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2 The Gold Standard, Deflation, and Financial Crisis in the Great Depression: An International Comparison

Ben Bernanke and Harold James

2.1 Introduction

Recent research on the causes of the Great Depression has laid much of the blame for that catastrophe on the doorstep of the international gold standard. In his new book, Temin (1989) argues that structural flaws of the interwar gold standard, in conjunction with policy responses dictated by the gold standard's "rules of the game," made an international monetary contraction and deflation almost inevitable. Eichengreen and Sachs (1985) have presented evidence that countries which abandoned the gold standard and the associated contractionary monetary policies recovered from the Depression more quickly than countries that remained on gold. Research by Hamilton (1987, 1988) supports the propositions that contractionary monetary policies in France and the United States initiated the Great Slide, and that the defense of gold standard parities added to the deflationary pressure.¹

The gold standard-based explanation of the Depression (which we will elaborate in section 2.2) is in most respects compelling. The length and depth of the deflation during the late 1920s and early 1930s strongly suggest a monetary origin, and the close correspondence (across both space and time) between deflation and nations' adherence to the gold standard shows the power of that system to transmit contractionary monetary shocks. There is also a high correlation in the data between deflation (falling prices) and depression (falling output), as the previous authors have noted and as we will demonstrate again below.

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If the argument as it has been made so far has a weak link, however, it is probably the explanation of how the deflation induced by the malfunctioning gold standard caused depression; that is, what was the source of this massive monetary non-neutrality?² The goal of our paper is to try to understand better the mechanisms by which deflation may have induced depression in the 1930s. We consider several channels suggested by earlier work, in particular effects operating through real wages and through interest rates. Our focus, however, is on a channel of transmission that has been largely ignored by the recent gold standard literature; namely, the disruptive effect of deflation on the financial system.

Deflation (and the constraints on central bank policy imposed by the gold standard) was an important cause of banking panics, which occurred in a number of countries in the early 1930s. As discussed for the case of the United States by Bernanke (1983), to the extent that bank panics interfere with normal flows of credit, they may affect the performance of the real economy; indeed, it is possible that economic performance may be affected even without major panics, if the banking system is sufficiently weakened. Because severe banking panics are the form of financial crisis most easily identified empirically, we will focus on their effects in this paper. However, we do not want to lose sight of a second potential effect of falling prices on the financial sector, which is "debt deflation" (Fisher 1933; Bernanke 1983; Bernanke and Gertler 1990). By increasing the real value of nominal debts and promoting insolvency of borrowers, deflation creates an environment of financial distress in which the incentives of borrowers are distorted and in which it is difficult to extend new credit. Again, this provides a means by which falling prices can have real effects.

To examine these links between deflation and depression, we take a comparative approach (as did Eichengreen and Sachs). Using an annual data set covering twenty-four countries, we try to measure (for example) the differences between countries on and off the gold standard, or between countries experiencing banking panics and those that did not. A weakness of our approach is that, lacking objective indicators of the seriousness of financial problems, we are forced to rely on dummy variables to indicate periods of crisis. Despite this problem, we generally do find an important role for financial crises—particularly banking panics—in explaining the link between falling prices and falling output. Countries in which, for institutional or historical reasons, deflation led to panics or other severe banking problems had significantly worse depressions than countries in which banking was more stable. In addition, there may have been a feedback loop through which banking panics, particularly those in the United States, intensified the severity of the worldwide deflation. Because of data problems, we do not provide direct evidence of the debt-deflation mechanism; however, we do find that much of the apparent impact of deflation on output is unaccounted for by the mechanisms we

explicitly consider, leaving open the possibility that debt deflation was important.

The rest of the paper is organized as follows. Section 2.2 briefly recapitulates the basic case against the interwar gold standard, showing it to have been a source of deflation and depression, and provides some new evidence consistent with this view. Section 2.3 takes a preliminary look at some mechanisms by which deflation may have been transmitted to depression. In section 2.4, we provide an overview of the financial crises that occurred during the interwar period. Section 2.5 presents and discusses our main empirical results on the effects of financial crisis in the 1930s, and section 2.6 concludes.

2.2 The Gold Standard and Deflation

In this section we discuss, and provide some new evidence for, the claim that a mismanaged interwar gold standard was responsible for the worldwide deflation of the late 1920s and early 1930s.

The gold standard—generally viewed at the time as an essential source of the relative prosperity of the late nineteenth and early twentieth centuries—was suspended at the outbreak of World War I. Wartime suspension of the gold standard was not in itself unusual; indeed, Bordo and Kydland (1990) have argued that wartime suspension, followed by a return to gold at prewar parities as soon as possible, should be considered part of the gold standard's normal operation. Bordo and Kydland pointed out that a reputation for returning to gold at the prewar parity, and thus at something close to the prewar price level, would have made it easier for a government to sell nominal bonds and would have increased attainable seignorage. A credible commitment to the gold standard thus would have had the effect of allowing war spending to be financed at a lower total cost.

Possibly for these reputational reasons, and certainly because of widespread unhappiness with the chaotic monetary and financial conditions that followed the war (there were hyperinflations in central Europe and more moderate but still serious inflations elsewhere), the desire to return to gold in the early 1920s was strong. Of much concern however was the perception that there was not enough gold available to satisfy world money demands without deflation. The 1922 Economic and Monetary Conference at Genoa addressed this issue by recommending the adoption of a gold exchange standard, in which convertible foreign exchange reserves (principally dollars and pounds) as well as gold would be used to back national money supplies, thus "economizing" on gold. Although "key currencies" had been used as reserves before the war, the Genoa recommendations led to a more widespread and officially sanctioned use of this practice (Lindert 1969; Eichengreen 1987).

During the 1920s the vast majority of the major countries succeeded in returning to gold. (The first column of table 2.1 gives the dates of return for the

countries in our data set.) Britain returned at the prewar parity in 1925, despite Keynes's argument that at the old parity the pound would be overvalued. By the end of 1925, out of a list of 48 currencies given by the League of Nations (1926), 28 had been pegged to gold. France returned to gold gradually, following the Poincaré stabilization, although at a new parity widely believed to undervalue the franc. By the end of 1928, except for China and a few small countries on the silver standard, only Spain, Portugal, Rumania, and Japan had not been brought back into the gold standard system. Rumania went back on gold in 1929, Portugal did so in practice also in 1929 (although not officially until 1931), and Japan in December 1930. In the same month the Bank for International Settlements gave Spain a stabilization loan, but the operation was frustrated by a revolution in April 1931, carried out by republicans who, as one of the most attractive features of their program, opposed the foreign stabilization credits. Spain thus did not join the otherwise nearly universal membership of the gold standard club.

The classical gold standard of the prewar period functioned reasonably smoothly and without a major convertibility crisis for more than thirty years. In contrast, the interwar gold standard, established between 1925 and 1928, had substantially broken down by 1931 and disappeared by 1936. An extensive literature has analyzed the differences between the classical and interwar gold standards. This literature has focused, with varying degrees of emphasis, both on fundamental economic problems that complicated trade and monetary adjustment in the interwar period and on technical problems of the interwar gold standard itself.

In terms of "fundamentals," Temin (1989) has emphasized the effects of the Great War, arguing that, ultimately, the war itself was the shock that initiated the Depression. The legacy of the war included—besides physical destruction, which was relatively quickly repaired—new political borders drawn apparently without economic rationale; substantial overcapacity in some sectors (such as agriculture and heavy industry) and undercapacity in others, relative to long-run equilibrium; and reparations claims and international war debts that generated fiscal burdens and fiscal uncertainty. Some writers (notably Charles Kindleberger) have also pointed to the fact that the prewar gold standards was a hegemonic system, with Great Britain the unquestioned center. In contrast, in the interwar period the relative decline of Britain, the inexperience and insularity of the new potential hegemon (the United States), and ineffective cooperation among central banks left no one able to take responsibility for the system as a whole.

The technical problems of the interwar gold standard included the following three:

1. *The asymmetry between surplus and deficit countries in the required monetary response to gold flows.* Temin suggests, correctly we believe, that this was the most important structural flaw of the gold standard. In theory, under the "rules of the game," central banks of countries experiencing gold

Table 2.1 Dates of Changes in Gold Standard Policies

Country	Return to Gold	Suspension of Gold Standard	Foreign Exchange Control	Devaluation
Australia	April 1925	December 1929	—	March 1930
Austria	April 1925	April 1933	October 1931	September 1931
Belgium	October 1926	—	—	March 1935
Canada	July 1926	October 1931	—	September 1931
Czechoslovakia	April 1926	—	September 1931	February 1934
Denmark	January 1927	September 1931	November 1931	September 1931
Estonia	January 1928	June 1933	November 1931	June 1933
Finland	January 1926	October 1931	—	October 1931
France	August 1926– June 1928	—	—	October 1936
Germany	September 1924	—	July 1931	—
Greece	May 1928	April 1932	September 1931	April 1932
Hungary	April 1925	—	July 1931	—
Italy	December 1927	—	May 1934	October 1936
Japan	December 1930	December 1931	July 1932	December 1931
Latvia	August 1922	—	October 1931	—
Netherlands	April 1925	—	—	October 1936
Norway	May 1928	September 1931	—	September 1931
New Zealand	April 1925	September 1931	—	April 1930
Poland	October 1927	—	April 1936	October 1936
Romania	March 1927– February 1929	—	May 1932	—
Sweden	April 1924	September 1931	—	September 1931
Spain	—	—	May 1931	—
United Kingdom	May 1925	September 1931	—	September 1931
United States	June 1919	March 1933	March 1933	April 1933

Source: League of Nations, *Yearbook*, various dates; and miscellaneous supplementary sources.

inflows were supposed to assist the price-specie flow mechanism by expanding domestic money supplies and inflating, while deficit countries were supposed to reduce money supplies and deflate. In practice, the need to avoid a complete loss of reserves and an end to convertibility forced deficit countries to comply with this rule; but, in contrast, no sanction prevented surplus countries from sterilizing gold inflows and accumulating reserves indefinitely, if domestic objectives made that desirable. Thus there was a potential deflationary bias in the gold standard's operation.

