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12 Implications of the Great Depression for the Development of the International Monetary System

Michael D. Bordo and Barry Eichengreen

Understanding the impact of the Great Depression on the development of the international monetary system requires one to ask the counterfactual question: What would the world have been like had the Depression not occurred? In this paper we speculate about the evolution of the international monetary system in the last two-thirds of the twentieth century absent the Great Depression but present the major postdepression political and economic upheavals: World War II and the cold war.[1]

We argue that without the depression the gold exchange standard would have persisted until the outbreak of World War II. It would have been suspended during the war and for a period of postwar reconstruction before being restored in the first half of the 1950s. The Bretton Woods Conference would not have taken place, nor would a Bretton Woods system of pegged but adjustable exchange rates and restrictions on capital account convertibility have been established. Instead, an unreformed gold exchange standard of pegged exchange rates and unlimited international capital mobility would have been restored after World War II.

But this gold exchange standard would have collapsed even earlier than was

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1. Alternatively, one might argue that these political upheavals would not have themselves occurred had they not been preceded by the depression. Here we ignore this more complicated counterfactual.

actually the case with Bretton Woods. The move toward floating exchange rates that followed would have taken place well before 1971.

The remainder of the paper is organized as follows. Section 12.1 describes the counterfactual in more detail. Section 12.2 draws out its implications for the operation of the international monetary system. In section 12.3 we present a model of the international monetary system from 1928 to 1971 and simulate its implications for the determination of the world price level and the durability of the gold exchange standard. Section 12.4 examines the implications for economic growth and resource allocation of allowing 1920s-style international capital mobility after World War II. Section 12.5 contemplates the implications for institution building and international cooperation of the "no Great Depression" scenario. Section 12.6 concludes with a summary evaluation of the impact of the depression on the international monetary system.

12.1 Constructing the Counterfactual

An adequate counterfactual requires not only assuming that the Great Depression did not take place but also being explicit about how the macroeconomic disaster of the 1930s was averted. On the assumption that the depression resulted from contractionary monetary policies that were transmitted internationally through the operation of the gold exchange standard, our counterfactual is that the disaster of the 1930s was avoided by the maintenance of stable monetary policies. There exist two variants of this hypothesis, both with the same implications for our counterfactual analysis. In one, the depression was precipitated by monetary events in the United States. Restrictive monetary policies precipitated the 1929 downturn, and inept monetary policies aggravated the depth and duration of the slump.[2] Other countries, their monetary and credit conditions tied together by the fixed exchange rates of the gold exchange standard, imported these contractionary impulses; they too lapsed into depression.[3] The corresponding counterfactual is that the Federal Reserve maintained a stable monetary policy throughout the 1930s, averting the banking panics of 1930–33, and that the rest of the world did not import a deflationary shock from the United States.[4]

2. Field (1984) and Hamilton (1987) show that stringent monetary conditions played an important role in the onset of the depression in the United States, while Friedman and Schwartz (1963) paint a detailed picture of the role of monetary policy in aggravating the severity of the slump.

3. This point is documented by Choudhri and Kochin (1980).

4. To the extent that bank failures would have occurred anyway, we assume that the Fed acted as lender of last resort to contain their spread. For simulations of the impact of a stable U.S. monetary policy on output and the price level in the interwar period, see Bordo, Choudhri, and Schwartz (1995) and McCallum (1990). This scenario presumes that the Fed had the understanding and policy tools to pursue monetary stability. Meltzer (1995), following Wheelock (1990), argues that Federal Reserve officials were wedded to the flawed Burgess-Riefler-Story doctrine and would have been unable to follow the correct course. Against this objection we cite two facts:

In the other variant of the hypothesis, no one country was large enough and no one set of national policies was sufficiently powerful to precipitate a global slump. Rather, the depression was induced by the simultaneous adoption of inappropriately restrictive policies by several leading countries. Monetary restriction in the United States, which reflected the Federal Reserve Board's desire to damp down the Wall Street boom, coincided with restrictive monetary policies in France, as the French authorities refused to accommodate the increase in money demand that followed inflation stabilization and converted the country's foreign exchange reserves into gold.[5] Together, contractionary impulses emanating from the two countries that between them held more than half of global gold reserves forced monetary restriction on other nations and depressed output and employment worldwide. The corresponding counterfactual is that the depression was averted by better, coordinated international monetary management. The countries concerned each could have reduced their discount rates and initiated expansionary open market operations without destabilizing their exchange rates or the gold exchange standard. The spread of deflation and banking crises under the fixed-rate gold standard would have been contained. This would have finessed the dilemma confronting the monetary authorities, of either staying on gold and deflating or following expansionary policies and being forced off (Eichengreen 1992). It would have prevented the Central European countries and the United Kingdom from being forced to abandon the gold standard in 1931.

Either way, the Great Depression would have been avoided, which is the starting point for our counterfactual analysis. Absent the depression, the gold exchange standard would have survived the 1930s.[6] The devaluations of sterling in 1931, the dollar in 1933, and the franc in 1936 would not have occurred.[7]

The system then would have been suspended during World War II, echoing the experience of World War I. We assume that the same fraction of wartime

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the connection between stable money and the real economy was known at the time, as noted by Laidler (1994), and other central banks had on previous occasions acted successfully as lenders of last resort.

5. This is the "international explanation" for the Great Depression. See Temin (1989), Eichengreen (1992), and Bernanke (1995).

6. This assumes that neither the decline in primary commodity prices in the second half of the 1920s nor German reparations transfers would have destabilized the exchange rates of major participants in the system. We provide analysis in defense of this assumption below.

7. This assumes that other problems with the operation of the gold exchange standard would not have precipitated its early collapse. Potentially, such problems included the tendency for countries to sterilize reserve flows (to violate the "rules of the gold standard game"), the liquidity problem (caused by insufficiently elastic supplies of gold and foreign exchange reserves), the confidence problem (caused by central banks' wholesale liquidation of foreign exchange), and the failure of international cooperation in support of currencies in distress (Eichengreen 1990; Bordo 1993). We argue that none of these problems would have brought down the gold exchange standard in the 1930s and show that, absent the Great Depression, this assumption is reasonable.

expenditures would have been financed with inflation as actually was the case, so that the inflation rate in the United States, Britain, and other major countries would have been roughly the same as that actually observed.

After the war the United States would have moved to restore the gold standard at the prewar parity (the prewar gold price of $20.67). It would have done so because this strategy had produced relatively satisfactory results after World War I. It would have been joined by the major continental European countries, since their experience with the interwar gold standard, to which they had returned (at devalued parities) following the inflation of the early 1920s, would have been broadly satisfactory in the absence of the depression.[8]

The distribution of the monetary gold stock would have been similar to what it was; the United States would have held the lion's share. While the increase in U.S. gold holdings that resulted from the 1933–34 devaluation of the dollar would not have occurred, there still would have been gold flows to the United States as a result of political uncertainty in Europe.[9] And even if the European Allies had retained more gold in 1939, they would have used more of it to purchase war matériel from the United States following the outbreak of hostilities. The implication is that the dollar shortage that plagued postwar Europe would have been little different in the absence of the Great Depression.[10] The Marshall Plan and other postwar aid still would have been needed.

Assuming that resumption would have occurred in the first half of the 1950s with the U.S. price of gold at $20.67 and other currencies realigned as they were with respect to the dollar, countries other than the United States would have had to deflate in order to acquire the reserves needed to restore convertibility. Given the lessons learned from the 1920–21 deflation, there is reason to think that there would have been resistance to a very radical deflation like

8. Of the major countries, only Britain might have dissented. Although the 1931 devaluation of sterling would not have occurred under our counterfactual, the high unemployment of the 1920s would. We assume that unemployment would have persisted at approximately the same rate in the 1930s. Combined with the loss of reserves and the obligations to the United States and the Commonwealth incurred during World War II, this would have led Britain to resist returning to the gold exchange standard at the prewar parity a second time. Instead, Britain would have devalued the pound to approximately its 1949 level. An alternative assumption is that Britain would have floated the pound in response to these difficulties. Against it one might argue that British policymakers were unwilling to countenance floating after World War II (the possibility was rejected in the context of the ROBOT Plan in 1952) and that they would have been even less willing to contemplate such radical measures absent the experience of the Great Depression. On the other hand, one might conjecture that absent the perceived problems with floating exchange rates in the 1930s, policymakers would have been more willing to toy with the idea of floating after World War II. Our own view is that contemporary perceptions of the operation of floating exchange rates in the 1930s were heavily conditioned by the instability and unsatisfactory performance of floating in the first half of the 1920s (Eichengreen 1992). The interlude of floating in the early 1920s would still have occurred under our counterfactual; hence, we assume that there would have been a continued aversion to floating after World War II.

9. Romer (1993) ascribes the largest part of the gold and capital flows from Europe to the United States in the second half of the 1930s to politically motivated capital flight.

10. For a sampling of writings on the dollar shortage, see Balogh (1946), Williams (1952), and MacDougall (1957).

that of 1920–21. The 1920–21 deflation had caused severe dislocations: with the decline of wage indexation in Britain (the "sliding scale agreements"—see Thomas 1994) and, more generally, the increasingly structured nature of labor markets after World War II, a repeat of that experience would have given rise to even higher levels of unemployment, something that powerful trade unions would have been unwilling to accept.[11] The only way the system could then have been resurrected would have been for the United States to provide sufficient liquidity to enable the European countries to restore convertibility at the somewhat higher level that prices had scaled.[12]

In this case and assuming that actual and counterfactual world money supplies were the same, the United States would have had to transfer $26 billion to its trading partners, almost double what it provided under the Marshall Plan, to permit the gold exchange standard to be reestablished in the early 1950s. This might seem like a pipe dream, given the opposition that existed in the U.S. Congress to the Marshall Plan, but if we add to Marshall Plan transfers the Anglo-American loan of 1945 and the U.S. quota in the International Monetary Fund (since we will argue that this last institution would not have existed in the absence of the Great Depression), we get a total that equals the liquidity required to restart the global gold exchange standard in the early 1950s. Given the imperatives of the cold war, which would have remained under our counterfactual, a transfer of this magnitude is not implausible.[13]

12.2 Implications of the Counterfactual

Assuming that the major countries all resumed current and capital account convertibility in the early 1950s and that other significant provisions of the gold exchange standard were maintained, the post–World War II international monetary system would have differed from that which actually prevailed in four important respects.

