflation in a variety of countries and use these experiences rather than macroeconomic models to estimate the costs of disinflation.

METHODOLOGY

Selecting Disinflation Episodes. My data cover 19 major industrial countries.[3] I examine movements in inflation, as measured by the Consumer Price Index for each country, from

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[3] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

1960 through 1991. To reduce the influence of unusual short-term movements in inflation, I examine not inflation itself, but "trend" inflation.[4] Unusual shocks, such as cold weather that causes crop failures, can have big effects on inflation in one quarter, but these temporary fluctuations are smoothed out by looking at trend inflation.

The first step is to identify disinflations—episodes in which trend inflation fell substantially. In particular, I select episodes in which trend inflation falls at least 2 percentage points below its peak level. To illustrate this procedure, trend inflation from 1961-89 is shown for four countries: the United States, Germany, the United Kingdom, and Japan (Figure 1). For each country, the arrows indicate the beginnings and ends of disinflations—the peak level of inflation and the minimum level at the end. The United States experienced three disinflations according to my definition. Their dates are 1969-71, 1974-76, and 1980-83. Germany experienced three disinflations at roughly the same time, while the United Kingdom experienced five, and Japan six.

Are the decreases in trend inflation observed in the data caused by tight monetary policy—by intentional decisions by central banks? In principle, inflation could fall for other reasons, such as the sharp decrease in world oil prices in 1986. To investigate this issue, I examined the historical record for nine major countries out of my sample of 19 (mainly by reading the *Economic Outlooks* published by the Organization for Economic Cooperation and Development). Each country shows evidence of a significant

monetary tightening near the start of *every* disinflation episode. Decreases in inflation arising entirely from other sources are apparently too small to meet my criterion of a 2-percentage-point fall.[5]

The Sacrifice Ratio. Once disinflation episodes are selected for each country, the next step is to calculate the cost of each disinflation, as measured by the sacrifice ratio. Again, this variable is the ratio of the output loss, as a percentage of potential output, to the decrease in the trend inflation rate. The denominator of this ratio—the change in trend inflation—can be calculated simply by taking the difference between trend inflation at the start and end of the episode. In the first U.S. disinflation, for example, this difference is 2.1 percentage points. (Trend inflation fell from 5.7 percent in the fourth quarter of 1969 to 3.6 percent in the fourth quarter of 1971.) The more difficult task is calculating the numerator of the sacrifice ratio: the lost output from disinflation.

The "output loss" from disinflation is the percentage difference between the actual level of output and what output would have been if there had been no disinflation, that is, if monetary policy had not tightened to fight inflation. The trick, therefore, is to estimate what would have happened under the alternative scenario.

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[4] Trend inflation in one quarter is defined as the average of inflation in that quarter, the previous four quarters, and the following four quarters. For example, trend inflation for the first quarter of 1992 is the average of inflation from the first quarter of 1991 through the first quarter of 1993. Trend inflation gives an accurate picture of the long-term rate of inflation.

[5] I have also compared my lists of disinflation episodes to lists of tight-money episodes constructed for the United States by Romer and Romer (1989) and for Japan by Fernandez (1992). These comparisons confirm the close correspondence between tight money and disinflation. Romer and Romer report that policy tightened in 1968, 1974, 1978, and 1979. In all these cases, the Federal Reserve was responding to recent increases in inflation (arising from spending on the Vietnam War in the first case, and from oil price increases in the rest). If the last two tightenings are interpreted as a single two-year episode, there is a close correspondence to the disinflations that I identify, which start in 1969, 1974, and 1980. Similarly, there is a close relationship between the Japanese disinflations that I identify and Fernandez's episodes.