This asymmetry between surplus and deficit countries also existed in the prewar period, but with the important difference that the prewar gold standard centered around the operations of the Bank of England. The Bank of England

of course had to hold enough gold to ensure convertibility, but as a profit-making institution it also had a strong incentive not to hold large stocks of barren gold (as opposed to interest-paying assets). Thus the Bank managed the gold standard (with the assistance of other central banks) so as to avoid both sustained inflows and sustained outflows of gold; and, indeed, it helped ensure continuous convertibility with a surprisingly low level of gold reserves. In contrast, the two major gold surplus countries of the interwar period, the United States and France, had central banks with little or no incentive to avoid accumulation of gold.

The deflationary bias of the asymmetry in required adjustments was magnified by statutory fractional reserve requirements imposed on many central banks, especially the new central banks, after the war. While Britain, Norway, Finland, and Sweden had a fiduciary issue—a fixed note supply backed only by domestic government securities, above which 100% gold backing was required—most countries required instead that minimum gold holdings equal a fixed fraction (usually close to the Federal Reserve's 40%) of central bank liabilities. These rules had two potentially harmful effects.

First, just as required "reserves" for modern commercial banks are not really available for use as true reserves, a large portion of central bank gold holdings were immobilized by the reserve requirements and could not be used to settle temporary payments imbalances. For example, in 1929, according to the League of Nations, for 41 countries with a total gold reserve of \$9,378 million, only \$2,178 million were "surplus" reserves, with the rest required as cover (League of Nations 1944, 12). In fact, this overstates the quantity of truly free reserves, because markets and central banks became very worried when reserves fell within 10% of the minimum. The upshot of this is that deficit countries could lose very little gold before being forced to reduce their domestic money supplies; while, as we have noted, the absence of any maximum reserve limit allowed surplus countries to accept gold inflows without inflating.

The second and related effect of the fractional reserve requirement has to do with the relationship between gold outflows and domestic monetary contraction. With fractional reserves, the relationship between gold outflow and the reduction in the money supply was not one for one; with a 40% reserve requirement, for example, the impact on the money supply of a gold outflow was 2.5 times the external loss. So again, loss of gold could lead to an immediate and sharp deflationary impact, not balanced by inflation elsewhere.

2. *The pyramiding of reserves.* As we have noted, under the interwar gold-exchange standard, countries other than those with reserve currencies were encouraged to hold convertible foreign exchange reserves as a partial (or in some cases, as a nearly complete) substitute for gold. But these convertible reserves were in turn usually only fractionally backed by gold. Thus, just as a shift by the public from fractionally backed deposits to currency would lower the total domestic money supply, the gold-exchange system opened up the

possibility that a shift of central banks from foreign exchange reserves to gold might lower the world money supply, adding another deflationary bias to the system. Central banks did abandon foreign exchange reserves en masse in the early 1930s, when the threat of devaluation made foreign exchange assets quite risky. According to Eichengreen (1987), however, the statistical evidence is not very clear on whether central banks after selling their foreign exchange simply lowered their cover ratios, which would have had no direct effect on money supplies, or shifted into gold, which would have been contractionary. Even if the central banks responded only by lowering cover ratios, however, this would have increased the sensitivity of their money supplies to any subsequent outflow of reserves.

3. *Insufficient powers of central banks.* An important institutional feature of the interwar gold standard is that, for a majority of the important continental European central banks, open market operations were not permitted or were severely restricted. This limitation on central bank powers was usually the result of the stabilization programs of the early and mid 1920s. By prohibiting central banks from holding or dealing in significant quantities of government securities, and thus making monetization of deficits more difficult, the architects of the stabilizations hoped to prevent future inflation. This forced the central banks to rely on discount policy (the terms at which they would make loans to commercial banks) as the principal means of affecting the domestic money supply. However, in a number of countries the major commercial banks borrowed very infrequently from the central banks, implying that except in crisis periods the central bank's control over the money supply might be quite weak.

The loosening of the link between the domestic money supply and central bank reserves may have been beneficial in some cases during the 1930s, if it moderated the monetary effect of reserve outflows. However, in at least one very important case the inability of a central bank to conduct open market operations may have been quite destabilizing. As discussed by Eichengreen (1986), the Bank of France, which was the recipient of massive gold inflows until 1932, was one of the banks that was prohibited from conducting open market operations. This severely limited the ability of the Bank to translate its gold inflows into monetary expansion, as should have been done in obedience to the rules of the game. The failure of France to inflate meant that it continued to attract reserves, thus imposing deflation on the rest of the world.³

Given both the fundamental economic problems of the international economy and the structural flaws of the gold standard system, even a relatively minor deflationary impulse might have had significant repercussions. As it happened, both of the two major gold surplus countries—France and the United States, who at the time together held close to 60% of the world's monetary gold—took deflationary paths in 1928–29 (Hamilton 1987).

In the French case, as we have already noted, the deflationary shock took the form of a largely sterilized gold inflow. For several reasons—including a

successful stabilization with attendant high real interest rates, a possibly undervalued franc, the lifting of exchange controls, and the perception that France was a "safe haven" for capital—beginning in early 1928 gold flooded into that country, an inflow that was to last until 1932. In 1928, France controlled about 15% of the total monetary gold held by the twenty-four countries in our data set (Board of Governors 1943); this share, already disproportionate to France's economic importance, increased to 18% in 1929, 22% in 1930, 28% in 1931, and 32% in 1932. Since the U.S. share of monetary gold remained stable at something greater than 40% of the total, the inflow to France implied significant losses of gold by countries such as Germany, Japan, and the United Kingdom.

With its accumulation of gold, France should have been expected to inflate; but in part because of the restrictions on open market operations discussed above and in part because of deliberate policy choices, the impact of the gold inflow on French prices was minimal. The French monetary base did increase with the inflow of reserves, but because economic growth led the demand for francs to expand even more quickly, the country actually experienced a wholesale price *deflation* of almost 11% between January 1929 and January 1930.

Hamilton (1987) also documents the monetary tightening in the United States in 1928, a contraction motivated in part by the desire to avoid losing gold to the French but perhaps even more by the Federal Reserve's determination to slow down stock market speculation. The U.S. price level fell about 4% over the course of 1929. A business cycle peak was reached in the United States in August 1929, and the stock market crashed in October.

The initial contractions in the United States and France were largely self-inflicted wounds; no binding external constraint forced the United States to deflate in 1929, and it would certainly have been possible for the French government to grant the Bank of France the power to conduct expansionary open market operations. However, Temin (1989) argues that, once these destabilizing policy measures had been taken, little could be done to avert deflation and depression, given the commitment of central banks to maintenance of the gold standard. Once the deflationary process had begun, central banks engaged in competitive deflation and a scramble for gold, hoping by raising cover ratios to protect their currencies against speculative attack. Attempts by any individual central bank to reflate were met by immediate gold outflows, which forced the central bank to raise its discount rate and deflate once again. According to Temin, even the United States, with its large gold reserves, faced this constraint. Thus Temin disagrees with the suggestion of Friedman and Schwartz (1963) that the Federal Reserve's failure to protect the U.S. money supply was due to misunderstanding of the problem or a lack of leadership; instead, he claims, given the commitment to the gold standard (and, presumably, the absence of effective central bank cooperation), the Fed had little choice but to let the banks fail and the money supply fall.

For our purposes here it does not matter much to what extent central bank

choices could have been other than what they were. For the positive question of what caused the Depression, we need only note that a monetary contraction began in the United States and France, and was propagated throughout the world by the international monetary standard.⁴

If monetary contraction propagated by the gold standard was the source of the worldwide deflation and depression, then countries abandoning the gold standard (or never adopting it) should have avoided much of the deflationary pressure. This seems to have been the case. In an important paper, Choudhri and Kochin (1980) documented that Spain, which never restored the gold standard and allowed its exchange rate to float, avoided the declines in prices and output that affected other European countries. Choudhri and Kochin also showed that the Scandinavian countries, which left gold along with the United Kingdom in 1931, recovered from the Depression much more quickly than other small European countries that remained longer on the gold standard. Much of this had been anticipated in an insightful essay by Haberler (1976).

Eichengreen and Sachs (1985) similarly focused on the beneficial effects of currency depreciation (i.e., abandonment of the gold standard or devaluation). For a sample of ten European countries, they showed that depreciating countries enjoyed faster growth of exports and industrial production than countries which did not depreciate. Depreciating countries also experienced lower real wages and greater profitability, which presumably helped to increase production. Eichengreen and Sachs argued that depreciation, in this context, should not necessarily be thought of as a "beggar thy neighbor" policy; because depreciations reduced constraints on the growth of world money supplies, they may have conferred benefits abroad as well as at home (although a coordinated depreciation presumably would have been better than the uncoordinated sequence of depreciations that in fact took place).⁵

Some additional evidence of the effects of maintaining or leaving the gold standard, much in the spirit of Eichengreen and Sachs but using data from a larger set of countries, is given in our tables 2.2 through 2.4. These tables summarize the relationships between the decision to adhere to the gold standard and some key macroeconomic variables, including wholesale price inflation (table 2.2), some indicators of national monetary policies (table 2.3), and industrial production growth (table 2.4). To construct these tables, we divided our sample of twenty-four countries into four categories:⁶ 1) countries not on the gold standard at all (Spain) or leaving prior to 1931 (Australia and New Zealand); 2) countries abandoning the full gold standard in 1931 (14 countries); 3) countries abandoning the gold standard between 1932 and 1935 (Rumania in 1932, the United States in 1933, Italy in 1934, and Belgium in 1935); and 4) countries still on the full gold standard as of 1936 (France, Netherlands, Poland).⁷ Tables 2.2 and 2.4 give the data for each country, as well as averages for the large cohort of countries abandoning gold in 1931, for the remnant of the gold bloc still on gold in 1936, and (for 1932–35, when there were a significant number of countries in each category) for all gold

standard and non-gold standard countries. Since table 2.3 reports data on four different variables, in order to save space only the averages are shown.⁸

The link between deflation and adherence to the gold standard, shown in table 2.2, seems quite clear. As noted by Choudhri and Kochin (1980), Spain's abstention from the gold standard insulated that country from the general deflation; New Zealand and Australia, presumably because they retained links to sterling despite early abandonment of the strict gold standard, did however experience some deflation. Among countries on the gold standard as of 1931, there is a rather uniform experience of about a 13% deflation in both 1930 and 1931. But after 1931 there is a sharp divergence between those countries on and those off the gold standard. Price levels in countries off the gold standard have stabilized by 1933 (with one or two exceptions), and these countries experience mild inflations in 1934–36. In contrast, the gold standard countries continue to deflate, although at a slower rate, until the gold standard's dissolution in 1936.