12.2.1 The Bretton Woods Institutions

It follows from our counterfactual that the Bretton Woods Conference would not have been convened. Most of the problems of concern to its participants would not have arisen in the absence of the depression: these include bilater-

11. Eichengreen (1992, chap. 3) discusses the macroeconomic effects of the 1920–21 deflation. Bayoumi and Eichengreen (1996) discuss the literature, suggesting a decline in wage and price flexibility after World War II.

12. Eichengreen (1993) concludes that this transfer was not necessary because it assumes the maintenance of capital controls, which limited the impact of shocks on the balance of payments and hence the need for reserves.

13. This, of course, is only one of several more or less equally plausible assumptions. Readers for whom this stretches credulity will want to refer to model D below, where we undertake a sensitivity analysis of this assumption, assuming that the world instead initiated a radical deflation after World War II, implying that the post–World War II world started off with a money supply some 45 percent below the actual, obviating the need to increase the magnitude of the Marshall Plan to get the gold exchange standard restarted.

alism, exchange controls, competitive devaluations, destabilizing speculation, hot money flows, and the international transmission of deflation.

There would thus have been no International Monetary Fund (IMF) to provide surveillance and conditional assistance and to supplement other sources of international reserves. Cooperation and policy coordination would been arranged directly among the major powers as in the 1920s. Governments would have found it difficult to resort to parity changes in the event of balance-of-payments problems, as authorized by the IMF Articles of Agreement in the event of fundamental disequilibrium.[14] And there would have existed no systemwide controls on capital flows. This would have made it more difficult for countries to follow independent monetary and fiscal policies.

12.2.2 The Supply and Demand for Reserves

Because post–World War II central banks would have been bound by national convertibility statutes, which required them to back their liabilities with gold and (often, limited amounts of) foreign exchange, gold would have been a more important component of international reserves than under Bretton Woods. The world demand for monetary gold would have been greater than was the case in fact. But the supply would have been different too. Gold production would have been less between 1929 and 1933 because, with less deflation, the relative price of gold would have been lower, and the new flow supply would have been less.[15] Production would have risen at best slowly in the 1930s, as it had in the 1920s, reflecting improvements in mining technology. It would have fallen during World War II, as it did in the latter stages of World War I, reflecting paper-money–induced inflation and governments' efforts to limit exchange rate fluctuations.[16] These changes would have reduced the world monetary gold stock in the postwar period below what it actually was.

As a result, there would have been an even greater demand for foreign exchange to supplement gold as international reserves. Most of that additional

14. In contrast, this practice was uncommon under the gold exchange standard of the 1920s. Eichengreen (1995) discusses why this "escape clause" provision, which had also been invoked (in the form of temporary suspensions of convertibility followed by resumption at the previous rate) under the pre–World War I gold standard (see Bordo and Kydland 1995) had become increasingly difficult to invoke under the reconstructed gold standard of the 1920s.

15. Production also would have been less after 1933 because the United States would not have raised the nominal gold price from $20.67 to $35.00 per ounce.

16. Fiat money inflation would normally be expected to raise the nominal price of gold and the prices of other commodities commensurately, with no implications for the real price of gold. During World War I, however, European governments sought to peg their currencies to gold and the dollar at only slightly depreciated rates; they prevented the price of gold from rising at the same rate as other commodity prices, eroding the incentive to devote resources to its production. And the United States maintained the $20.67 peg through the war (with the exception of the gold embargo of 1917–19). Our assumption is that broadly similar policies would have been pursued during World War II, especially since the United States never abandoned the $35.00 per ounce peg and the Tripartite Agreement of 1936 attempted to stabilize the franc and the pound. In addition, in the face of less deflation, the nonmonetary gold stock would have increased relative to the monetary gold stock in the 1930s and more so during the World War II inflation.

demand would have been met by dollars rather than sterling, since Britain's post–World War II economic difficulties would not have been any less severe and governments would have been reluctant to hold the currency of a country in dire straits. The stock of dollars held as official foreign balances would have grown more quickly than was actually the case.[17] This would have pushed the world toward a dollar standard in which the United States as center country held gold as its reserves and the rest of the world held dollars. For political reasons, however, a number of countries would have resisted giving up their gold reserves and going onto a dollar standard. They would have likely precipitated its collapse even sooner than was actually the case.[18]

12.2.3 The Capacity for Adjustment and Intervention

The reconstructed gold exchange standard would have been free of restrictions on capital movements, as had been the case before World War I and in the 1920s.[19] Countries therefore would have faced an even tougher balance-of-payments constraint than under Bretton Woods. Sterilized intervention would have been the only instrument available for insulating economies from the policies required for the maintenance of external balance. The same evidence that suggests that sterilized intervention has offered governments only limited room for maneuver in the high–capital-mobility environment of recent decades suggests that this would have been true after World War II under our counterfactual.[20]

Under Bretton Woods, countries could alter parities in response to a fundamental disequilibrium. In the counterfactual this is no longer the case. The only channel of adjustment for deficit countries (other than breaking the link to gold) would have been deflation and, in the face of sticky wages and prices,

17. This assumes that countries had been able to acquire these balances at the desired rate. As explained above, this would have required that the Marshall Plan transfer to the European countries to have been larger than the $13 billion granted.

18. Had the price of gold been increased after World War II, as was suggested in the 1960s by Jacques Rueff, among others, then the pressure would have been less and the ultimate collapse would have been later. But we think that there were good reasons why schemes to adjust the domestic price of gold under a gold-exchange-standard–like system were problematic. An alternative point of view (advocated by, inter alia, Meltzer 1991 and McKinnon 1969) is that had the United States continued to follow stable money policies, the rest of the world would have been willing to continue to use dollars as international reserves instead of gold. The gold exchange standard would have evolved into the kind of dollar standard advocated in the Bretton Woods era by McKinnon and others. We argue below, however, that historical factors grounded in countries' earlier experiences with the operation of the gold standard rendered this outcome unlikely.

19. In addition, the IMF would not have been present to advance liquidity to countries facing balance-of-payments difficulties, as already noted.

20. Evidence for the interwar period based on offset coefficients (Kwiecinska-Kalita 1996) similarly suggests that most countries (other than the United States) had very little leeway for independent monetary policy action. The evidence for the Bretton Woods period, when capital controls were pervasive, stands in contrast: Kouri and Porter (1974) and Obstfeld (1982), among others, demonstrate a role for sterilized intervention for the major European countries. Pasula (1994, 1996), in contrast, finds that the offset to monetary policy under Bretton Woods was complete.

depression. This would have created pressure to break with gold in favor of greater exchange rate flexibility.

12.2.4 The Efficiency of Resource Allocation

Absent the capital controls of the Bretton Woods system, the reintegration of world capital markets would have occurred more rapidly. Resource allocation would have been better, accelerating growth and convergence in countries that started the postwar period with real incomes below that of the United States.

How much faster convergence would have been and what countries would have benefited is unclear, however. Abramovitz (1989) and Wolf (1995) show that there was already rapid convergence among the high-income countries, notwithstanding low levels of international capital mobility. It could be that other channels, including international trade and technology transfer, transmitted to the members of the "convergence club" the main gains from openness. At the same time, Saint-Paul (1995) suggests that Europe and Japan would have grown even faster had international financial liberalization allowed them to more quickly augment their capital stocks. Sachs and Warner (1995), on the other hand, can be read as suggesting that the main benefits from financial liberalization would have accrued not to the high-income countries that were already members of the convergence club but to low-income developing countries less able to import expertise through other channels.

12.3 The Gold Exchange Standard, 1925–60

In this section we develop a model of the gold exchange standard on the assumption that, rather than collapsing during the Great Depression, it continued operating until the outbreak of World War II and was reestablished following the conclusion of hostilities.

We extend a generic model of the gold standard to incorporate some special features of interwar monetary arrangements. In calibration we use data for a composite of 21 countries that account for 75 percent of the world monetary gold stock and a comparable share of economic activity in 1928.

12.3.1 The Model

A simulation model of the global gold standard was developed by Bordo and Ellson (1985), building on the theoretical model in Barro (1979). The model contains a money market and a gold market. The former determines the world price level, given the world monetary gold stock determined in the latter. The gold market takes the price of gold as fixed by the authorities and, given the price level from the money market, determines the real price of gold and the world monetary gold stock.

Equation (1) is the money supply:

$$M^s = \lambda P_G G_M , \tag{1}$$

where M^s is the world money supply in dollars, λ is the money-gold multiplier (the ratio of currency plus deposits to the monetary gold stock), P_G is the fixed nominal price of an ounce of gold, and G_M is the world monetary gold stock (in ounces).

Equations (2a) and (2b) are two variants of the income velocity of circulation. Equation (2a) assumes that velocity is a logarithmic function of the nominal interest rate:[21]

$$V = \bar{V} i^{\alpha} . \tag{2a}$$

Equation (2b), following Bordo and Jonung (1987), takes trend velocity as a function of institutional factors that evolve at a rate μ:

$$V = \bar{V} e^{\mu t} . \tag{2b}$$

The nominal interest rate is

$$i = r + \pi , \tag{3}$$

where r is the real rate of interest and π is the expected rate of change of the price level. Following Mundell (1970) the real interest rate depends negatively on expected inflation:

$$r = \bar{r} - a\pi . \tag{4}$$

We assume perfect foresight so that actual and expected inflation are equal:[22]

$$\pi = (P_t - P_{t-1})/P_{t-1} . \tag{5}$$

Money market equilibrium requires

$$P = \lambda V P_G G_M / y . \tag{6}$$

Given λ, P_G, perfect foresight, and an exogenous level of output, y, the price level is determined by the monetary gold stock.

Equations (7) to (9) determine the gold market equilibrium and, together with equations (1) to (6), the money supply and the price level. Gold production is characterized by increasing costs; the supply of new gold is

$$g = \bar{g} P_g^{\beta} e^{\gamma t}, \tag{7}$$

21. We depart from Barro (1979), who assumes a constant real interest rate and makes the demand for money a function of the expected rate of change in the price level. But following Barro, eqs. (2a) and (2b) assume the real income and price elasticities of real money demand to be one.