FIGURE 1
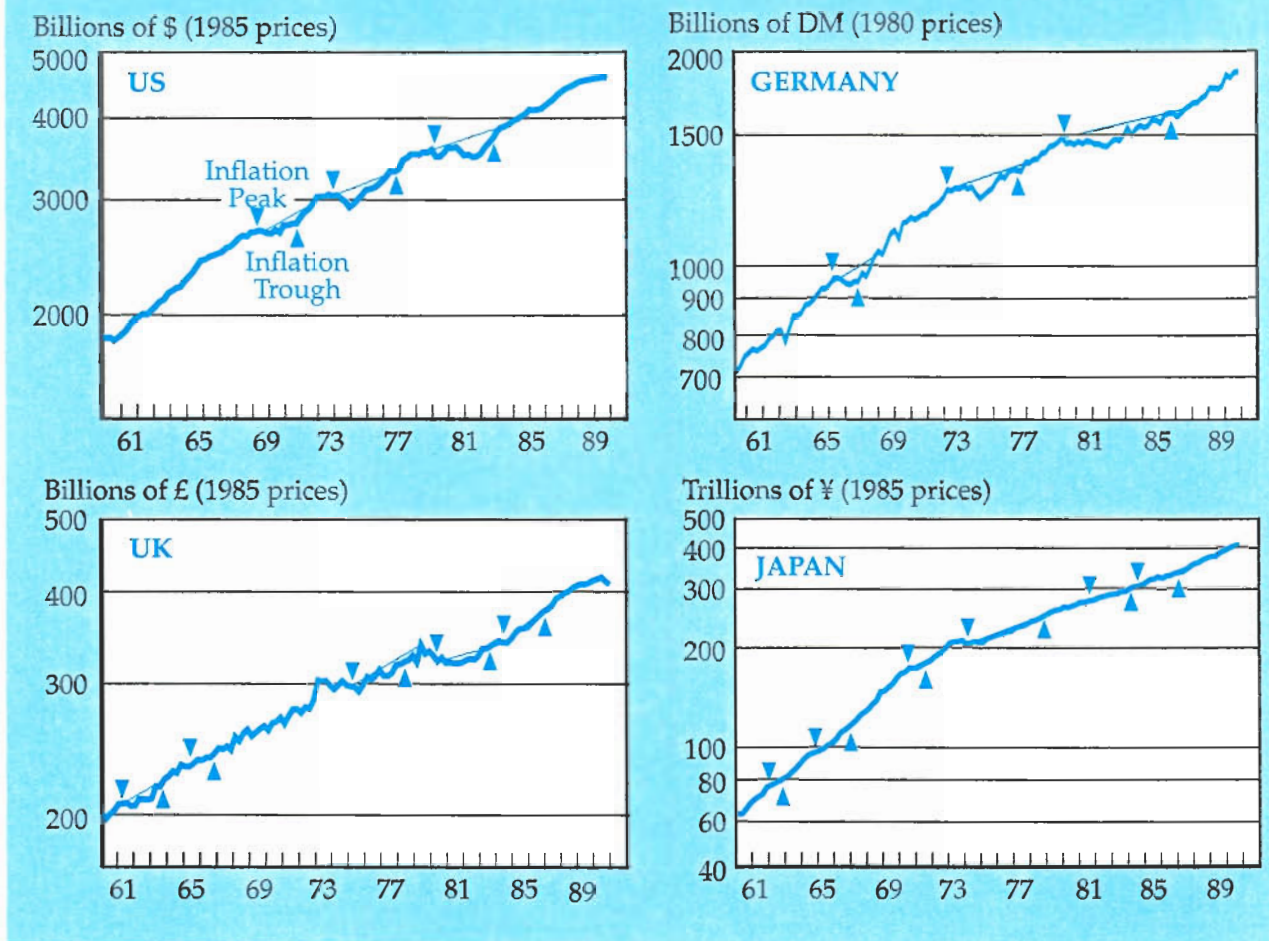# Trend Inflation and Disinflation Episodes
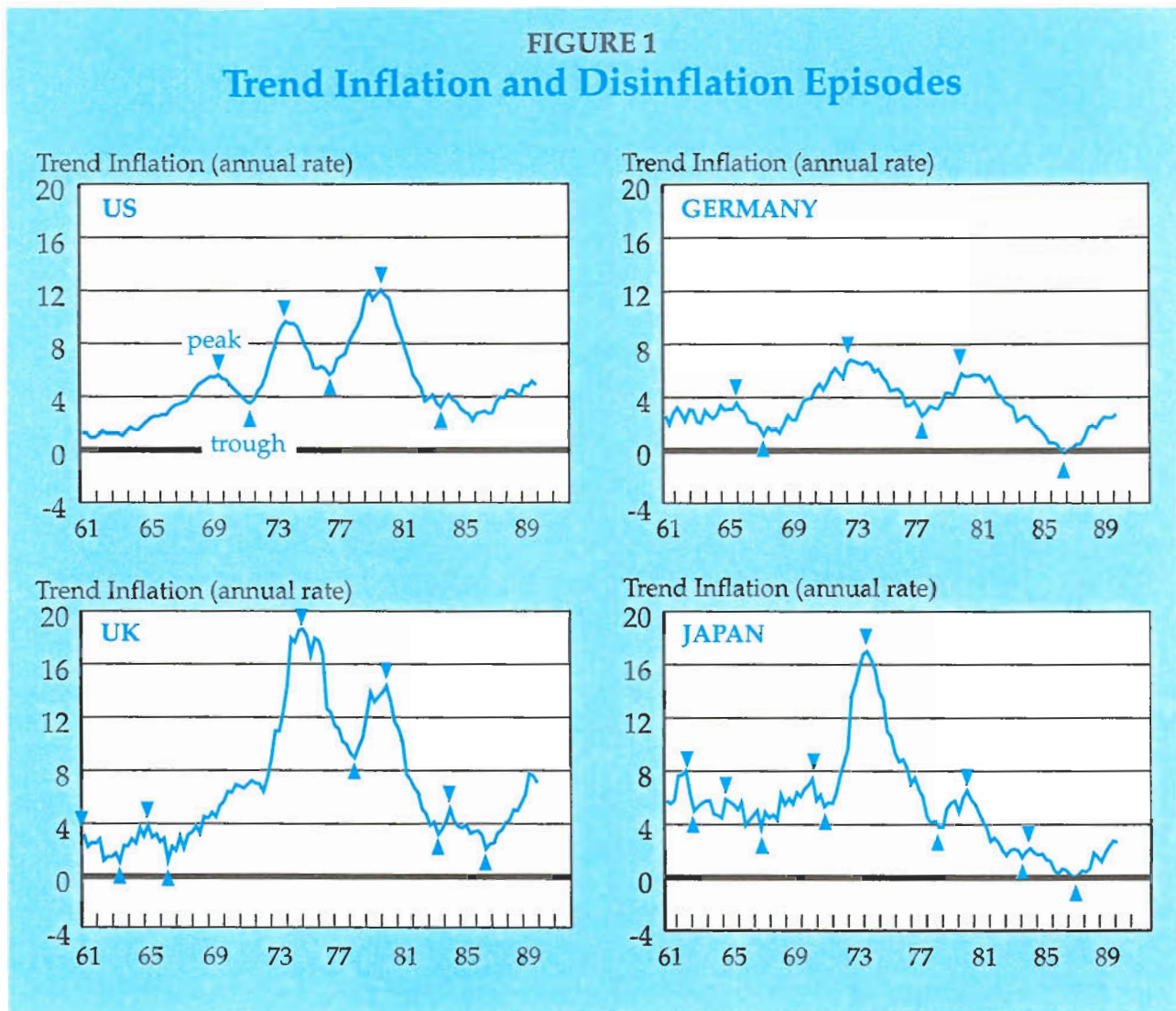
To do so, I make the key assumption that the effects of disinflation eventually wear off—that output eventually returns to the path it would have followed in the absence of disinflation. Specifically, I assume that output is back on this normal path one year after the end of disinflation—one year after inflation reaches its minimum level. This assumption is based on historical experience in the United States and other countries. Usually output falls during disinflation, then rises rapidly after the minimum inflation level is reached as the effects of tight money fade and the economy returns to normal. The rapid growth usually levels off