With such clearly divergent price behavior between countries on and off gold, one would expect to see similarly divergent behavior in monetary policy. Table 2.3 compares the average behavior of the growth rates of three monetary aggregates, called for short M0, M1, and M2, and of changes in the central bank discount rate. M0 corresponds to money and notes in circulation, M1 is the sum of M0 and commercial bank deposits, and M2 is the sum of M1 and savings bank deposits.⁹ The expected differences in the monetary policies of the gold and non-gold countries seem to be in the data, although somewhat less clearly than we had anticipated. In particular, despite the twelve percentage point difference in rates of deflation between gold and non-gold countries in 1932, the differences in average money growth in that year between the two classes of countries are minor; possibly, higher inflation expectations in the countries abandoning gold reduced money demand and thus became self-confirming. From 1933 through 1935, however, the various monetary indicators are more consistent with the conclusion stressed by Eichengreen and Sachs (1985), that leaving the gold standard afforded countries more latitude to expand their money supplies and thus to escape deflation.

The basic proposition of the gold standard-based explanation of the Depression is that, because of its deflationary impact, adherence to the gold standard had very adverse consequences for real activity. The validity of this proposition is shown rather clearly by table 2.4, which gives growth rates of industrial production for the countries in our sample. While the countries which were to abandon the gold standard in 1931 did slightly worse in 1930 and 1931 than the nations of the Gold Bloc, subsequent to leaving gold these countries performed much better. Between 1932 and 1935, growth of industrial production in countries not on gold averaged about seven percentage points a year better than countries remaining on gold, a very substantial effect.

In summary, data from our sample of twenty-four countries support the

Table 2.2 **Log-differences of the Wholesale Price Index**

	1930	1931	1932	1933	1934	1935	1936
<i>1. Countries not on gold standard or leaving prior to 1931</i>							
Spain	-.00	.01	-.01	-.05	.03	.01	.02
Australia (1929)	-.12	-.11	-.01	-.00	.04	-.00	.05
New Zealand (1930)	-.03	-.07	-.03	.03	.01	.03	.01
<i>2. Countries abandoning full gold standard in 1931</i>							
Austria	-.11	-.07	.03	-.04	.02	-.00	-.01
Canada	-.10	-.18	-.08	.01	.06	.01	.03
Czechoslovakia	-.12	-.10	-.08	-.03	.02	.04	.00
Denmark	-.15	-.13	.02	.07	.09	.02	.05
Estonia	-.14	-.11	-.09	.02	.00	-.01	.08
Finland	-.09	-.07	.07	-.01	.01	.00	.02
Germany	-.10	-.12	-.14	-.03	.05	.03	.02
Greece	-.10	-.11	.18	.12	-.01	.02	.02
Hungary	-.14	-.05	-.01	-.14	.00	.08	.03
Japan	-.19	-.17	.05	.11	-.01	.04	.06
Latvia	-.16	-.18	.00	-.02	-.01	.05	.04
Norway	-.08	-.12	.00	-.00	.02	.03	.05
Sweden	-.14	-.09	-.02	-.02	.06	.02	.03
United Kingdom	-.17	-.18	-.04	.01	.04	.04	.06
Average	-.13	-.12	-.01	.00	.02	.03	.04
<i>3. Countries abandoning gold standard between 1932 and 1935</i>							
Rumania (1932)	-.24	-.26	-.11	-.03	.00	.14	.13
United States (1933)	-.10	-.17	-.12	.02	.13	.07	.01
Italy (1934)	-.11	-.14	-.07	-.09	-.02	.10	.11
Belgium (1935)	-.13	-.17	-.16	-.06	-.06	.13	.09
<i>4. Countries still on full gold standard as of 1936</i>							
France	-.12	-.10	-.16	-.07	-.06	-.11	.19
Netherlands	-.11	-.16	-.17	-.03	.00	-.02	.04
Poland	-.12	-.14	-.13	-.10	-.06	-.05	.02
Average	-.12	-.13	-.15	-.07	-.04	-.06	.08
<i>5. Grand averages</i>							
Gold standard countries			-.13	-.07	-.04	-.05	
Non-gold countries			-.01	.00	.03	.04	

Note: Data on wholesale prices are from League of Nations, *Monthly Bulletin of Statistics* and *Yearbook*, various issues. Dates in parentheses are years in which countries abandoned gold, with "abandonment" defined to include the imposition of foreign exchange controls or devaluation as well as suspension; see table 2.1.

Table 2.3 Monetary Indicators

	1930	1931	1932	1933	1934	1935	1936
<i>1. Countries abandoning full gold standard in 1931</i>							
M0 growth	-.04	-.02	-.07	.06	.05	.05	.08
M1 growth	.01	-.11	-.07	.02	.05	.04	.08
M2 growth	.03	-.08	-.04	.03	.05	.05	.06
Discount rate change	-0.8	0.4	-0.2	-1.2	-0.4	-0.1	-0.1
<i>2. Countries still on full gold standard as of 1936</i>							
M0 growth	.03	.07	-.06	-.02	.01	-.03	.03
M1 growth	.05	-.06	-.07	-.05	.01	-.06	.08
M2 growth	.08	-.00	-.02	-.02	.02	-.03	.05
Discount rate change	-1.4	-0.4	0.1	-0.4	-0.4	0.8	-0.3
<i>3. Grand averages: Countries on gold</i>							
M0 growth			-.04	-.03	.01	-.02	
M1 growth			-.09	-.04	-.01	-.06	
M2 growth			-.05	-.01	.01	-.02	
Discount rate change			0.2	-0.5	-0.4	0.7	
<i>4. Grand averages: Countries off gold</i>							
M0 growth			-.07	.05	.03	.06	
M1 growth			-.06	.01	.04	.05	
M2 growth			-.03	.02	.04	.05	
Discount rate change			-0.3	-1.0	-0.4	-0.2	

Note: M0 is money and notes in circulation. M1 is base money plus commercial bank deposits. M2 is M1 plus savings deposits. Growth rates of monetary aggregates are calculated as log-differences. The discount rate change is in percentage points. The data are from League of Nations, *Monthly Bulletin of Statistics* and *Yearbook*, various issues.

view that there was a strong link between adherence to the gold standard and the severity of both deflation and depression. The data are also consistent with the hypothesis that increased freedom to engage in monetary expansion was a reason for the better performance of countries leaving the gold standard early in the 1930s, although the evidence in this case is a bit less clear-cut.

2.3 The Link Between Deflation and Depression

Given the above discussion and evidence, it seems reasonable to accept the idea that the worldwide deflation of the early 1930s was the result of a monetary contraction transmitted through the international gold standard. But this

Table 2.4 Log-differences of the Industrial Production Index

	1930	1931	1932	1933	1934	1935	1936
<i>1. Countries not on gold standard or leaving prior to 1931</i>							
Spain	-.01	-.06	-.05	-.05	.01	.02	NA
Australia (1929)	-.11	-.07	.07	.10	.09	.09	.07
New Zealand (1930)	-.25	-.14	.05	.02	.13	.09	.14
<i>2. Countries abandoning full gold standard in 1931</i>							
Austria	-.16	-.19	-.14	.03	.11	.13	.07
Canada	-.16	-.18	-.20	.04	.20	.10	.10
Czechoslovakia	-.11	-.10	-.24	-.05	.10	.05	.14
Denmark	.08	-.08	-.09	.14	.11	.07	.04
Estonia	-.02	-.09	-.17	.05	.17	.10	.10
Finland	-.10	-.13	.19	.02	.03	.10	.09
Germany	-.15	-.24	-.24	.13	.27	.16	.12
Greece	.01	.02	-.08	.10	.12	.12	-.03
Hungary	-.06	-.08	-.06	.07	.12	.07	.10
Japan	-.05	-.03	.07	.15	.13	.10	.06
Latvia	.08	-.20	-.08	.31	.15	.05	.04
Norway	.01	-.25	.17	.01	.04	.10	.09
Sweden	.03	-.07	-.08	.02	.19	.11	.09
United Kingdom	-.08	-.10	-.00	.05	.11	.07	.09
Average	-.05	-.12	-.07	.08	.13	.10	.08
<i>3. Countries abandoning gold standard between 1932 and 1935</i>							
Rumania (1932)	-.03	.05	-.14	.15	.19	-.01	.06
United States (1933)	-.21	-.17	-.24	.17	.04	.13	.15
Italy (1934)	-.08	-.17	-.15	.10	.08	.16	-.07
Belgium (1935)	-.12	-.09	-.16	.04	.01	.12	.05
<i>4. Countries still on full gold standard as of 1936</i>							
France	-.01	-.14	-.19	.12	-.07	-.04	.07
Netherlands	.02	-.06	-.13	.07	.02	-.03	.01
Poland	-.13	-.14	-.20	.09	.12	.07	.10
Average	-.04	-.11	-.17	.10	.02	.00	.06
<i>5. Grand averages</i>							
Gold standard countries			-.18	.09	.03	.01	
Non-gold countries			-.06	.08	.12	.09	

Note: Data on industrial production are from League of Nations, *Monthly Bulletin of Statistics and Yearbook*, various issues, supplemented by League of Nations, *Industrialization and Foreign Trade*, 1945.

raises the more difficult question of what precisely were the channels linking deflation (falling prices) and depression (falling output). This section takes a preliminary look at some suggested mechanisms. We first introduce here two principal channels emphasized in recent research, then discuss the alternative of induced financial crisis.