22. Bordo and Ellson (1985) also use an adaptive expectations scheme. In their simulations, the adjustment path of the model differed under the two schemes but the long-run equilibrium values of the endogenous variables are of course unaffected.

where g is gold production, P_g is the real price of gold (P_G/P), and γ is the exogenous rate of technological progress in the mining industry.[23] The flow demand for nonmonetary gold is

$$\dot{G}_N = (\varepsilon + \delta)(G_N^* - G_N), \tag{8}$$

where $\dot{G}_N$ is the net change in the nonmonetary gold stock, G_N^* is the target stock of nonmonetary gold, and G_N is the actual stock. G_N^* is defined as

$$G_N^* = \bar{G}_N P_g^{-\theta} y^{\eta} i^{-\phi},$$

ε is a partial adjustment factor, and δ is the depreciation rate or normal replacement flow.

Since the monetary authorities maintain a fixed price of gold, the change in the monetary gold stock is

$$\dot{G}_M = g - \dot{G}_N, \tag{9}$$

where $\dot{G}_M$ is the net change in the monetary gold stock. Taking logs, and solving equations (1) to (9) simultaneously, steady state solutions in terms of growth rates are

$$\dot{P} = \dot{G}_M = \dot{G}_N = 0.$$

This implies $g = g_N^*$: that, in equilibrium, gold production equals the depreciation rate multiplied by the desired nonmonetary gold stock.[24]

12.3.2 Incorporating the Gold Exchange Standard

A key difference between the gold standard and the gold exchange standard is λ, the money-gold multiplier. After World War I, most nations adopted a form of gold exchange standard in which foreign bonds and bills of exchange supplemented monetary gold stocks. To capture this feature of the gold exchange standard, we decompose λ into the ratio of broad money to high-powered money (M/H), the ratio of high-powered money to gold and foreign exchange reserves (H/R), and the ratio of international reserves to gold (R/G) (Bernanke 1995). M/H depends on the development of the banking system, while H/R is determined by sterilization policies and by the laws specifying gold backing for liabilities; in the United States, for example, the Federal Reserve before 1945 had a gold cover requirement of 40 percent against notes and 35 percent against deposits, which implied a minimum value for H/R of

23. Barro does not account for technological progress but discusses the implications of incorporating it. We assume that technological progress is exogenous. In fact, there is evidence that major technological changes in the gold industry were both induced and exogenous (Rockoff 1984).

24. While Bordo and Ellson (1985) account for the fact that gold is a durable exhaustible resource, we eliminate this aspect of the model to simplify the analysis. Our hypothetical gold standard will exhibit less deflation than if we accounted for depletion.

2.63. *R/G* reflects the substitution of foreign exchange for gold. For the center countries of the interwar gold standard, the United States and the United Kingdom, $R/G = 1$. The same is true of the United States after World War II.

Figure 12.1*A* shows the evolution of the three ratios from 1925 for our aggregate of 21 countries.[25] *M/H* is stable prior to the onset of the depression, when it declines in response to the global banking crisis. *H/R* begins falling with the establishment of the gold exchange standard in 1925, reflecting sterilization policies in the United States and France. *R/G* rises up to the onset of the depression, reflecting the substitution of foreign exchange for gold by participating countries. It then declines as the participants, fearing speculative attacks on the reserve currencies, converted their foreign exchange to gold.

The multiplier λ can be broken into two components:

$$\lambda(1) = \frac{M}{R} = \frac{M}{H}\frac{H}{R}$$

and

$$\lambda(2) = \frac{R}{G}.$$

12.3.3 The Distribution of Gold

The adequacy of the global supply of monetary gold and its distribution between deficit and surplus countries dominated discussions of the interwar gold exchange standard and the Bretton Woods system. The first concern is readily addressed using our model, while addressing the second requires us to specify one further relationship.

We assume that the demand for reserves by the center country(ies) and the rest of the world depends on levels of economic activity, a measure of the opportunity cost of holding reserves, and factors such as their openness (see Eichengreen 1990). The center country(ies) holds only gold reserves, while the rest of the world holds both gold and foreign exchange, with the breakdown between the two determined by the return on short-term foreign assets and legal gold cover requirements. We assume that the center country's share of total reserves (and of the world monetary gold stock) paralleled the evolution of the share of its output in the world's total.

12.3.4 Simulating the Model

Table 12.1 lists the parameters used in the simulation.[26] Table 12.2 shows the initial values and data definitions. We developed world aggregates for the endogenous variables (money supply, monetary base, international reserves,

25. Complete data for our 21 countries are not available after 1935.

26. The elasticities in the gold market equations are derived from regression estimates using data for the period 1880–1928. In the sensitivity analysis reported below we also used elasticities estimated in the *U.S. Gold Commission Report* (1982) using post–World War II data.

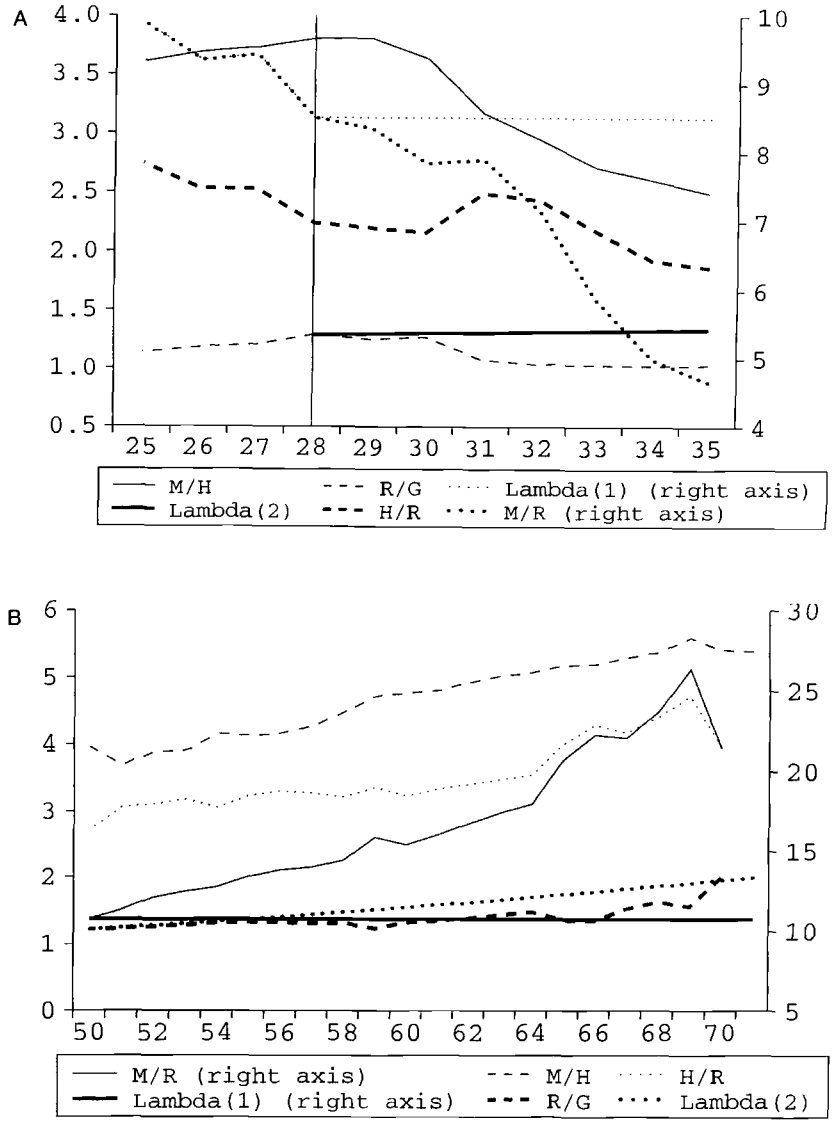

Fig. 12.1 Ratios for the world, 1925–35 (*A*) and 1950–51 (*B*)

Note: International reserves and gold reserves have been adjusted to take out the IMF, as described in the text.

Table 12.1 Parameters of the Simulated Models

A. 1928–38	B. 1950–71	C. Gold Commission Elasticities
$\overline{V} = 2.26$	$\overline{V} = 1.65$	$\beta = 0.6$
$a = 0.25$	$a = 0.25$	$\gamma = 0.03$
$\overline{g} = 3.31$	$\overline{g} = 5.04$	$\theta = 1.2$
$\alpha = 0.5$	$\alpha = 0.5$	$\eta = 1.0$
$\beta = 0.6$	$\beta = 0.6$	$\phi = 0.1$
$\overline{G}_N = 0.08$	$\overline{G}_N = 0.04$	
$\theta = 0.3$	$\theta = 0.3$	
$\eta = 0.7$	$\eta = 0.7$	
$\kappa = (\eta_y^R - \eta_y^G)\,\dot{y} = 0.133*0.0394$	$\kappa = (\eta_y^R - \eta_y^G)\,\dot{y} = 0.55*0.0428$	
$\lambda(1) = (M/R)_{1928} = 8.5$	$\lambda(1) = (M/R)_{1950} = 10.7$	
$\lambda(2) = (R/G)_{1928}e^{\kappa t}$; $(R/G)_{1928} = 1.3$	$\lambda(2) = (R/G)_{1950}e^{\kappa t}$; $(R/G)_{1950} = 1.2$	
$\phi = 0.03$	$\phi = 0.03$	
$\overline{r} = 0.045$	$\overline{r} = 0.0145$	
$\mu = -0.026$	$\mu = 0.00285$	
$\gamma = 0.018$	$\gamma = 0.018$	
$\varepsilon = 0.5$	$\varepsilon = 0.5$	
$\delta = 0.01$	$\delta = 0.01$	

Source: Panel C from *U.S. Gold Commission Report* (1982).

gold reserves, price level, real income) based on data for the 21 countries considered in Bordo and Schwartz (1996).[27] These 21 countries account for roughly 75 percent of the world monetary gold stock before World War II and 85 percent thereafter, and for the vast majority of world economic activity.[28]

We construct $\lambda(1)$ and $\lambda(2)$ assuming that the shares of the 21 countries in world gold and international reserves remained constant after two benchmark years (1928 and 1950) for which world data are available.[29] This allows us to connect the data for our 21 countries to the world gold market totals in the *U.S. Gold Commission Report* (1982).[30]

We simulate the model over the period 1929–38 on the assumption that the

27. The countries are United States, United Kingdom, France, Germany, Japan, Italy, Canada, Netherlands, Belgium, Sweden, Norway, Denmark, Finland, Portugal, Spain, Switzerland, Greece, Australia, Argentina, Brazil, and Chile.