after about a year. In the United States, average output growth is 5.8 percent in the year after an inflation trough, considerably above average growth for 1960-91.

In addition to assuming that output is back to normal four quarters after the end of disinflation, I assume that in the absence of disinflation, output would have grown at a constant percentage rate between the start of disinflation and four quarters after the end. Figure 2 shows output for the same four countries shown in Figure 1. The arrows indicate the beginnings and ends of the disinflation episodes identified with the inflation data. For

FIGURE 2
Trend Output During Disinflations

Billions of $ (1985 prices)

Billions of DM (1980 prices)

Billions of £ (1985 prices)

Trillions of ¥ (1985 prices)

each disinflation, the steady path that I assume output would have followed if there had been no disinflation is shown by the straight line from output at the start of disinflation to output four quarters after disinflation.

To understand this procedure, look at the graph for the United States. Outside of disinflation episodes, output grows fairly steadily, indicating fairly steady economic growth. When a disinflation begins, output dips down, then eventually rises rapidly. By connecting the two points on the output graph— the start of disinflation and the point one year after the end—I fill in the gaps created by these

temporary dips. These straight lines indicate a hypothetical output path that fits in with the smooth growth in other periods. Therefore, these lines are reasonable estimates of what would have happened to output if there were no disinflation. The results for Germany and the United Kingdom are similar to those for the United States: disinflations are accompanied by sizable output losses. In Japan, the constructed lines are close to actual output, implying that disinflation did not push output far from its normal level.

Once I have estimated the path that output would have followed if there had been no

disinflation, calculating the output loss from disinflation is easy: the output loss is the total area of the gap between my estimated output line and the actual path of output. This total output loss is divided by the fall in inflation to calculate the sacrifice ratio for each episode.

Is Disinflation Really the Cause of Temporarily Lower Output? In calculating sacrifice ratios, I assume that output losses during disinflations are *caused* by the disinflations—or more precisely by the tight monetary policy through which disinflation is achieved. As described earlier, this view is consistent with the traditional theory that inflation adjusts slowly to a reduction in money growth; under this assumption, tight monetary policy reduces the real money supply, raising interest rates and thereby reducing output. My assumption that tight policy caused the recessions is supported by the evidence that policy was indeed tight near the start of the disinflations in my sample. On the other hand, it is possible that other factors were also at work—that the output losses arise at least partly from other events that occurred around the same time as the disinflations.

Some disinflations occur shortly after OPEC shocks (as with the last two U.S. disinflations), for example, and so some of the output losses might be blamed on delayed effects of the oil shocks. However, there is little difference between the output losses in disinflations that are preceded by oil shocks and those that are not.[6] This evidence suggests that tight monetary policy, which occurs in all disinflation episodes, is responsible for most of the output losses.

BASIC RESULTS

Here I will focus on the results for nine major countries: the United States, the United King-

dom, Germany, Japan, France, Italy, Switzerland, Canada, and Australia. There are 28 disinflation episodes in this sample.[7] Table 1 lists the dates of the disinflations in the nine countries, the initial level of inflation, the change in inflation, and the sacrifice ratio. The results produce a clear conclusion about the central issue of this article: disinflations are indeed costly. Averaging over all 28 episodes yields an overall sacrifice ratio of 1.4: reducing trend inflation by 1 percentage point costs 1.4 percent of a year's output. On average, moderate reductions in inflation cause significant recessions: reducing trend inflation by 5 percentage points could be achieved at a cost of 7 percent of a year's output or 3.5 percent of output for two years.

The sacrifice ratio varies widely across different episodes, however. The lowest value of the ratio is 0.0 (UK 1965-66) and the highest is 3.6 (Germany 1980-86). Despite this variation, the ratio is positive in 27 of 28 episodes. Thus the view that disinflation can be costless gains little support from history: past disinflations are almost always costly.

The sacrifice ratio also appears to differ systematically across countries. For each of the nine countries I have looked at so far, Table 2 gives the average ratio for all episodes in the country. The United States is near the high end of the range, with an average ratio of 2.4. Thus a 5-percentage-point reduction in U.S. inflation costs 12 percentage points of output historically, compared with 7 percentage points for the average country. The sacrifice ratio in

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[6] See Ball (1993b), pages 12-14.