1. *Real wages.* If wages possess some degree of nominal rigidity, then falling output prices will raise real wages and lower labor demand. Downward stickiness of wages (or of other input costs) will also lower profitability, potentially reducing investment. This channel is stressed by Eichengreen and Sachs (see in particular their 1986 paper) and has also been emphasized by Newell and Symons (1988).

Some evidence on the behavior of real wages during the Depression is presented in table 2.5, which is similar in format to tables 2.2–2.4. Note that table 2.5 uses the wholesale price index (the most widely available price index) as the wage deflator. According to this table, there were indeed large real wage increases in most countries in 1930 and 1931. After 1931, countries leaving the gold standard experienced a mild decline in real wages, while real wages in gold standard countries exhibited a mild increase. These findings are similar to those of Eichengreen and Sachs (1985).

The reliance on nominal wage stickiness to explain the real effects of the deflation is consistent with the Keynesian tradition, but is nevertheless somewhat troubling in this context. Given (i) the severity of the unemployment that was experienced during that time; (ii) the relative absence of long-term contracts and the weakness of unions; and (iii) the presumption that the general public was aware that prices, and hence the cost of living, were falling, it is hard to understand how nominal wages could have been so unresponsive. Wages had fallen quickly in many countries in the contraction of 1921–22. In the United States, nominal wages were maintained until the fall of 1931 (possibly by an agreement among large corporations; see O'Brien 1989), but fell sharply after that; in Germany, the government actually tried to depress wages early in the Depression. Why then do we see these large real wage increases in the data?

One possibility is measurement problems. There are a number of issues, such as changes in skill and industrial composition, that make measuring the cyclical movement in real wages difficult even today. Bemanke (1986) has argued, in the U.S. context, that because of sharp reductions in workweeks and the presence of hoarded labor, the measure real wage may have been a poor measure of the marginal cost of labor.

Also in the category of measurement issues, Eichengreen and Hatton (1987) correctly point out that nominal wages should be deflated by the relevant product prices, not a general price index. Their table of product wage indices (nominal wages relative to manufacturing prices) is reproduced for 1929–38 and for the five countries for which data are available as our table 2.6. Like table 2.5, this table also shows real wages increasing in the early

Table 2.5 Log-differences of the Real Wage

	1930	1931	1932	1933	1934	1935	1936
<i>1. Countries not on gold standard or leaving prior to 1931</i>							
Spain				not available			
Australia (1929)	.10	.01	-.05	-.04	-.03	.01	-.03
New Zealand (1930)	.03	.00	-.00	-.05	-.01	-.01	.10
<i>2. Countries abandoning full gold standard in 1931</i>							
Austria	.14	.05	-.04	-.00	-.05	-.03	.06
Canada	.11	.15	.00	-.06	-.05	.02	-.01
Czechoslovakia	.14	.11	.08	.02	-.04	-.05	-.00
Denmark	.17	.11	-.03	-.07	-.09	-.01	-.04
Estonia	.16	.07	.02	-.06	-.01	.06	-.03
Finland				not available			
Germany	.12	.06	-.03	-.00	-.07	-.03	-.02
Greece				not available			
Hungary	.14	-.00	-.07	.09	-.06	-.11	-.00
Japan	.05	.21	-.04	-.12	.02	-.05	-.05
Latvia	.20	.18	-.15	-.05	.01	-.05	-.02
Norway	.08	.08	.02	-.02	-.01	-.03	-.02
Sweden	.17	.09	.01	-.02	-.06	-.01	-.02
United Kingdom	.17	.16	.02	-.02	-.03	-.03	-.03
Average	.14	.11	-.02	-.03	-.04	-.03	-.02
<i>3. Countries abandoning gold standard between 1932 and 1935</i>							
Rumania (1932)	.20	.14	-.10	-.05	-.02	-.15	-.12
United States (1933)	.10	.13	-.01	-.03	.04	-.03	.02
Italy (1934)	.10	.07	.05	.07	-.01	-.11	-.06
Belgium (1935)	.19	.10	.07	.04	.01	-.16	-.02
<i>4. Countries still on full gold standard as of 1936</i>							
France	.21	.09	.12	.07	.06	.09	-.06
Netherlands	.12	.14	.09	-.02	-.04	-.01	-.06
Poland	.11	.06	.05	.00	.01	.02	-.03
Average	.15	.10	.09	.02	.01	.03	-.05
<i>5. Grand averages</i>							
Gold standard countries			.05	.03	.01	.02	
Non-gold countries			-.02	-.03	-.03	-.04	

Note: The real wage is the nominal hourly wage for males (skilled, if available) divided by the wholesale price index. Wage data are from the International Labour Office, *Year Book of Labor Statistics*, various issues.

Table 2.6 Indices of Product Wages

Year	United Kingdom	United States	Germany	Japan	Sweden
1929	100.0	100.0	100.0	100.0	100.0
1930	103.0	106.1	100.4	115.6	116.6
1931	106.4	113.0	102.2	121.6	129.1
1932	108.3	109.6	96.8	102.9	130.0
1933	109.3	107.9	99.3	101.8	127.9
1934	111.4	115.8	103.0	102.3	119.6
1935	111.3	114.3	105.3	101.6	119.2
1936	110.4	115.9	107.7	99.2	116.0
1937	107.8	121.9	106.5	87.1	101.9
1938	108.6	130.0	107.7	86.3	115.1

Source: Eichengreen and Hatton (1987, 15).

1930s, but overall the correlation of real wage increases and depression does not appear particularly good. Note that Germany, which had probably the worst unemployment problem of any major country, has almost no increase in real wages;¹⁰ the United Kingdom, which began to recover in 1932, has real wages increasing on a fairly steady trend during its recovery period; and the United States has only a small dip in real wages at the beginning of its recovery, followed by more real wage growth. The case for nominal wage stickiness as a transmission mechanism thus seems, at this point, somewhat mixed.

2. *Real interest rates.* In a standard IS-LM macro model, a monetary contraction depresses output by shifting the LM curve leftwards, raising real interest rates, and thus reducing spending. However, as Temin (1976) pointed out in his original critique of Friedman and Schwartz, it is real rather than nominal money balances that affect the LM curve; and since prices were falling sharply, real money balances fell little or even rose during the contraction.

Even if real money balances are essentially unchanged, however, there is another means by which deflation can raise *ex ante* real interest rates: Since cash pays zero nominal interest, in equilibrium no asset can bear a nominal interest rate that is lower than its liquidity and risk premia relative to cash. Thus an expected deflation of 10% will impose a real rate of at least 10% on the economy, even with perfectly flexible prices and wages. In an IS-LM diagram drawn with the nominal interest rate on the vertical axis, an increase in expected deflation amounts to a leftward shift of the IS curve.

Whether the deflation of the early 1930s was anticipated has been extensively debated (although almost entirely in the United States context). We will add here two points in favor of the view that the extent of the worldwide deflation was less than fully anticipated.

First, there is the question of whether the nominal interest rate floor was in fact binding in the deflating countries (as it should have been if this mechanism was to operate). Although interest rates on government debt in the United States often approximated zero in the 1930s, it is less clear that this

was true for other countries. The yield on French treasury bills, for example, rose from a low of 0.75% in 1932 to 2.06% in 1933, 2.25% in 1934, and 3.38% in 1935; during 1933–35 the nominal yield on French treasury bills exceeded that of British treasury bills by several hundred basis points on average.¹¹

Second, the view that deflation was largely anticipated must contend with the fact that nominal returns on safe assets were very similar whether countries abandoned or stayed on gold. If continuing deflation was anticipated in the gold standard countries, while inflation was expected in countries leaving gold, the similarity of nominal returns would have implied large expected differences in real returns. Such differences are possible in equilibrium, if they are counterbalanced by expected real exchange rate changes; nevertheless, differences in expected real returns between countries on and off gold on the order of 11–12% (the realized difference in returns between the two blocs in 1932) seem unlikely.¹²

3. *Financial crisis.* A third mechanism by which deflation can induce depression, not considered in the recent literature, works through deflation's effect on the operation of the financial system. The source of the non-neutrality is simply that debt instruments (including deposits) are typically set in money terms. Deflation thus weakens the financial positions of borrowers, both nonfinancial firms and financial intermediaries.

Consider first the case of intermediaries (banks).¹³ Bank liabilities (primarily deposits) are fixed almost entirely in nominal terms. On the asset side, depending on the type of banking system (see below), banks hold either primarily debt instruments or combinations of debt and equity. Ownership of debt and equity is essentially equivalent to direct ownership of capital; in this case, therefore, the bank's liabilities are nominal and its assets are real, so that an unanticipated deflation begins to squeeze the bank's capital position immediately. When only debt is held as an asset, the effect of deflation is for a while neutral or mildly beneficial to the bank. However, when borrowers' equity cushions are exhausted, the bank becomes the owner of its borrowers' real assets, so eventually this type of bank will also be squeezed by deflation.

As pressure on the bank's capital grows, according to this argument, its normal functioning will be impeded; for example, it may have to call in loans or refuse new ones. Eventually, impending exhaustion of bank capital leads to a depositors' run, which eliminates the bank or drastically curtails its operation. The final result is usually a government takeover of the intermediation process. For example, a common scenario during the Depression was for the government to finance an acquisition of a failing bank by issuing its own debt; this debt was held (directly or indirectly) by consumers, in lieu of (vanishing) commercial bank deposits. Thus, effectively, government agencies became part of the intermediation chain.¹⁴

Although the problems of the banks were perhaps the more dramatic in the Depression, the same type of non-neutrality potentially affects nonfinancial

firms and other borrowers. The process of "debt deflation", that is, the increase in the real value of nominal debt obligations brought about by falling prices, erodes the net worth position of borrowers. A weakening financial position affects the borrower's actions (e.g., the firm may try to conserve financial capital by laying off workers or cutting back on investment) and also, by worsening the agency problems in the borrower-lender relationship, impairs access to new credit. Thus, as discussed in detail in Bernanke and Gertler (1990), "financial distress" (such as that induced by debt deflation) can in principle impose deadweight losses on an economy, even if firms do not undergo liquidation.