28. For the postwar period, we dropped the three Latin American countries from the sample because they followed unstable monetary and exchange rate policies atypical of the Bretton Woods experience and no longer played a significant role in the international monetary system.

29. Whenever we refer to 21 countries, we should be understood as meaning 18 countries (excluding the three Latin Americans) after World War II. We also adjusted the world monetary gold stock series taken from League of Nations (1931), which ends in 1931, to the series world central bank gold reserves from the *U.S. Gold Commission Report* (1982), which extends from 1913 to 1980. The two series became virtually identical after the United States nationalized private gold holdings in 1934.

30. We used U.S. interest rates as representative of the world and assumed U.S. total factor productivity growth (γ) as representative of technological progress in world gold production.

Table 12.2 **Initial Values and Definitions of Variables**

Initial Value	Definition
	A. 1928–38
$P_G = 20$	Price of gold; dollars per ounce.
$P = 1$	World price index: weighted sum of 21 countries' GNP deflators 1928 = 1, weights = shares of each country's GNP in total GNP in current dollars.
$y = 191$	World output; billion dollars. Sum of 21 countries' real GNP in current dollars, it is assumed to grow at approximately 3.9 percent, the growth rate in 1921–28.
$M^S = 85$	Money supply; billion dollars. M2 definition (currency plus total deposits), sum of 21 countries in current dollars.
$H = 23$	High-powered money (currency plus reserves): sum of 21 countries in current dollars.
$R = 10$	International reserves (central bank gold reserves plus foreign exchange reserves): sum of 21 countries in current dollars.
$G_R = 7.7$	Central bank gold reserves: sum of 21 countries in current dollars.
$G_M = 535$	World monetary gold stock; millions of ounces.
$G_N = 489$	World nonmonetary gold stock; millions of ounces.
$g = 20$	World gold production first period; millions of ounces.
$V = 2.26$	World velocity in 1928.
$i = 0.045$	U.S. nominal interest rate in 1928 (short-term commercial paper rate).
	B. 1950–71 (1953–71)
$P_G = 20$ (20)	Fixed price of gold; dollars per ounce.
$P = 1.51$ (1.61)	World price index: weighted sum of 18 countries' GNP deflators 1928 = 1, weights = shares of each country's GNP in total GNP in current dollars.
$y = 276$ (351)	World output; billion dollars. Sum of 18 countries' real GNP in current dollars, it is assumed to grow at approximately 4.3 percent, the growth rate in 1950–71.
$M^S = 254$ (317)	Money supply; billion dollars. M2 definition (currency plus total deposits), sum of 18 countries in current dollars.
$H = 64$ (81)	High-powered money (currency plus reserves): sum of 18 countries in current dollars.
$R = 24$ (25)	International reserves (central bank gold reserves valued at $20 per ounce plus foreign exchange reserves less reserve position in IMF plus IMF quota), sum of 18 countries in current dollars.
$G_R = 19$ (20)	Central bank gold reserves plus IMF quota: sum of 21 countries in current dollars.
$G_M = 917$ (928)	World monetary gold stock; millions of ounces.
$G_N = 566$ (605)	World nonmonetary gold stock; millions of ounces.
$g = 24$ (24)	World gold production first period; millions of ounces.
$V = 1.65$ (1.87)	World velocity in 1950.
$i = 0.0145$ (0.0252)	U.S. nominal interest rate in 1950 (short-term commercial paper rate).

arrangements in place in the second half of the 1920s were not interrupted by the depression. We assume that the system was then suspended with the onset of World War II (as it had been following the outbreak of World War I).

In the period 1939–49, we treat the world as on a fiat monetary standard—that is, as if central banks closed their gold windows. Our first counterfactual

Table 12.3 Assumptions behind the Simulated Models

Model	Assumptions
Model A: benchmark	1. Constant velocity at average level of 1921–28 for interwar simulation; 1950 level for postwar simulation 2. Ratio of world money supply to international reserves ($\lambda(1)$) fixed at 1928 level for interwar simulation; 1950 level for postwar simulation 3. Ratio of international reserves to gold ($\lambda(2)$), a function of the difference between the income elasticities of demand for total international reserves and the demand for gold reserves (0.133 interwar; 0.55 postwar) times the trend growth rate of world real income (3.9 percent interwar; 4.4 percent postwar) 4. Gold market elasticities (β, θ, η, ϕ), based on regressions for the period 1880–1928 5. Real output and total factor productivity grows at the 1921–28 rate for interwar simulation; 1950–71 rate for postwar simulation
Model B: Velocity trends	Same as model A except velocity declines at 1921–28 trend in the interwar period (−2.6 percent) and rises at the 1950–71 trend in the postwar period (0.3 percent).
Model C: Velocity as function of nominal interest rate	Same as model A except velocity varies with simulated interwar and postwar trends in nominal interest rates.
Model D: Post–World War II resumption similar to post–World War I	Same as model A except money supply and price level start at much lower levels in 1950.
Model E: Sensitivity analysis of model A using postwar gold market elasticities	Same as model A except for the use of postwar elasticities (β, θ, η, ϕ) in the gold production and nonmonetary demand for gold equations.
Model F: Sensitivity analysis of model A with the postwar gold exchange standard	Same as model A except post–World War II resumption occurs in 1953 after the Marshall Plan.

reinstates the gold exchange standard in 1950 with the U.S. price of gold at $20.67 and other currencies realigned as they were vis-à-vis the dollar.[31]

Table 12.3 presents the assumptions underlying the simulations described below. Results are summarized in table 12.4.

Model A is the simplest variant of the model; it fixes velocity at its 1928 level and allows output and total factor productivity to continue growing at their 1921–28 rates. The multiplier $\lambda(1)$, the ratio of world money supply to international reserves, is fixed at its 1928 level (see fig. 12.1*A*). This assumes that neither the United States nor France followed the restrictive monetary pol-

31. We choose 1950 to allow for reconstruction and the reestablishment of prewar financial relationships, and because the major devaluation of sterling and 23 other currencies in 1949, most authorities believe, reestablished the pre–World War II parities. In a simulation reported below we also tried 1953 as the starting period.

Table 12.4 **Annual Growth Rates of Different Variables (actual values and simulated values)**

Period and Variable	Actual	Model					
		A	B	C	D	E	F
1928–38							
P	−1.0	−1.3	−3.3	−2.3	−1.3	−1.3	−1.3
M	−3.7	2.6	3.2	2.9	2.6	2.6	2.6
MGS	2.8	2.1	2.7	2.4	2.1	2.0	2.0
NMGS	1.8	2.0	1.5	1.8	2.0	2.0	2.0
WGS	2.4	2.0	2.2	2.1	2.0	2.0	2.0
g	7.0	2.6	3.8	3.2	2.6	2.6	2.6
i	−22.0	−2.6	−3.4	−3.5	−2.6	−2.1	−2.1
1939–49							
P	5.9	5.9	5.9	5.9	1.1	5.9	5.9
M	–	–	–	–	–	–	–
MGS	2.7	2.7	2.7	2.7	2.7	2.7	2.2
NMGS	0.7	−0.3	0.0	−0.1	−0.0	−0.3	0.4
WGS	1.9	1.4	1.6	1.5	1.5	1.4	1.4
g	−5.2	−1.6	−1.6	−1.6	1.3	−1.6	−1.6
i	6.8	6.8	6.8	6.8	6.8	6.8	6.8
1950–71[a]							
P	2.9	−0.8	−0.5	−0.9	−0.3	−1.0	−1.0
M	7.1	3.4	3.5	3.7	4.0	3.3	3.2
MGS	0.9	1.1	1.2	1.4	1.6	0.9	0.9
NMGS	3.2	2.6	2.7	2.6	2.8	3.0	2.8
WGS	1.9	1.7	1.8	1.9	2.1	1.8	1.7
g	3.4	2.3	2.1	2.8	2.0	2.8	2.8
i	6.4	−2.1	−2.0	−1.0	−1.8	−1.8	−1.2

Note: P = price level, M = money supply, MGS = monetary gold stock, NMGS = nonmonetary gold stock, WGS = world gold stock, g = production, and i = interest rate.

[a]Model F is simulated for 1953–71 (see text).

icies that led them to accumulate a growing share of global gold reserves and plunged the world economy into the depression.

We assume that the ratio of reserves to gold evolved as a function of the difference between the income elasticities of the demand for total international reserves and the demand for gold reserves (equal to 0.133) multiplied by the trend rate of growth of world real income, that is,

$$\lambda(2) = \left(\frac{R}{G}\right)_{1928} e^{\kappa t}, \quad \text{where } \kappa = (\eta_y^R - \eta_y^G)\,\dot{y}$$

(see fig. 12.1*A*).[32] Based on initial values for the 21-country aggregate, we simulate the model to obtain the money supply, price level, gold production,

32. These elasticities were estimated from cross-sectional regressions using data for 24 countries in 1929 in Eichengreen (1990). The sample includes most of the 21 countries included in our

world total gold stock, world nonmonetary gold stock, world monetary gold stock, and interest rates shown in figures 12.2*A*–12.2*F*.

For 1939–49, the money supply process is determined not by gold supplies but by the exigencies of war finance. We take prices as exogenous and assume that they followed the actual pattern of U.S. inflation.[33] World gold production depends on the real price of gold, which is driven by U.S. price-level movements and productivity in the mining industry.