[7] My data cover 19 countries in all (see footnote 3), with a total of 65 disinflations. The advantage of focusing on the nine major countries is that more precise data are available, leading to more accurate estimates of sacrifice ratios. (For the other countries there are no quarterly output data, and I must make inferences based on annual data.) In general, the main results for the smaller group of countries carry over to the larger group as well, although measurement error causes greater variation in individual sacrifice ratios.

TABLE 1
Disinflations
Quarterly Data

Episode	Length in Quarters	Initial Inflation (% per year)	Change in Inflation	Sacrifice Ratio
AUSTRALIA				
74:2-78:1	15	14.60	6.57	0.7234
82:1-84:1	8	10.50	4.98	1.2782
CANADA				
74:2-76:4	10	10.60	3.14	0.6273
81:2-85:2	16	11.60	7.83	2.3729
FRANCE				
74:2-76:4	10	11.90	2.98	0.9070
81:1-86:4	23	13.00	10.42	0.5997
GERMANY				
65:4-67:3	7	3.67	2.43	2.5590
73:1-77:3	18	6.92	4.23	2.6358
80:1-86:3	26	5.86	5.95	3.5565
ITALY				
63:3-67:4	17	6.79	5.74	2.6539
77:1-78:2	5	16.50	4.30	0.9776
80:1-87:2	29	19.10	14.56	1.5992
JAPAN				
62:3-63:1	2	8.11	3.00	0.5309
65:1-67:2	9	5.99	2.20	1.6577
70:3-71:2	3	7.53	2.09	1.2689
74:1-78:3	18	17.10	13.21	0.6068
80:2-83:4	14	6.68	5.07	0.0174
84:2-87:1	11	2.29	2.11	1.4801
SWITZERLAND				
73:4-77:4	16	9.42	8.28	1.8509
81:3-83:4	9	6.15	3.86	1.2871
UNITED KINGDOM				
61:2-63:3	9	4.24	2.10	1.9105
65:2-66:3	5	4.91	2.69	-0.0063
75:1-78:2	13	19.70	9.71	0.8679
80:2-83:3	13	15.40	11.12	0.2935
84:2-86:3	9	6.19	3.03	0.8680
UNITED STATES				
69:4-71:4	8	5.67	2.14	2.9364
74:1-76:4	11	9.70	4.00	2.3914
80:1-83:4	15	12.10	8.83	1.8320

Germany is even higher than the ratio in the United States; France and the UK have the lowest ratios (0.8).

Why does the United States have a relatively high sacrifice ratio? More generally, can we explain the variation in ratios across countries and the variation across different episodes in a given country? I turn to these questions next.

THE SPEED OF DISINFLATION AND ITS COST

Background. In explaining why the cost of disinflation can vary, many economists cite the speed of disinflation. In some cases, disinflation is quite slow; for example, it took Germany from 1980 through 1986 to reduce inflation by about 6 percentage points. In contrast, Australia reduced inflation almost as much (by 5 points) over just two years, from 1982 to 1984. Economic theory gives us many reasons to think that such differences in speed produce different output costs of disinflation.

Unfortunately, economic theorists do not agree on the effect of speed: some argue that

gradual disinflation is less costly, and others that quick disinflation is less costly. Gradualists argue that wages and prices possess considerable inertia and thus need time to adjust to a tightening of monetary policy. If the central bank slows money growth drastically before prices can adjust, a recession results. But if money growth falls slowly, prices can adjust in tandem, reducing the effect on the economy. Milton Friedman, one proponent of this view, in his 1980 book with Rose Friedman, writes:

> *The most important device for mitigating the side effects is to slow inflation gradually but steadily by a policy announced in advance and adhered to so it becomes credible. The reason for the gradualness and advance announcement is to give people time to readjust their arrangements—and to induce them to do so. Many people have entered into long-term contracts ... on the basis of anticipations about the likely rate of inflation. These long-term contracts make it difficult to reduce inflation rapidly and mean that trying to do so will impose heavy costs on many people. Given time these contracts will be completed or renewed or renegotiated, and can then be adjusted to the new situation. (p. 273)*