Before trying to assess the quantitative impact of these and other channels on output, we briefly discuss the international incidence of financial crisis during the Depression.

2.4 Interwar Banking and Financial Crises

Financial crises were of course a prominent feature of the interwar period. We focus in this section on the problems of the banking sector and, to a lesser extent, on the problems of domestic debtors in general, as suggested by the discussion above. Stock market crashes and defaults on external debt were also important, of course, but for the sake of space will take a subsidiary role here.

Table 2.7 gives a chronology of some important interwar banking crises. The episodes listed actually cover a considerable range in terms of severity, as the capsule descriptions should make clear. However the chronology should also show that (i) quite a few different countries experienced significant banking problems during the interwar period; and (ii) these problems reached a very sharp peak between the spring and fall of 1931, following the Creditanstalt crisis in May 1931 as well as the intensification of banking problems in Germany.

A statistical indicator of banking problems, emphasized by Friedman and Schwartz (1963), is the deposit-currency ratio. Data on the changes in the commercial bank deposit-currency ratio for our panel of countries are presented in table 2.8. It is interesting to compare this table with the chronology in table 2.7. Most but not all of the major banking crises were associated with sharp drops in the deposit-currency ratio; the most important exception is in 1931 in Italy, where the government was able to keep secret much of the banking system's problems until a government takeover was affected. On the other hand, there were also significant drops in the deposit-currency ratio that were not associated with panics; restructurings of the banking system and exchange rate difficulties account for some of these episodes.

What caused the banking panics? At one level, the panics were an endogenous response to deflation and the operation of the gold standard regime.

Table 2.7 A Chronology of Interwar Banking Crises, 1921–36

Date	Country	Crises
June 1921	SWEDEN	Beginning of deposit contraction of 1921–22, leading to bank restructurings. Government assistance administered through Credit Bank of 1922.
1921–22	NETHERLANDS	Bank failures (notably Marx & Co.) and amalgamations.
1922	DENMARK	Heavy losses of one of the largest banks, Danske Landmandsbank, and liquidation of smaller banks. Landmandsbank continues to operate until a restructuring in April 1928 under a government guarantee.
April 1923	NORWAY	Failure of Centralbanken for Norge.
May 1923	AUSTRIA	Difficulties of a major bank, Allgemeine Depositenbank; liquidation in July.
September 1923	JAPAN	In wake of the Tokyo earthquake, bad debts threaten Bank of Taiwan and Bank of Chosen, which are restructured with government help.
September 1925	SPAIN	Failure of Banco de la Union Mineira and Banco Vasca.
July–September 1926	POLAND	Bank runs cause three large banks to stop payments. The shakeout of banks continues through 1927.
1927	NORWAY, ITALY	Numerous smaller banks in difficulties, but no major failures.
April 1927	JAPAN	Thirty-two banks unable to make payments. Restructuring of 15th Bank and Bank of Taiwan.
August 1929	GERMANY	Collapse of Frankfurter Allgemeine Versicherungs AG, followed by failures of smaller banks, and runs on Berlin and Frankfurt savings banks.
November 1929	AUSTRIA	Bodencreditanstalt, second largest bank, fails and is merged with Creditanstalt.
November 1930	FRANCE	Failure of Banque Adam, Boulogne-sur-Mer, and Oustric Group. Runs on provincial banks.
	ESTONIA	Failure of two medium-sized banks, Estonia Government Bank Tallin and Reval Credit Bank; crisis lasts until January.
December 1930	U.S.	Failure of Bank of the United States.
	ITALY	Withdrawals from three largest banks begin. A panic ensues in April 1931, followed by a government reorganization and takeover of frozen industrial assets.
April 1931	ARGENTINA	Government deals with banking panic by allowing Banco de Nacion to rediscount commercial paper from other banks at government-owned Caja de Conversión.

(continued)

Table 2.7	(continued)	
Date	Country	Crises
May 1931	AUSTRIA	Failure of Creditanstalt and run of foreign depositors.
	BELGIUM	Rumors about imminent failure of Banque de Bruxelles, the country's second largest bank, induce withdrawals from all banks. Later in the year, expectations of devaluation lead to withdrawals of foreign deposits.
June 1931	POLAND	Run on banks, especially on Warsaw Discount Bank, associated with Creditanstalt; a spread of the Austrian crisis.
April–July 1931	GERMANY	Bank runs, extending difficulties plaguing the banking system since the summer of 1930. After large loss of deposits in June and increasing strain on foreign exchanges, many banks are unable to make payments and Darmstädter Bank closes. Bank holiday.
July 1931	HUNGARY	Run on Budapest banks (especially General Credit Bank). Foreign withdrawals followed by a foreign creditors' standstill agreement. Bank holiday.
	LATVIA	Run on banks with German connections. Bank of Libau and International Bank of Riga particularly hard hit.
	AUSTRIA	Failure of Vienna Mercur-Bank.
	CZECHOSLOVAKIA	Withdrawal of foreign deposits sparks domestic withdrawals but no general banking panic.
	TURKEY	Run on branches of Deutsche Bank and collapse of Banque Turque pour le Commerce et l'Industrie, in wake of German crisis.
	EGYPT	Run on Cairo and Alexandria branches of Deutsche Orientbank.
	SWITZERLAND	Union Financière de Genève rescued by takeover by Comptoir d'Escompte de Genève.
	RUMANIA	Collapse of German-controlled Banca Generala a Tarii Românești. Run on Banca de Credit Roman and Banca Romaneasca.
	MEXICO	Suspension of payments after run on Credito Espanol de Mexico. Run on Banco Nacional de Mexico.
	August 1931	U.S.
September 1931		U.K.
	ESTONIA	General bank run following sterling crisis; second wave of runs in November.

Table 2.7 (continued)

Date	Country	Crises
October 1931	RUMANIA	Failure of Banca Marmerosch, Blank & Co. Heavy bank runs.
	FRANCE	Collapse of major deposit bank Banque Nationale de Cr�dit (restructured as Banque Nationale pour le Commerce et l'Industrie). Other bank failures and bank runs.
March 1932	SWEDEN	Weakness of one large bank (Skandinaviska Kreditaktiebolaget) as result of collapse of Kreuger industrial and financial empire, but no general panic.
May 1932	FRANCE	Losses of large investment bank Banque de l'Union Parisienne forces merger with Cr�dit Mobilier Fran�ais.
June 1932	U.S.	Series of bank failures in Chicago.
October 1932	U.S.	New wave of bank failures, especially in the Midwest and Far West.
February 1933	U.S.	General banking panic, leading to state holidays and a nationwide bank holiday in March.
November 1933	SWITZERLAND	Restructuring of large bank (Banque Populaire Suisse) after heavy losses.
March 1934	BELGIUM	Failure of Banque Belge de Travail develops into general banking and exchange crisis.
September 1934	ARGENTINA	Bank problems throughout the fall induce government-sponsored merger of four weak banks (Banco Espanol del Rio de la Plata, Banco el Hogar Argentina, Banco Argentina-Uruguayo, Ernesto Tornquist & Co.).
October 1935	ITALY	Deposits fall after Italian invasion of Abyssinia.
January 1936	NORWAY	After years of deposit stability, legislation introducing a tax on bank deposits leads to withdrawals (until fall).
October 1936	CZECHOSLOVAKIA	Anticipation of second devaluation of the crown leads to deposit withdrawals.

When the peak of the world banking crisis came in 1931, there had already been almost two years of deflation and accompanying depression. Consistent with the analysis at the end of the last section, falling prices lowered the nominal value of bank assets but not the nominal value of bank liabilities. In addition, the rules of the gold standard severely limited the ability of central banks to ameliorate panics by acting as a lender of last resort; indeed, since banking panics often coincided with exchange crises (as we discuss further below), in order to maintain convertibility central banks typically *tightened* monetary policy in the face of panics. Supporting the connection of banking problems with deflation and "rules of the game" constraints is the observation that there were virtually no serious banking panics in any country after aban-

Table 2.8 Log-differences of Commercial Bank Deposit-Currency Ratio

Country	1930	1931	1932	1933	1934	1935	1936
Australia	-.05	-.12*	.05	.01	.05	-.03	-.01
Austria	.17	-.40*	-.06	-.20*	-.07	-.01	-.02
Belgium	-.13*	-.22*	-.10*	.07	-.13*	-.27*	-.02
Canada	.07	-.01	.03	-.05	.00	.01	-.06
Czechoslovakia	-.11	-.08	.07	.02	.07	-.03	-.11*
Denmark	.08	-.03	.00	-.07	.02	.02	-.00
Estonia	.16	-.29*	-.02	-.05	.10	.05	.13
Finland	.09	-.05	.14	-.04	-.06	-.04	-.09
France	-.07	-.12*	-.01	-.10*	-.07	-.10	-.03
Germany	-.11*	-.40*	.05	-.09	-.01	-.08	-.02
Greece	.17	.07	-.27*	-.03	.06	-.04	.02
Hungary	.07	-.07	.10	-.03	-.08	-.05	-.03
Italy	.04	-.01	.05	.06	.01	-.20*	.08
Japan	.09	.03	-.12*	-.04	.03	-.00	.09
Latvia	.03	-.57*	.11	-.06	.12	.10	.45
Netherlands	.10	-.36*	-.05	-.06	-.05	-.08	.24
Norway	.04	-.15*	-.06	-.09	-.01	.03	-.23*
New Zealand	.04	-.11*	.03	.07	.15	-.08	-.32*
Poland	.07	-.29*	-.02	-.08	.10	-.06	.10
Rumania	.11	-.76*	-.05	-.11*	-.28*	.10	-.16*
Sweden	-.00	-.00	-.02	-.06	-.11*	-.08	-.07
Spain	.00	-.24*	.08	.03	.01	.06	N.A.
United Kingdom	.03	-.07	.10	-.07	-.02	.01	-.03
United States	.00	-.15*	-.26*	-.15*	.14	.05	.02

Note: Entries are the log-differences of the ratio of commercial bank deposits to money and notes in circulation. Data are from League of Nations, *Monthly Bulletin of Statistics* and *Yearbook*, various issues.