For the postwar period we fix velocity and $\lambda(1)$ at their 1950 levels (Fig. 12.1*B*)and allow world output and U.S. total factor productivity to grow at their 1950–71 rates. The multiplier $\lambda(2)$, which depends on the difference between the income elasticities of demand for reserves and gold in the interwar years, turns out to be too low to provide an equilibrium solution to the model, given higher postwar growth rates. We experimented with different values for the difference in these elasticities before settling on 0.55 as the benchmark case.[34] (See fig. 12.1*B*.)

We start our simulations in 1950 using the hypothetical world monetary gold stock but actual international reserves, money supplies, prices, and output. This assumes that the gold exchange standard was restored without a radical postwar deflation like that of the 1920s.

Given a hypothetical monetary gold stock of $21 billion and actual reserves of $61 billion, foreign exchange reserves would have had to be $13 billion larger than the actual value of $27 billion in 1950. The United States would have had to double its Marshall Plan transfer of $13 billion to get the gold exchange standard restarted.[35]

12.3.5 Simulation Results

Gold production increases in our simulation by less than it actually did in the 1930s (fig. 12.2*A*). This is because the model generates less deflation in the

world aggregate. By using the estimates for 1929 we are therefore eliminating from our counterfactual scenario the effects of the contractionary shift from gold to foreign exchange undertaken by the Bank of France during the depression.

33. Adequate data for our 21-country aggregate are not available for the period of the war. We add simulated gold production to the 1938 simulated world gold stock and adjust for depreciation to obtain a new hypothetical stock. We assume that the world monetary gold stock increased from its hypothetical 1938 level following the actual 1939–50 trend. Given the monetary gold stock we then derive the nonmonetary gold stock.

34. The difference between the income elasticities of reserves and gold based on simple ordinary least squares regressions over the 1950–71 period was 0.47.

35. As we note above, one can imagine that the $8.8 billion of gold that member countries transferred to the IMF could have been used for other purposes, reducing the increase in Marshall aid to slightly more than $4 billion. The Anglo-American loan of 1945 of $3.75 billion by the United States and $1.5 billion by Canada as well as U.S. loans to France and Germany together could have made up the difference. Interestingly, the sum of the Marshall Plan transfer plus the hypothetical transfer that is required to restart the gold exchange standard in our scenario just equals the $26 billion that Keynes advocated as necessary to start the International Clearing Union. Below, we undertake some sensitivity analyses, varying this assumption to see how much difference is made by different degrees of postwar deflation.

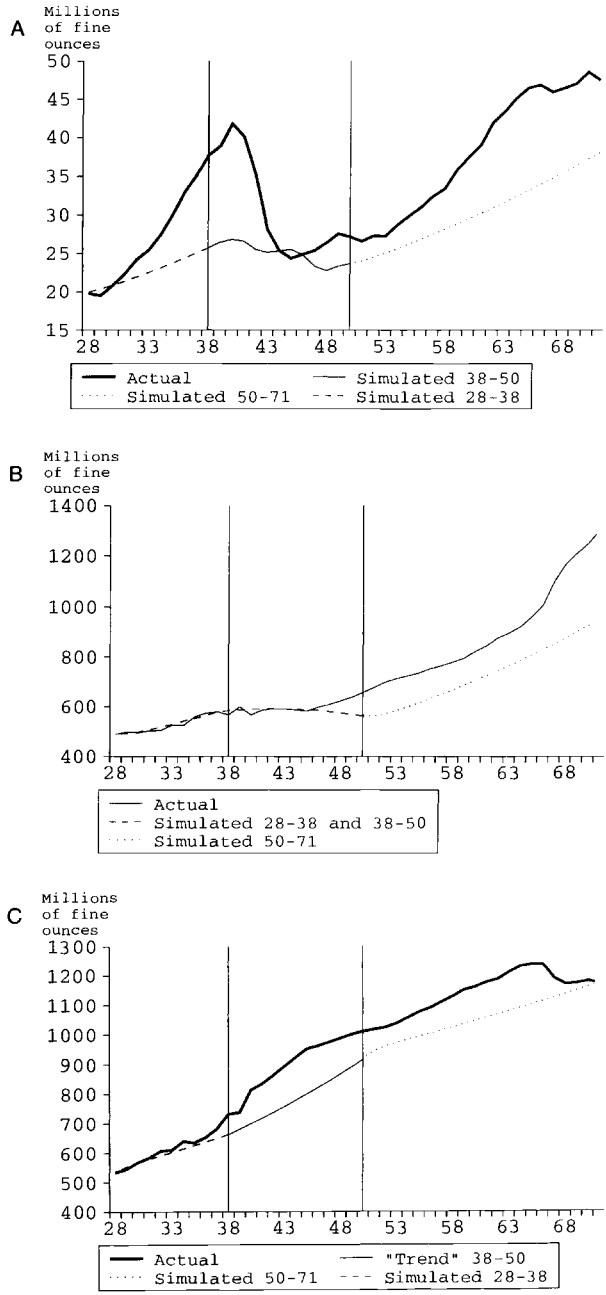

Fig. 12.2 Model A: *A*, world gold production; *B*, nonmonetary gold stock; *C*, monetary gold stock

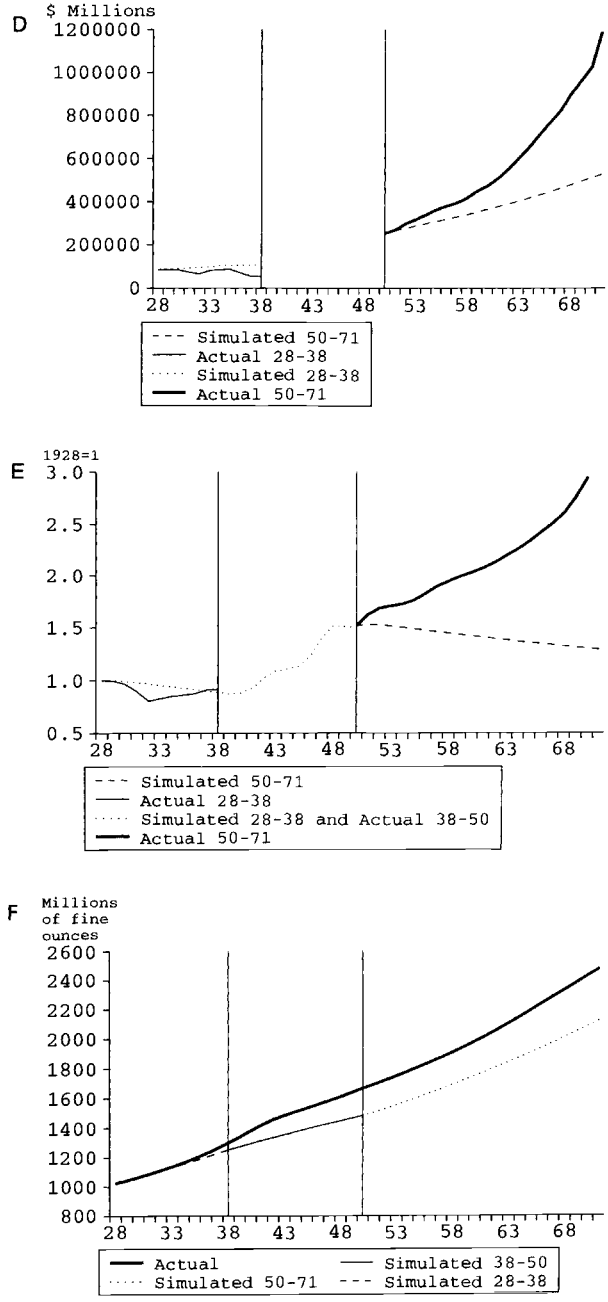

Fig. 12.2 (cont.) ***D*****, actual and simulated money supply;** ***E*****, actual and simulated prices;** ***F*****, total world gold stock**

absence of the depression and because without the 1933 devaluation of the dollar the United States would not have raised the nominal price of gold. The nonmonetary gold stock grows faster, reflecting the fact that gold is cheaper relative to other commodities in the absence of deflation (see fig. 12.2*B*); the world monetary gold stock therefore grows more slowly (fig. 12.2*C*). M2 rises instead of falling as it did during the depression (fig. 12.2*D*), and the price level (fig. 12.2*E*) declines at an annual rate of 1.3 percent (in contrast to the sharp deflation and rebound that actually occurred—see table 12.4).

Gold production during World War II is below actual levels because the gold price is lower in the absence of dollar devaluation, reducing the world gold stock (fig. 12.2*F*). The monetary gold stock follows its actual trend but starting from the lower simulated 1938 level. The nonmonetary gold stock, derived as a residual from the total stock, is also below its historical level.

The price level evolves very differently under our hypothetical standard than under Bretton Woods. Simulated deflation is about 1 percent a year, compared to an actual annual inflation rate of 2.9 percent.[36] Though the monetary gold stock grows rapidly in the postwar simulations and money supply expands by 3.3 percent per annum, this growth is not rapid enough to offset the effect on the price level of the 4.3 percent per annum rate of output growth.

Below we summarize the results of sensitivity analyses of our model, varying assumptions on the behavior of velocity and using alternative resumption scenarios. (See tables 12.3 and 12.4 for the assumptions and results of the different scenarios.) Model B assumes that M2 velocity, rather than remaining constant, declined in the 1930s at the same 2.6 percent trend as in 1921–28 before rising at a rate of 0.3 percent per annum (as it did) from 1950 to 1971.[37] This aggravates deflation between the wars but ameliorates it after World War II.

Model C assumes that velocity is a function of the nominal interest rate (which incorporates expected inflation on the assumption of perfect foresight).[38] This produces less of a decline in velocity in the interwar period and more of a decline after World War II (see fig. 12.3). Deflation is less than in model B in the interwar period and about the same as in model A in the postwar years (see table 12.4).

Model D simulates the effects of deflating before restoring the gold standard after World War II, that is, repeating the patterns followed by the United Kingdom and other countries after World War I. We start with model A but assume

36. The tendency for deflation to reduce the nonmonetary gold stock would have been offset by the growth of real income. While deflation would have stimulated gold production, the net effect would still have been growth in the monetary gold stock at rates below the actual.

37. A justification for this assumption is that trends in velocity reflected the institutional factors documented by Bordo and Jonung (1987, 1990).