Others disagree. In an influential paper, Thomas Sargent (1983) argues that *quick* disinflation is less costly because of the behavior of expectations. As discussed earlier, disinflation is less costly if it is anticipated in advance—or at least if expectations adjust quickly once disinflation begins. In Sargent's view, a quick disinflation can be accompanied by a dramatic announcement that policy is changing sharply, which produces a drop in expected inflation. Gradual disinflation is less likely to change expectations. Policymakers may announce that they are in the process of slowly reducing money growth, but price setters are unlikely to believe this until after they have seen a substantial amount of progress. As

TABLE 2
Average Sacrifice Ratios by Country

Australia	1.00
Canada	1.50
France	0.75
Germany	2.92
Italy	1.74
Japan	0.93
Switzerland	1.57
United Kingdom	0.79
United States	2.39

Sargent puts it, "gradualism invites speculation about future reversals, or U-turns, in policy." In his view, firms may continue to raise prices quickly because they are not confident that the gradual disinflation will be completed.

Other arguments are possible as well. For example, recent research on price stickiness suggests that firms adjust their prices in response to large shocks but that it is not worth the effort to adjust to small shocks.[8] This idea provides another reason to support quick disinflation. A sudden drop in money growth is a major shock, so prices will adjust and the real money supply and output will not change much. In contrast, a series of small drops in money growth—a gradual disinflation—may not trigger quick price adjustment because there is never a large shock. With inflation falling more slowly than money growth, there can be a major recession.

Considerable controversy exists over which of these views is correct. All seem reasonable

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[8] For example, see Ball and Mankiw (1993).

on theoretical grounds. Since theory cannot resolve the issue, I look once again at the costs of past disinflations.

Results. I adopt a specific definition of the "speed" of disinflation: the ratio of the change in trend inflation over the disinflation episode to the length of the episode in quarters. In other words, speed is the amount of disinflation per quarter during an episode.

After calculating the speed of the 28 disinflations in the group of nine major countries, I examine the relationship between speed and the sacrifice ratio: do episodes with faster speeds have higher or lower sacrifice ratios?[9] The results support the view that quicker disinflations are less costly; that is, they support anti-gradualists like Sargent against gradualists like Friedman. According to my estimates, reducing the length of a given disinflation from 20 to 5 quarters (i.e., from five to one-and-one-quarter years) would cut the sacrifice ratio by almost two-thirds.

These results potentially help us explain differences in sacrifice ratios in different U.S. episodes. For example, the speed of disinflation was .27 in the disinflation beginning in 1969, but .59 in the disinflation beginning in 1980. (The greater speed in the second episode reflected a longer disinflation but a much larger overall fall in inflation: 8.8 percentage points compared with 2.1 percentage points.) The sacrifice ratio was 1.8 in the quicker disinflation, compared with 2.9 in the slower episode. Paul Volcker, the chairman of the Fed in 1980, was often criticized for disinflating quickly because a deep recession occurred in 1981-82. My

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[9] Specifically, I use the statistical technique of linear regression to estimate how much the sacrifice ratio changes for an increase in speed of a given magnitude. See Ball (1993b), Tables IV, V, and VI. Linear regression is the basic technique that economists use to measure the effect of one variable on another. A description of the technique can be found in most introductory textbooks on statistics.

results suggest that the overall output costs would have been larger if disinflation had been more gradual.

LABOR CONTRACTS AND THE COST OF DISINFLATION

Background. As discussed above, one major factor determining the cost of disinflation is the speed with which wages and prices adjust to tighter monetary policy. In explaining wage and price rigidity, many economists have pointed to the existence of labor contracts that fix wages for substantial periods. In the United States, for example, union contracts usually set wages for three years in advance. Because renegotiating such contracts is difficult, firms and workers have little flexibility to adjust to changes in circumstances, such as tighter monetary policy. If the prices of firms' products are closely tied to the wages they pay, these prices will also be quite rigid.