*Decline exceeds .10.

donment of the gold standard—although it is also true that by time the gold standard was abandoned, strong financial reform measures had been taken in most countries.

However, while deflation and adherence to the gold standard were necessary conditions for panics, they were not sufficient; a number of countries made it through the interwar period without significant bank runs or failures, despite being subject to deflationary shocks similar to those experienced by the countries with banking problems.¹⁵ Several factors help to explain which countries were the ones to suffer panics.

1. *Banking structure.* The organization of the banking system was an important factor in determining vulnerability to panics. First, countries with “unit banking,” that is, with a large number of small and relatively undiversified banks, suffered more severe banking panics. The leading example is of course the United States, where concentration in banking was very low, but a high incidence of failures among small banks was also seen in other countries (e.g., France). Canada, with branch banking, suffered no bank failures during

the Depression (although many branches were closed). Sweden and the United Kingdom also benefited from a greater dispersion of risk through branch systems.¹⁶

Second, where “universal” or “mixed” banking on the German or Belgian model was the norm, it appears that vulnerability to deflation was greater. In contrast to the Anglo-Saxon model of banking, where at least in theory lending was short term and the relationship between banks and corporations had an arm’s length character, universal banks took long-term and sometimes dominant ownership positions in client firms. Universal bank assets included both long-term securities and equity participations; the former tended to become illiquid during a crisis, while the latter exposed universal banks (unlike Anglo-Saxon banks, which held mainly debt instruments) to the effects of stock market crashes. The most extreme case was probably Austria. By 1931, after a series of mergers, the infamous Creditanstalt was better thought of as a vast holding company rather than a bank; at the time of its failure in May 1931, the Creditanstalt owned sixty-four companies, amounting to 65% of Austria’s nominal capital (Kindleberger 1984).

2. *Reliance of banks on short-term foreign liabilities.* Some of the most serious banking problems were experienced in countries in which a substantial fraction of deposits were foreign-owned. The so-called hot money was more sensitive to adverse financial developments than were domestic deposits. Runs by foreign depositors represented not only a loss to the banking system but also, typically, a loss of reserves; as we have noted, this additional external threat restricted the ability of the central bank to respond to the banking situation. Thus, banking crises and exchange rate crises became intertwined.¹⁷ The resolution of a number of the central European banking crises required “standstill agreements,” under which withdrawals by foreign creditors were blocked pending future negotiation.

International linkages were important on the asset side of bank balance sheets as well. Many continental banks were severely affected by the crises in Austria and Germany, in particular.

3. *Financial and economic experience of the 1920s.* It should not be particularly surprising that countries which emerged from the 1920s in relatively weaker condition were more vulnerable to panics. Austria, Germany, Hungary, and Poland all suffered hyperinflation and economic dislocation in the 1930s, and all suffered severe banking panics in 1931. While space constraints do not permit a full discussion of the point here, it does seem clear that the origins of the European financial crisis were at least partly independent of American developments—which argues against a purely American-centered explanation of the origins of the Depression.

It should also be emphasized, though, that not just the existence of financial difficulties during the 1920s but also the policy response to those difficulties was important. Austria is probably the most extreme case of nagging banking problems being repeatedly “papered over.” That country had banking prob-

lems throughout the 1920s, which were handled principally by merging failing banks into still-solvent banks. An enforced merger of the Austrian Bodencreditanstalt with two failing banks in 1927 weakened that institution, which was part of the reason that the Bodencreditanstalt in turn had to be forceably merged with the Creditanstalt in 1929. The insolvency of the Creditanstalt, finally revealed when a director refused to sign an "optimistic" financial statement in May 1931, sparked the most intense phase of the European crisis.

In contrast, when banking troubles during the earlier part of the 1920s were met with fundamental reform, performance of the banking sector during the Depression was better. Examples were Sweden, Japan, and the Netherlands, all of which had significant banking problems during the 1920s but responded by fundamental restructurings and assistance to place banks on a sound footing (and to close the weakest banks). Possibly because of these earlier events, these three countries had limited problems in the 1930s. A large Swedish bank (Skandinaviska Kreditaktiebolaget) suffered heavy losses after the collapse of the Kreuger financial empire, and a medium-sized Dutch bank (Amstelbank) failed because of its connection to the Creditanstalt; but there were no widespread panics, only isolated failures.

A particularly interesting comparison in this regard is between the Netherlands and neighboring Belgium, where banking problems persisted from 1931 to 1935 and where the ultimate devaluation of the Belgian franc was the result of an attempt to protect banks from further drains. Both countries were heavily dependent on foreign trade and both remained on gold, yet the Netherlands did much better than Belgium in the early part of the Depression (see table 2.4). This is a bit of evidence for the relevance of banking difficulties to output.

Overall, while banking crises were surely an endogenous response to depression, the incidence of crisis across countries reflected a variety of institutional factors and other preconditions. Thus it will be of interest to compare the real effects of deflation between countries with and without severe banking difficulties.

On "debt deflation," that is, the problems of nonfinancial borrowers, much less has been written than on the banking crises. Only for the United States has the debt problem in the 1930s been fairly well documented (see the summary in Bernanke 1983 and the references therein). In that country, large corporations avoided serious difficulties, but most other sectors—small businesses, farmers, mortgage borrowers, state and local governments—were severely affected, with usually something close to half of outstanding debts being in default. A substantial portion of New Deal reforms consisted of various forms of debt adjustment and relief.

For other countries, there are plenty of anecdotes but not much systematic data. Aggregate data on bankruptcies and defaults are difficult to interpret because increasing financial distress forced changes in bankruptcy practices

and procedures; when the League of Nations' *Monthly Bulletin of Statistics* dropped its table on bankruptcies in its December 1932 issue, for example, the reason given therein was that "the numerous forms of agreement by which open bankruptcies are now avoided have seriously diminished the value of the table" (p. 529). Perhaps the most extreme case of a change in rules was Rumania's April 1932 Law on Conversion of Debts, which essentially eliminated the right of creditors to force bankruptcy. Changes in the treatment of bankruptcy no doubt ameliorated the effects of debt default, but the fact that these changes occurred indicates that the perceived problem must have been severe. More detailed country-by-country study of the effects of deflation on firm balance sheets and the relation of financial condition to firm investment, production, and employment decisions—where the data permit—would be extremely valuable. A similar comment applies to external debt problems, although here interesting recent work by Eichengreen and Portes (1986) and others gives us a much better base of knowledge to build on than is available for the case of domestic debts.

2.5 Regression Results

In this section we present empirical results based on our panel data set. The principal question of interest is the relative importance of various transmission mechanisms of deflation to output. We also address the question, so far not discussed, of whether banking crises could have intensified the deflation process itself.

The basic set of results is contained in table 2.9, which relates the log-differences in industrial production for our set of countries to various combinations of explanatory variables. The definitions of the right-hand-side variables are as follows:

$\Delta \ln PW$: log-difference of the wholesale price index;

$\Delta \ln EX$: log-difference of nominal exports;

$\Delta \ln W$: log-difference of nominal wage;

$DISC$: central bank discount rate, measured relative to its 1929 value (a government bond rate is used for Canada; since no 1929 interest rate could be found for New Zealand, that country is excluded in regressions including $DISC$);

$PANIC$: a dummy variable, set equal to the number of months during the year that the country experienced serious banking problems (see below);

$\Delta \ln M0$: log-difference of money and notes in circulation.

Exports are included to control for trade effects on growth, including the benefits of competitive devaluation discussed by Eichengreen and Sachs (1986); and the wage is included to test for the real wage channel of transmission from deflation to depression. Of course, theory says that both of these

variables should enter in real rather than in nominal terms; unfortunately, in practice the theoretically suggested deflator is not always available (as we noted in our discussion of the real wage above). We resolve this problem by supposing that the true equation is, for example,

$$(1) \quad \Delta \ln IP = \beta_e (\Delta \ln EX - \Delta \ln P_e) + \beta_w (\Delta \ln W - \Delta \ln P_w) + \text{error}$$

where P_e and P_w , the optimal deflators, are not available. Let the projections of log-changes in the unobserved deflators on the log-change in the wholesale price deflator be given by

$$(2) \quad \Delta \ln P_i = \psi_i \Delta \ln PW + u_i \quad i = e, w$$

where the u_i are uncorrelated with $\Delta \ln PW$ and presumably the ψ_i are positive. Then (1) becomes

$$(3) \quad \Delta \ln IP = -(\beta_e \psi_e + \beta_w \psi_w) \Delta \ln PW + \beta_e \Delta \ln EX + \beta_w \Delta \ln W + \text{new error}$$

This suggests allowing $\Delta \ln PW$ and the nominal growth rates of exports and wages to enter the equation separately, which is how we proceed.¹⁸ Putting $\Delta \ln PW$ in the equation separately has the added advantage of allowing us to account for any additional effect of deflation (such as debt deflation) not explicitly captured by the other independent variables.

The discount rate *DISC* is included to allow for the interest rate channel and as an additional proxy for monetary policy. Since $\Delta \ln PW$ is included in every equation, inclusion of the nominal interest rate *DISC* is equivalent to including the actual ex post real interest rate, that is, we are effectively assuming that deflation was fully anticipated; this should give the real interest rate hypothesis its best chance.