38. We use the U.S. three-month commercial paper rate to proxy for the nominal interest rate. To avoid difficulties encountered in making the model converge we initially solved model A for the price level, substituted it into eqs. (4) to (6) and then solved for velocity. We then substituted the resultant trend of velocity into model A and solved for the endogenous variables.

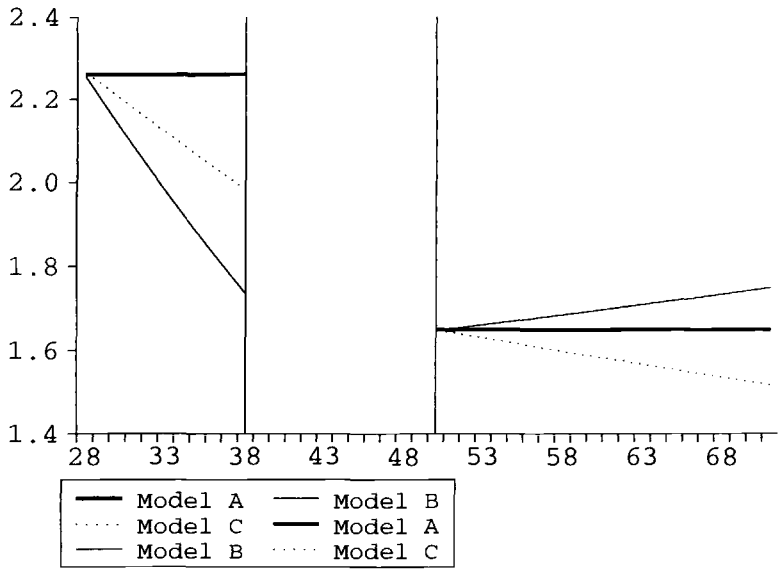

Fig. 12.3 Underlying velocity trends in models A, B, and C

that when World War II ended the United States deflated vigorously to restore the price level to its 1938 level and other countries did likewise. Rather than allowing international liquidity to increase by $13 billion by 1950, we assume that monetary authorities maintained international reserves at their actual levels in relation to gold reserves in 1950 and that money supplies were kept in the same proportion to reserves as actually prevailed. This implies a money supply 45 percent below the actual.[39]

Finally, we test for sensitivity to alternative gold market elasticities. In place of elasticities based on pre–Great Depression data, we use elasticities from the *U.S. Gold Commission Report* (1982) based on data for the postwar period. Postwar gold production and nonmonetary gold demand functions are somewhat more elastic than their prewar counterparts (see table 12.2), but simulations in model E produce patterns for the endogenous variables not that different from those in the benchmark model A (see table 12.4).[40]

39. Although money supplies and price levels start out below those of model A (fig. 12.4), the lower price level stimulates gold production and increases the nonmonetary gold stock. The net effect would have been to raise the monetary gold stock. This would have produced a path for the price level not dissimilar from that of model A.

40. This reinforces our belief in the robustness of the model. We tried some additional experiments. Instead of using the postwar gold market elasticities from the *U.S. Gold Commission Report* (1982), we estimated our own, using the 18-country data set. The elasticities and simulations were quite similar to those reported here. Second, we ran the simulations using the pre–Great Depression elasticities for the interwar period and our postwar elasticities for the postwar period. Again the model was robust. We regard the simulations based on pre–Great Depression data as closest to the spirit of our counterfactual scenario, on the grounds that, had the gold exchange standard been preserved, the structure of the gold market would not have changed dramatically.

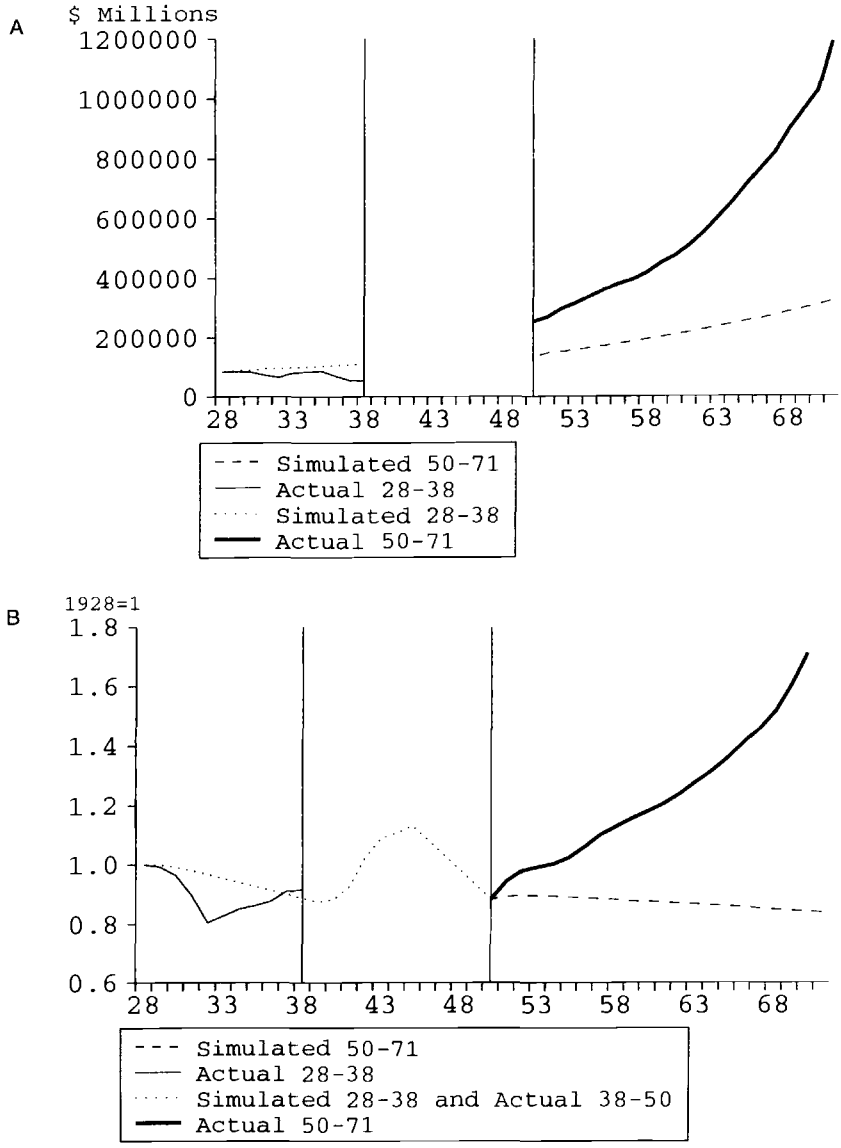

Fig. 12.4 Actual and simulated (*A*) money supply and (*B*) prices, model D

12.3.6 Viability of the Gold Exchange Standard and the Triffin Dilemma

We now address two key questions about the operation of the hypothetical gold exchange standard. We ask whether there would have existed adequate gold reserves in the 1930s and how the Triffin dilemma would have played itself out after World War II.

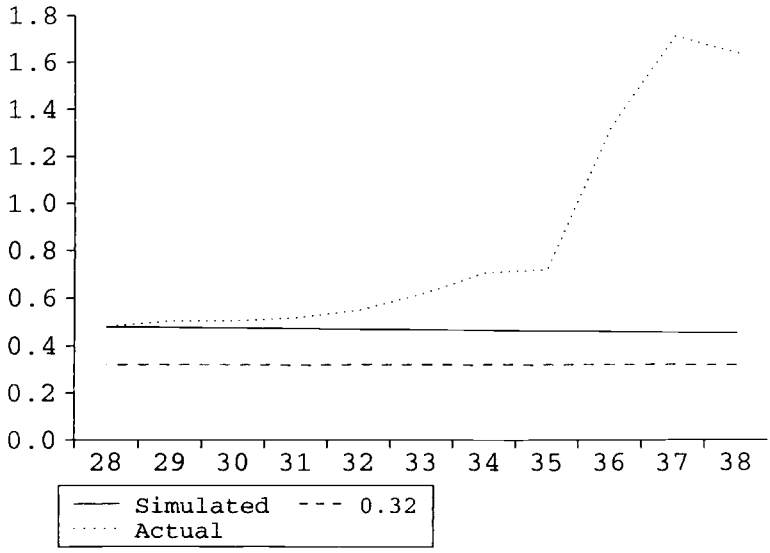

Fig. 12.5 Actual and simulated *G/H* for the world, 1928–38
Note: For 1936–38 data were available for only a limited number of countries.

The first "Interim Report of the Gold Delegation" (League of Nations 1930) devoted considerable attention to whether there would be enough gold to allow the system to operate for another decade. The league's experts warned of a gold shortage but observed that it could be ameliorated by policies to encourage governments and central banks to economize on use of precious metal.

We address this question by comparing ratios of gold reserves to the monetary base obtained from simulations with the league's estimates of the legal minimum ratio mandated by gold standard statutes.[41] Figure 12.5 plots the counterfactual reserve ratio for model A, along with the actual ratio and the minimum legal ratio of 31.7 percent. While the actual ratio rose in the 1930s (reflecting the collapse of price levels and the rise in the real price of gold), the simulated ratio declines slightly but never approaches the legal minimum before World War II. These simulations suggest that a gold shortage would not have been an insurmountable obstacle to the persistence of the system.

Even had this interwar problem been surmounted, Triffin (1947) warned that there would be insufficient gold to finance the growth of world output and trade in the postwar period. The substitution of foreign exchange, primarily dollars, for gold might postpone the problem, but as foreign dollar holdings increased

41. League of Nations (1930, annex 13, table 5, p. 96). To calculate the hypothetical ratio we multiplied the simulated ratio of the world monetary gold stock to the world money supply by the 1928 ratio of world money supply to the monetary base. This calculation is based on the assumption that in the absence of the Great Depression and its banking panics, the money supply multiplier (*M/H*) would not have declined as it did.