This reasoning has led many economists to suggest that differences in the costs of disinflation in different countries depend on differences in labor contracts. The degree of rigidity in contracts varies widely. The United States has three-year contracts and a staggered schedule of wage adjustments as well: contracts in different industries overlap rather than expiring at the same time. Macroeconomists such as John Taylor (1983) argue that this staggered adjustment makes it hard for wages to adjust to tighter monetary policy: no union wants to be the first to accept wage cuts, and a coordinated adjustment of all wages is impossible. In Japan, by contrast, labor contracts last only a year. In addition, contracts are synchronized: wages in all industries are adjusted together every spring. Many economists argue that Japanese wages are more flexible than U.S. wages, so that disinflation is less costly in Japan (Gordon, 1982).

A final difference in wage-setting institutions is the degree of indexation—of automatic "cost-of-living" adjustments for inflation. In

theory, greater indexation should make wages adjust more quickly to disinflation, reducing the costs. Indexation also varies widely across countries; for example, indexation is more widespread in most European countries than in the United States. Again, economists often argue that these differences help explain differences in the costs of disinflation.

That wage-setting institutions should have an effect on the sacrifice ratio seems intuitive. On the other hand, some macroeconomic theories hold that these institutions have no role. For example, some theories emphasize rigidities that arise in product markets rather than labor markets; others deny that any kind of wage or price rigidity is important. I now ask whether the historical data show that wage-setting institutions help explain the variation in the sacrifice ratio.

Results. For this analysis, I draw on data for all 19 countries because doing so allows me to examine a wider range of wage-setting practices. As an overall measure of wage flexibility, I use a very convenient index of "nominal wage responsiveness" constructed by Michael Bruno and Jeffrey Sachs (1985). For each country, Bruno and Sachs rate the flexibility of wage-setting as zero, one, or two along three dimensions: contract length, indexation, and synchronization. For contract-length flexibility, countries with three-year contracts, such as the United States, are assigned a rating of zero. Countries with contracts between one and three years, such as the United Kingdom, are rated one; and countries with contracts of a year or less, such as Japan, receive the highest rating of two. There are similar classifications for the extent of synchronization and indexation. Bruno and Sachs's overall measure of flexibility is the sum of the three individual rankings, and thus runs from zero to six. The only country with a total rating of zero—the country with the least flexible wages—is Switzerland. Denmark, Australia, and New Zealand have the maximum flexibility with a rating of six.

I compare the sacrifice ratios in various episodes with the wage responsiveness in the relevant country. The results support the theory that more flexible wages reduce the costs of disinflation. My estimates suggest that raising the responsiveness from zero to six—that is, moving from the sticky-wage institutions in Switzerland to the flexible-wage institutions in Denmark—would reduce the sacrifice ratio from 1.4 to only 0.5.

In addition to examining the effect of overall flexibility, I also examine the individual effects of the three components: contract length, indexation, and synchronization. These results suggest that contract length is the most important aspect of flexibility. My estimates indicate that reducing contract length from three years to one year would reduce the predicted sacrifice ratio by about half, even if the extent of synchronization and indexation is unchanged.

CONCLUSION

Do these results provide any lessons for policymakers? The central lesson is that disinflation is costly: reducing inflation is desirable, but it comes at a substantial cost in terms of lost output in the short run. Policymakers should disinflate only if they believe the long-term benefits of lower inflation are worth the price.

Another lesson is that gradual disinflation does not avoid the costs. My results suggest that pushing inflation down slowly eventually leads to a larger total output loss than does quick disinflation. But quick disinflation is likely to result in a deep recession. Some economists believe that deep recessions, even if short-lived, cause disproportionately large disruptions of economic activity. If so, there could be a case for gradual disinflation despite its higher total output losses. The overall lesson is an unhappy one: there is no costless way out of high inflation.

A more positive lesson is that the costs of disinflation can be reduced significantly if wage-

setting institutions are made more flexible. Japan's success at reducing inflation at low cost arises partly from its one-year, synchronized wage adjustments. Efforts to shorten and synchronize U.S. labor contracts could mean less lost output if the United States again faces the need to disinflate.

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