In an attempt to control for fiscal policy, we also included measures of central government expenditure in our first estimated equations. Since the estimated coefficients were always negative (the wrong sign), small, and statistically insignificant, the government expenditure variable is excluded from the results reported here.

Construction of the dummy variable *PANIC* required us to make a judgment about which countries' banking crises were most serious, which we did from our reading of primary and secondary sources. We dated periods of crisis as starting from the first severe banking problems; if there was some clear demarcation point (such as the U.S. bank holiday of 1933), we used that as the ending date of the crisis; otherwise we arbitrarily assumed that the effects of the crisis would last for one year after its most intense point. The banking crises included in the dummy are as follows (see also table 2.7):

1. Austria (May 1931–January 1933): from the Creditanstalt crisis to the date of official settlement of the Creditanstalt's foreign debt.
2. Belgium (May 1931–April 1932; March 1934–February 1935): for one year after the initial Belgian crisis, following Creditanstalt, and for one

year after the failure of the Banque Belge de Travail led to a general crisis.

3. Estonia (September 1931–August 1932): for one year after the general banking crisis.
4. France (November 1930–October 1932): for one year following each of the two peaks of the French banking crises, in November 1930 and October 1931 (see Bouvier 1984).
5. Germany (May 1931–December 1932): from the beginning of the major German banking crisis until the creation of state institutes for the liquidation of bad bank debts.
6. Hungary (July 1931–June 1932): for one year following the runs in Budapest and the bank holiday.
7. Italy (April 1931–December 1932): from the onset of the banking panic until the takeover of bank assets by a massive new state holding company, the Istituto per la Ricostruzione Industriale (IRI).
8. Latvia (July 1931–June 1932): for one year following the onset of the banking crisis.
9. Poland (June 1931–May 1932): for one year following the onset of the banking crisis.
10. Rumania (July 1931–September 1932): from the onset of the crisis until one year after its peak in October 1931.
11. United States (December 1930–March 1933): from the failure of the Bank of the United States until the bank holiday.

The inclusion of Austria, Belgium, Estonia, Germany, Hungary, Latvia, Poland, Rumania, or the United States in the above list cannot be controversial; each of these countries suffered serious panics. (One might quibble on the margin about the exact dating given—for example, Temin [1989] and others have argued that the U.S. banking crisis did not really begin until mid 1931—but we doubt very much that changes of a few months on these dates would affect the results.) The inclusion of France and Italy is more controversial. For example, Bouvier (1984) argues that the French banking crisis was not as serious as some others, since although there were runs and many banks failed, the very biggest banks survived; also, according to Bouvier, French banks were not as closely tied to industry as other banking systems on the Continent. For Italy, as we have noted, early and massive government intervention reduced the incidence of panic (see Ciocca and Toniolo 1984); however, the banks were in very poor condition and (as noted above) eventually signed over most of their industrial assets to the IRI.

To check the sensitivity of our results, we reestimated the key equations omitting first the French crisis from the *PANIC* variable, then the French and Italian crises. Leaving out France had a minor effect (lowering the coefficient

on *PANIC* and its *t*-statistic about 5% in a typical equation); the additional exclusion of the Italian crisis has essentially no effect.¹⁹

As a further check, we also reestimated our key equations omitting, in separate runs, (i) the United States; (ii) Germany and Austria; and (iii) all eastern European countries. In none of these equations were our basic results substantially weakened, which indicates that no single country or small group of countries is driving our findings.

The first seven equations in table 2.9 are not derived from any single model, but instead attempt to nest various suggested explanations of the link between deflation and depression. Estimation was by OLS, which opens up the possibility of simultaneity bias; however, given our maintained view that the deflation was imposed by exogenous monetary forces, a case can be made for treating the right-hand-side variables as exogenous or predetermined.

The principal inferences to be drawn from the first seven rows of table 2.9 are as follows:²⁰

1. Export growth consistently enters the equation for output growth strongly, with a plausible coefficient and a high level of statistical significance.
2. When wage growth is included in the output equation along with only wholesale price and export growth (row 5), it enters with the wrong sign.

Table 2.9 Determinants of the Log-difference of Industrial Production
(dependent variable: $\Delta \ln I/P$)

Equation	Independent Variables					
	$\Delta \ln PW$	$\Delta \ln EX$	$\Delta \ln W$	<i>DISC</i>	<i>PANIC</i>	$\Delta \ln M0$
(1)	.855 (.098)					
(2)	.531 (.095)				-.0191 (.0026)	
(3)	.406 (.121)	.231 (.043)				
(4)	.300 (.111)	.148 (.041)			-.0157 (.0027)	
(5)	.364 (.141)	.231 (.046)	.272 (.206)			
(6)	.351 (.128)	.150 (.044)	-.072 (.197)		-.0156 (.0029)	
(7)	.296 (.123)	.103 (.044)	-.119 (.189)	-.0358 (.0102)	-.0138 (.0028)	
(8)		.217* (.048)	-.015 (.189)		-.0126 (.0031)	.405 (.098)

Note: For variable definitions, see text. The sample period is 1930–36. The panel consists of twenty-four countries except that, due to missing wage data, Finland, Greece, and Spain are excluded from equations (5)–(8). Estimates of country-specific dummies are not reported. Standard errors are in parentheses.

*Export growth is measured in real terms in equation (8).

Only when the *PANIC* variable is included does nominal wage growth have the correct (negative) sign (rows 6 and 7). In the equation encompassing all the various channels (row 7), the estimated coefficient on wage growth is of the right sign and a reasonable magnitude, but it is not statistically significant.

3. The discount rate enters the encompassing equation (row 7) with the right sign and a high significance level. A 100-basis-point increase in the discount rate is estimated to reduce the growth rate of industrial production by 3.6 percentage points.

4. The effect of banking panics on output is large (a year of panic is estimated in equation (7) to reduce output growth by $12 \times .0138$, or more than 16 percentage points) and highly statistically significant (*t*-statistics of 4.0 or better). The measured effect of the *PANIC* variable does not seem to depend much on what other variables are included in the equation.

5. There may be some residual effect of deflation on output not accounted for by any of these effects. To see this, note that in principle the coefficient on $\Delta \ln PW$ in equation (7) of table 2.9 should be equal to and opposite the weighted sum of the coefficients on $\Delta \ln EX$, $\Delta \ln W$, and *DISC* (where the weights are the projection coefficients of the respective "true" deflators on $\Delta \ln PW$). Suppose for the sake of illustration that each of the projection coefficients equals one (that is, the wholesale price index is the correct deflator). Then the expected value of the coefficient on $\Delta \ln PW$ should be approximately .052; the actual value is .296, with a standard error of .123. Thus there may be channels relating deflation to depression other than the ones explicitly accounted for here. One possibility is that we are simply picking up the effects of a simultaneity bias (a reverse causation from output to prices). Alternatively, it is possible that an additional factor, such as debt deflation, should be considered.

As an alternative to the procedure of nesting alternative channels in a single equation, in equation (8) of table 2.9 we report the results of estimating the reduced form of a simple aggregate demand–aggregate supply (AD-AS) system. Under conventional assumptions, in an AD-AS model output growth should depend on money growth and autonomous spending growth (represented here by growth in *real exports*²¹), which shift the AD curve; and on nominal wage growth, which shifts the AS curve. In addition, we allow *PANIC* to enter the system, since banking panics could in principle affect both aggregate demand and aggregate supply. The results indicate large and statistically significant effects on output growth for real export growth, money growth, and banking panics. Nominal wage growth enters with the correct sign, but the coefficient is very small and statistically insignificant.

We have so far focused on the effects of banking panics (and other variables) on output. There is an additional issue that warrants some discussion here; namely, the possibility that banking panics might have themselves worsened the deflationary process.

Some care must be taken with this argument. Banking panics undoubtedly

had large effects on the composition of national money supplies, money multipliers, and money demand. Nevertheless, as has been stressed by Temin (1989), under a gold standard, small country price levels are determined by international monetary conditions, to which domestic money supplies and demands must ultimately adjust. Thus banking panics cannot intensify deflation in a small country.²² Indeed, a regression (not reported) of changes in wholesale prices against the *PANIC* variable and time dummies (in order to isolate purely cross-sectional effects) confirms that there is very little relationship between the two variables.

The proposition that bank panics should not affect the price level does not necessarily hold for a large country, however. In econometric language, under a gold standard the price level of a large country must be cointegrated with world prices; but while this means that domestic prices must eventually adjust to shocks emanating from abroad, it also allows for the possibility that domestic shocks will influence the world price level. Notice that if banking panics led to deflationary shocks in a large country and these shocks were transmitted around the world by the gold standard, a cross-sectional comparison would find no link between panics and the price level.

The discussion of the gold standard and deflation in section 2.2 cited Hamilton's (1987) view that the initial deflationary impulses in 1928–29 came from France and the United States—both “big” countries, in terms of economic importance and because of their large gold reserves. This early deflation obviously cannot be blamed on banking panics, since these did not begin until at least the end of 1930. But it would not be in any way inconsistent with the theory of the gold standard to hypothesize that banking panics in France and the United States contributed to world deflation during 1931–32.²³

Empirical evidence bearing on this question is presented in table 2.10. We estimated equations for wholesale price inflation in the United States and France, using monthly data for the five-year period 1928–32. We included an error-correction term in both equations to allow for cointegration between the U.S. and French price levels, as would be implied by the gold standard. This error-correction term is the difference between the log-levels of U.S. and French wholesale prices in period $t - 1$; if U.S. and French prices are in fact cointegrated, then the growth rate of U.S. prices should respond negatively to the difference between the U.S. price and the French price, and the French growth rate of prices should respond positively. Also included in the equations are lagged inflation rates (to capture transitory price dynamics), current and lagged base money growth, and current and lagged values of the deposits of failing banks (for the United States only, due to data availability).