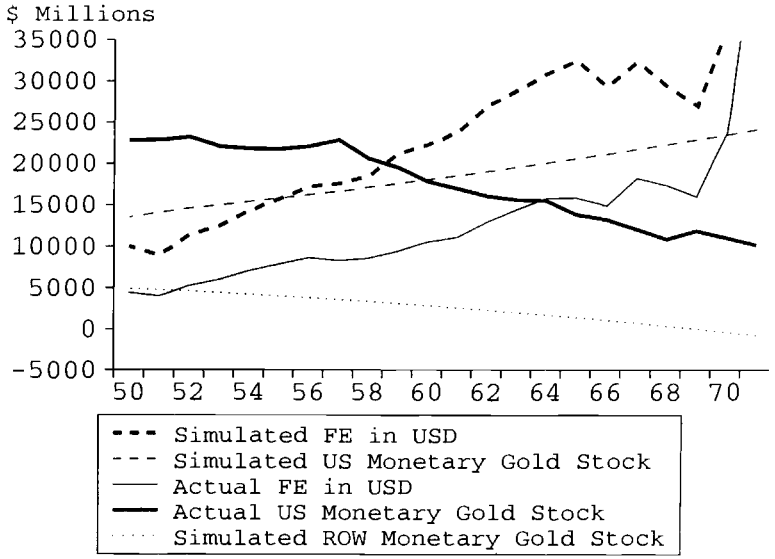

Fig. 12.6 "Triffin crisis," model A
Note: FE = foreign exchange; ROW = rest of world.

relative to the U.S. monetary gold stock, a point would be reached where the United States would be unable to satisfy demands for conversion. Official holdings of U.S. dollars did in fact surpass the U.S. monetary gold stock in 1965 (Bordo 1993, fig. 1.10), leading the U.S. government and Federal Reserve System to adopt gold-conserving policies and to support the development of special drawing rights (SDRs; effectively a form of paper gold).[42]

We can use our simulations to see whether the Triffin problem would have also arisen under the hypothetical postwar gold exchange standard. Figure 12.6, based on model A, depicts official holdings of dollars and monetary gold in the United States and the rest of the world.[43] Starting with the actual 1950 ratio of U.S. gold to total reserves, we allow this ratio to then move with the ratio of U.S. to world output.[44]

Figure 12.6 shows that the U.S. monetary gold stock, rather than declining,

42. Total foreign dollar holdings (both private and official) surpassed the U.S. monetary gold stock in 1960.

43. We derived official dollar holdings by subtracting the simulated world monetary gold stock from simulated international reserves to give us foreign exchange holdings. We then used the actual ratio of dollars to total foreign exchange to back out dollars held by the rest of the world in the form of foreign exchange. This calculation assumes that sterling would have declined as a reserve asset under the postwar gold exchange standard much as it in fact did under Bretton Woods.

44. To derive the U.S. monetary gold stock in 1950, we assumed that between 1929 and 1949 the U.S. monetary gold stock had the same share in the hypothetical world monetary gold stock as it did in fact. This presumes that the political factors that led to capital flight and gold flows in the 1930s and 1940s were the key determinants of the rising U.S. share.

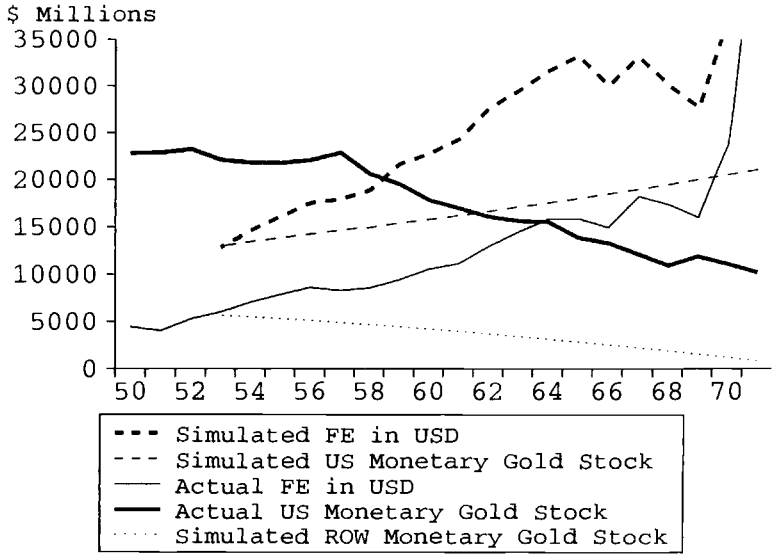

Fig. 12.7 "Triffin crisis," model F
Note: FE = foreign exchange; ROW = rest of world.

would have increased throughout the period, while the monetary gold stock of the rest of the world would have declined to zero in 1970. This result is driven by the fact that the demand for reserves increases faster than the demand for gold (that $\lambda(2) = 0.55$), together with the fact that the demand for reserves by the United States (the reserve currency country) could be satisfied only by gold. The dollar balances of the rest of the world would have exceeded the U.S. monetary gold stock in 1955, pointing to the possibility of a crisis at a relatively early date.

Model B, based on actual trends in velocity, produces similar paths for monetary gold stocks, although the levels are somewhat higher, reflecting the inheritance of a larger monetary gold stock from the interwar period (a consequence of the extra deflation produced by the falling trend in velocity). This pushes the date of the confidence crisis out to 1959. Model C, based on endogenous velocity, presents a pattern similar to model A. Model D, the post–World War I resumption scenario, reveals that dollar holdings would have surpassed the U.S. monetary gold stock in 1955, as in model A.

In our final exercise in sensitivity analysis, we posit that European countries postponed resumption until 1953 to better cope with the dollar shortage. This assumes that the inflow of Marshall aid would have sufficed at that point to provide the liquidity needed to start up the system. We label these simulations model F. Figure 12.7 shows that the world would have immediately

entered the zone in which U.S. foreign monetary liabilities exceeded U.S. gold reserves.[45]

One can imagine four possible scenarios once the world entered the "crisis zone" (in the words of Kenen 1960) where foreign holdings of dollars exceeded the U.S. monetary gold stock. First, the gold exchange standard could have unraveled into a pure gold standard, as countries unwilling to shift to a pure gold exchange standard followed deflationary policies to restore their original gold reserves. We think this scenario is implausible. Just as the decline in the share of foreign exchange in global reserves from 37 percent to 11 percent between 1928 and 1931 aggravated the interwar problem of deflation and depression, ultimately leading countries to abandon the system, it is unlikely that they would have had more stomach for a deflationary crisis in the 1950s.

Alternatively, in the face of an unraveling gold exchange standard, the major countries might have negotiated something like the Bretton Woods agreement. This would have involved creation of an institution like the IMF to provide a reserve asset as a substitute for dollars. Whether it would also have encouraged the use of capital controls and the adjustable peg is questionable. This would likely have depended on whether our hypothetical gold exchange standard, when it was operating, induced asymmetric adjustment and destabilizing capital flows as in the 1930s, or smooth adjustment and stabilizing capital movements as in the pre-1914 period. This in turn would reflect the credibility of commitment to gold convertibility. But we are skeptical that an IMF would have been established absent the events of the 1930s but present the perception of events of the 1920s—the perception that floating exchange rates led to destabilizing capital flows and the deflationary consequences of Britain's return to gold at the original parity—since in our hypothetical gold exchange standard world the perceived problems associated with a gold exchange standard would not have materialized.

Finally, the system could have been transformed into a pure dollar standard. Some authors (e.g., McKinnon 1969; Meltzer 1991) posit that had the United States followed stable monetary policies under Bretton Woods—had it geared policy to the maintenance of price stability—the gold-dollar standard would have evolved into a pure dollar standard that could have lasted indefinitely. There would have been no "Triffin crisis" because countries other than the United States would have been willing to hold unlimited quantities of dollars.

An examination of the composition of countries' gold reserves during the Bretton Woods period in fact suggests that most advanced countries, with the principal exceptions of Germany, Italy, and Japan, in fact strongly preferred to

45. This is not surprising, since between 1950 and 1953 U.S. gold reserves had already begun their precipitous decline and, combined with the Marshall Plan aid and the Korean War inflation-induced balance-of-payments deficits, official outstanding dollar liabilities would have exceeded the hypothetical monetary gold stock.

hold gold throughout the 1950s and 1960s (see Kenen 1963; IMF 1972). To the extent that the preference for gold over interest-earning dollar-denominated assets reflected memories of capital losses due to the devaluations of the 1930s (and not simply the monetary policies the United States followed in the 1960s), one could argue that, in our scenario of a preserved and restored gold exchange standard, this preference would have been less; absent the inflationary shocks of the Vietnam War and the shift to expansionary monetary policy, the system might have prevailed considerably longer than we suggest above.[46] The counterargument, which we find compelling, is that the preference of some countries—notably France—for gold over foreign exchange reserves predated the Great Depression. France had begun converting its gold into foreign exchange as early as May 1927, more than two years before the onset of the slump (Clarke 1967). The Bank of France relied heavily on reserve inflows and outflows for balance-of-payments adjustment even before World War I (Bloomfield 1959), and the country's experience with high inflation in the first half of the 1920s reinforced French officials' commitment to the operation of a pure gold standard. It is unlikely that, in the absence of the depression, French policymakers would have been more willing to hold foreign exchange reserves.[47] Thus, as U.S. foreign monetary liabilities began to rise, countries like France with the strongest preference for gold over foreign exchange would have presented the liabilities to the Federal Reserve for conversion (as they in fact did in the mid-1960s). This would have created a problem of collective action: other countries might have been willing to hold U.S. monetary liabilities so long as the central banks and governments of countries like France did the same, but once the latter showed a desire to convert their foreign exchange to gold, all the governments concerned had an incentive to get out of dollars before U.S. gold reserves were exhausted. Although the precise timing of the crisis remains difficult to pin down, the final denouement is the same.

Following the collapse of the gold exchange standard, it is likely the world would have moved toward the managed float with capital mobility that we have today. Rather than attempt to create a world central bank and a new international monetary system, or to put up with a dollar standard, the major nations would have preferred cutting the link with gold and following independent financial policies. Given the problems associated with the above three options, we believe that this one would have been most likely.

46. Indeed, in a world without the Great Depression and the aversion to deflation it spawned, the United States, as center country of the gold exchange standard, may have followed the type of monetary policy that Britain did when it was the center country of the classical gold standard—a policy of maintaining convertibility at any price.