The results are interesting. First, there is evidence for cointegration: The error-correction terms have the right signs and reasonable magnitudes, although only the U.S. term is statistically significant. Thus we may infer that shocks hitting either French or U.S. prices ultimately affected both price levels. Second, both U.S. base money growth and bank failures are important

Table 2.10 Error-correction Equations for U.S. and French Wholesale Prices

	Dependent Variable	
	$\Delta \ln USAWPI$	$\Delta \ln FRAWPI$
ConStant	.044 ($t = 3.81$)	-.006 ($t = 1.57$)
Log <i>USAWPI</i> - log <i>FRAWPI</i> (lagged once)	-.166 ($t = 2.77$)	.071 ($t = 1.10$)
Four lagS of own WPI growth	-.530 ($F = 1.57; p = .202$)	.320 ($F = 2.48; p = .057$)
Current and four lagS of base money growth	1.412 ($F = 5.62; p = .0005$)	.519 ($F = 0.78; p = .569$)
Current and four lagS of deposits of failing U.S. banks, in logS	-.020 ($F = 5.61; p = .0005$)	
R^2	.531	.307
D-W	1.62	1.87

Note: Deposits of failing banks are from the *Federal Reserve Bulletin*. *USAWPI* and *FRAWPI* are wholesale price indexes for the United States and France, respectively. Monthly data from 1928 to 1932 are used.

determinants of the U.S. (and by extension, the French) deflation rates; these two variables enter the U.S. price equation with the right sign and marginal significance levels of .0005.

With respect to the effect of banking panics on the price level, then, the appropriate conclusion appears to be that countries with banking panics did not suffer worse deflation than those without panics;²⁴ however, it is possible that U.S. banking panics in particular were an important source of *world* deflation during 1931–32, and thus, by extension, of world depression.

2.6 Conclusion

Monetary and financial arrangements in the interwar period were badly flawed and were a major source of the fall in real output. Banking panics were one mechanism through which deflation had its effects on real output, and panics in the United States may have contributed to the severity of the world deflation.

In this empirical study, we have focused on the effects of severe banking panics. We believe it likely, however, that the effects of deflation on the financial system were not confined to these more extreme episodes. Even in countries without panics, banks were financially weakened and contracted their

operations. Domestic debt deflation was probably a factor, to a greater or lesser degree, in every country. And we have not addressed at all the effect of deflation on the burden of external debt, which was important for a number of countries. As we have already suggested, more careful study of these issues is clearly desirable.

Notes

1. The original diagnosis of the Depression as a monetary phenomenon was of course made in Friedman and Schwartz (1963). We find the more recent work, though focusing to a greater degree on international aspects of the problem, to be essentially complementary to the Friedman-Schwartz analysis.

2. Eichengreen and Sachs (1985) discuss several mechanisms and provide some cross-country evidence, but their approach is somewhat informal and they do not consider the relative importance of the different effects.

3. To be clear, gold inflows to France did increase the French monetary base directly, one for one; however, in the absence of supplementary open market purchases, this implied a rising ratio of French gold reserves to monetary base. Together with the very low value of the French money multiplier, this rising cover ratio meant that the monetary expansion induced by gold flowing into France was far less significant than the monetary contractions that this inflow induced elsewhere.

4. Temin (1989) suggests that German monetary policy provided yet another contractionary impetus.

5. There remains the issue of whether the differences in timing of nations' departure from the gold standard can be treated as exogenous. Eichengreen and Sachs (1985) argue that exogeneity is a reasonable assumption, given the importance of individual national experiences, institutions, and fortuitous events in the timing of each country's decision to go off gold. Strong national differences in attitudes toward the gold standard (e.g., between the Gold Bloc and the Sterling Bloc) were remarkably persistent in their influence on policy.

6. The countries in our sample are listed in table 2.1. We included countries for which the League of Nations collected reasonably complete data on industrial production, price levels, and money supplies (League of Nations' *Monthly Bulletin of Statistics and Yearbooks*, various issues; see also League of Nations, *Industrialization and Foreign Trade*, 1945). Latin America, however, was excluded because of concerns about the data and our expectation that factors such as commodity prices would play a more important role for these countries. However, see Campa (forthcoming) for evidence that the gold standard transmitted deflation and depression to Latin America in a manner very similar to that observed elsewhere.

7. We define abandonment of the gold standard broadly as occurring at the first date in which a country imposes exchange controls, devalues, or suspends gold payments; see table 2.1 for a list of dates. An objection to this definition is that some countries continued to try to target their exchange rates at levels prescribed by the gold standard even after "leaving" the gold standard by our criteria; Canada and Germany are two examples. We made no attempt to account for this, on the grounds that defining adherence to the gold standard by looking at variables such as exchange rates, money growth, or prices risks assuming the propositions to be shown.

8. In constructing the grand averages taken over gold and non-gold countries, if a

country abandoned the gold standard in the middle of a year, it is included in both the gold and non-gold categories with weights equal to the fraction of the year spent in each category. We use simple rather than weighted averages in the tables, and similarly give all countries equal weight in regression results presented below. This was done because, for the purpose of testing hypotheses (e.g., about the relationship between deflation and depression) it seems most reasonable to treat each country (with its own currency, legal system, financial system, etc.) as the basic unit of observation and to afford each observation equal weight. If we were instead trying to measure the overall economic significance of, for example, an individual country's policy decisions, weighted averages would be more appropriate.

9. The use of the terms M1 and M2 should not be taken too literally here, as the transactions characteristics of the assets included in each category vary considerably among countries. The key distinction between the two aggregates is that commercial banks, which were heavily involved in commercial lending, were much more vulnerable to banking panics. Savings banks, in contrast, held mostly government securities, and thus often gained deposits during panic periods.

10. However, it must be mentioned that recent exponents of the real wage explanation of German unemployment invoke it to account for high levels of unemployment throughout the mid and late 1920s, and not just for the period after 1929 (Borchardt 1979).

11. In the French case, however, there may have been some fear of government default, given the large deficits that were being run; conceivably, this could explain the higher rate on French bills.

12. A possible response to this point is that fear of devaluation added a risk premium to assets in gold standard countries. This point can be checked by looking at forward rates for foreign exchange, available in Einzig (1937). The forward premia on gold standard currencies are generally small, except immediately before devaluations. In particular, the three-month premium on dollars versus the pound in 1932 had a maximum value of about 4.5% (at an annual rate) during the first week of June, but for most of the year was considerably less than that.

13. The effect of deflation on banks, and the relationship between deflation and bank runs, has been analyzed in a theoretical model by Flood and Garber (1981).

14. An important issue, which we cannot resolve here, is whether government takeovers of banks resulted in some restoration of intermediary services, or if, instead, the government functioned primarily as a liquidation agent.

15. In the next section we divide our sample into two groups: eleven countries with serious banking problems and thirteen countries without these problems. In 1930, the year before the peak of the banking crises, the countries that were to avoid banking problems suffered on average a 12% deflation and a 6% fall in industrial production; the comparable numbers for the group that was to experience panics were 13% and 8%. Thus, there was no large difference between the two groups early in the Depression. In contrast, in 1932 (the year following the most intense banking crises), industrial production growth in countries without banking crises averaged -2%; in the group that experienced crises the comparable number was -16%.

16. Although this correlation seems to hold during the Depression, we do not want to conclude unconditionally that branch banking is more stable; branching facilitates diversification but also increases the risk that problems in a few large banks may bring down the entire network.

17. Causality could run in both directions. For example, Wigmore (1987) argues that the U.S. banking panic in 1933 was in part created by a run on the dollar.

18. It has been pointed out to us that if nominal wages were literally rigid, then this approach would find no effect for wages even though changes in the real wage might

be an important channel for the effects of deflation. The reply to this is that, if nominal wages are completely rigid, the hypothesis that real wages are important can never be distinguished from an alternative which proposes that deflation has its effects in some other way.

19. In another sensitivity check, we also tried multiplying *PANIC* times the change in the deposit-currency ratio, to allow for differential severity of panics. The results exhibited an outlier problem. When Rumania (which had a change in the deposit-currency ratio of $-.76$ in 1931) was excluded, the results were similar to those obtained using the *PANIC* variable alone. However, inclusion of Rumania weakened both the magnitude and statistical significance of the effect of panics on output. The "reason" for this is that, despite its massive deposit contraction, Rumania experienced a 5% growth of industrial production in 1931. Whether this is a strong contradiction of the view that panics affect real output is not clear, however, since according to the League of Nations the peak of the Rumania crisis did not occur until September or October, and industrial production in the subsequent year fell by 14%. Another reason to downplay these results is that the change in the deposit-currency ratio may not be a good indicator of the severity of the banking crisis, as the Italian case indicates.

20. Results were unchanged when lagged industrial production growth was added to the equations. The coefficient on lagged production was typically small and statistically insignificant.

21. Deflation is by the wholesale price index.

22. A possible exception to this proposition for a small country might be a situation in which there are fears that the country will devalue or abandon gold; in this case the country's price level might drop below the world level without causing inflows of reserves. An example may be Poland in 1932. A member of the Gold Bloc, Poland's wholesale price level closely tracked that of France until mid 1931, when Poland experienced severe banking problems and withdrawals of foreign deposits, which threatened convertibility. From that point on, even though both countries remained on the gold standard, money supplies and prices in Poland and France began to diverge. From the time of the Polish crisis in June 1931 until the end of 1932, money and notes and circulation dropped by 9.1% in Poland (compared to a gain of 10.5% in France); Polish commercial bank deposits fell 24.5% (compared to a 4.1% decline in France); and Polish wholesale prices declined 35.2% (compared to a decline of 18.3% in France). Despite its greater deflation, Poland lost about a sixth of its gold reserves in 1932, while France gained gold.

23. This hypothesis does not bear on Temin's claim that there was little that central banks could do about banking crises under the gold standard; rather, the argument is that if, fortuitously, French and U.S. banking panics had not occurred, world deflation in 1931-32 would have been less severe.

24. Indeed, if banking panics induced countries to abandon gold, they may have indirectly contributed to an eventual rise in price levels.

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