47. One can argue that the depth of the depression in France, which was itself perceived to have resulted from commitment to the maintenance of the gold standard (Mouré 1991, 274–77), worked to weaken the country's preference for holding gold, which would therefore have been even stronger in the absence of the slump.

12.4 Implications for Growth and Resource Allocation after World War II

Having established that the interwar gold standard would have persisted for the duration of the 1930s and been resurrected after World War II, we now consider the implications of this arrangement for growth and resource allocation. Perhaps the most important implication of the postwar international monetary system for resource allocation followed from the prevalence of capital controls, which were pervasive after the war but would have been absent under our counterfactual.

12.4.1 The Problem

We assume that controls on capital and current account transactions would have been absent following a relatively limited transitional period on the grounds that these were incompatible with the operation of the gold standard. Freedom to convert currency and token coin, however obtained, into gold at the statutory rate and to import and export that gold was a keystone of the gold standard system.[48]

The question then becomes how the post–World War II world would have evolved in the absence of controls. Here it is important to distinguish between the early and not-so-early postwar periods. One reason is that data are more partial and less complete for the early postwar years. Only from the mid-1960s does the IMF begin providing quantitative indicators of the incidence of capital controls; comparable indices for earlier years (of our own construction) may be less reliable. Even for the advanced industrial countries, macroeconomic data for the immediate postwar years are incomplete. Data gaps are an even greater problem, of course, for developing countries, many of which did not exist as independent states before the 1960s.

While it unambiguously follows from our counterfactual that the early postwar period—say through the 1950s—would have been free of capital controls, it is not so clear how to characterize the subsequent counterfactual regime. Had the reconstructed gold exchange standard collapsed in, say, 1960 and countries accepted greater exchange rate flexibility, would that flexibility have been accompanied by the imposition of controls, as in the 1930s, or by the mainte-

48. To be sure, central banks and governments used a variety of measures that resembled capital controls. They used the gold devices—paying out clipped and worn coin, or accepting gold imports only at inland cities rather than at central bank offices located close to a port—as a way of discouraging reserve inflows and outflows and mimicking some of the effects of controls. Even Britain, that most faithful adherent to the gold standard, had embargoed foreign lending in the second half of the 1920s. In the early 1930s the United States, under the provisions of the Johnson Act, had prohibited lending to countries in default on their outstanding debts. But notwithstanding these exceptions, the essence of the gold standard remained free international capital mobility. Most of the restrictions on capital flows imposed in the 1930s were adopted in response to the collapse of the international monetary and financial system, an event that we assume away in our counterfactual.

nance of open capital markets? For reasons given in section 12.3, we assume the latter and thus contrast the impact of the actual regime of current and capital account restrictions with a counterfactual of open capital markets.

The obvious hypothesis is that the absence of restrictions on international capital flows would have made for a more efficient allocation of resources and, ultimately, faster economic growth. Capital would have flowed from countries where it was abundant to those where it was scarce. The stimulus to investment and growth would have been most apparent in those countries on the receiving end, but a more efficient allocation of funds could also have redounded favorably on the creditor countries, insofar as they received a higher return on their investments and felt the favorable repercussions of higher growth worldwide. Financial repression that distorted the intersectoral allocation of resources and depressed domestic savings rates in the countries in which it was practiced would not have been possible in the face of open international financial markets. Counterarguments include (1) that capital controls were never entirely effective and therefore that one should not expect to discern a large impact on economic outcomes and (2) that policies of industrial targeting, in East Asia for example, helped to solve coordination problems and internalize externalities that would have held back the growth process otherwise and that these interventions would not have been possible in the absence of controls. The effect of controls on growth and resource allocation is ultimately an empirical question.

12.4.2 The Literature

The literature contains two notable attempts to answer this question. Alesina, Grilli, and Milesi-Ferretti (1994) consider the experience of 20 industrial countries since 1950, relating a dummy variable for the presence or absence of capital controls constructed from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* to the accumulation of public debt, the rate of inflation, the real interest rate, and the GDP growth rate. They find that countries with controls accumulate more public debt, have lower real interest rates, and run higher inflation rates. This is consistent with the view that capital controls, by bottling up international financial flows, facilitate collection of the inflation tax and reduce the costs of servicing the public debt. The implications for the rate of GDP growth are unclear: the authors find only a small and statistically insignificant impact of controls on the growth of GDP per capita.

Grilli and Milesi-Ferretti (1995) extend the analysis to a panel of 61 industrial and developing economies. They distinguish three measures of controls: restrictions on payments for capital transactions (as in Alesina et al. 1994); separate exchange rates for capital transactions or invisibles (a proxy for multiple currency practices, which theory suggests should have much the same effect as capital controls); and restrictions on payments for current transactions (which are often used in the attempt to evade restriction on capital transac-

tions).[49] They too find that the presence of capital controls, current account restrictions, and multiple exchange rate practices are associated with higher rates of inflation and lower real interest rates (where the analysis of real interest rates is limited to the industrial countries). There is some evidence that capital controls are positively associated with growth, while current account restrictions are negatively associated, although neither correlation is robust.

In this section we extend and reconsider this evidence. We extend the data back from the mid-1960s to 1959, which is important given the focus of our counterfactual analysis. We consider intermediate variables linking controls to growth, such as the investment rate, the savings rate, and export growth. We control for problems of unobserved heterogeneity. While Grilli and Milesi-Ferretti test for the endogeneity of capital controls and find that the results are little affected by this correction, our concern is different, namely, that countries with and without controls are not drawn from the same underlying population—that they differ in ways that are difficult to observe. We implement an econometric correction for this problem. And we use principal components to construct a summary measure of the incidence of controls that removes some ambiguity about the effects of alternative measures.

12.4.3 Methodology

Governments impose controls when they believe the policy will achieve a desired end (such as reducing inflation or limiting external deficits). Hence, controls tend to be observed where they are likely to have the largest effect. This creates problems of selectivity, in whose presence least squares estimation will deliver coefficient estimates of the average effect of such policies.

To obtain unbiased estimates we condition on the propensity score.[50] The effect we seek to measure is the difference in, say, the current account of a particular country as a function of whether it imposes capital controls. While we only have data on the current account balance associated with the policy that was actually in place, we are interested in the counterfactual, in what would have happened had the other policy been followed. If controls were imposed randomly, least squares would suffice. But countries with controls are not identical to countries that shun the policy. In the language of experimental design, we lack a control group that is otherwise identical to the treatment group. If x_i is a vector of factors determining the likelihood of capital controls, the joint distribution of x_i for countries that have capital controls is different from the joint distribution for countries that do not.

We address this problem by using the information in x_i to sort countries in our sample by the likelihood of their adopting controls. We form a subgroup

49. As before, they consider the impact on inflation (excluding inflation rates above 80 percent per annum to prevent the results from being dominated by outliers), real interest rates, and per capita GDP growth.

50. For a general treatment of propensity score methods see Rosenbaum and Rubin (1983, 1984). For a related example in the economics literature, see Angrist (1995).

with a similar likelihood of imposing controls—with a similar *propensity score*—and compare the current accounts of countries with and without controls within that subgroup, thereby minimizing the bias owing to heterogeneity.[51]

In a small sample we are unlikely to have countries with identical propensity scores. Instead, we group the sample into quintiles, where the first group comprises the 20 percent least likely to have controls, the last group the 20 percent most likely to have them. Within each of the five groups we then compare the current accounts of countries with and without controls.[52]

The propensity of a country-year pair to have imposed *any* form of capital control (restrictions on payments for capital transactions, separate exchange rates for capital transactions or invisibles, and restrictions on payments for current transactions) is modeled as a function of the number of executive changes in the country from 1950 to 1982, the legal independence of the central bank, the average turnover rate of central bankers per year, a dummy indicating a majority coalition government is in power, a dummy indicating a left-of-center government is in power, a dummy indicating a fixed or managed exchange rate arrangement is in place, the log of real per capita GDP, and the following variables lagged one year: the ratio of the current account deficit to GDP, the ratio of government consumption to GDP, and the ratio of trade (the sum of imports and exports) to GDP.

For each dependent variable six regressions are run. The first two include only industrialized countries, for which we have relatively few missing observations. The first of these regressions has no controls for time or country effects, while the second includes year controls. The next four regressions em-

51. We thus implement a logit model designed to predict whether capital controls are in place as a function of the components of x_i and use the coefficients from this model to derive the fitted probability of a country's having capital controls in a given year. This fitted probability is the propensity score. The proposition underlying the methodology is that conditional on the estimated propensity score the joint distribution of x_i for countries with capital controls is identical to the joint distribution for countries without them. We would like to take a group of countries with the same values of the x_i vector and compare the current accounts of countries that imposed capital controls with the current accounts of those that did not. More generally, we can compare countries with the same value of some function of x_i, say $b(x_i)$. In the present context, $b(x_i)$ is the propensity score estimated from the logit model. Comparing the current accounts of countries with the same value of $b(x_i)$ should then deliver unbiased estimates of the effect of capital controls.

52. This comparison is undertaken using a standard least squares model with the current account (and other measures of economic policy and performance) as the dependent variable and the independent variables employed by Grilli and Milesi-Ferretti (1995). Since we are comparing countries with similar but not necessarily equal propensity scores, not all of the bias will be eliminated. However, Rosenbaum and Rubin (1984) argue that this method is likely to remove some 90 percent of the bias due to heterogeneity. Finally, to find the average effect of capital controls in the population, we take the average of the five estimated coefficients from the quintile regressions. In computing the standard error of this average, we assume the propensity score for each observation is measured without error, placing all observations in the correct quintile. Assuming that the coefficients from the five quintiles are independent of each other, we can compute the standard error of the weighted average of coefficients using the simple formula for the variance of a weighted sum of independent random variables.

ploy data for all countries in the sample, industrial and developing. The first has no time or year controls, the second has year controls, the third has country controls, and the last has country controls and includes the lagged value of the dependent variable as an additional regressor.[53] The range of years for each regression is 1959 to 1989.[54] Each of these regressions includes the three alternative measures of capital controls. In addition, however, we use principal component methods to construct a single measure of controls from our three dummy variables.

Each of the regressions includes as independent variables, in addition to the measures of capital controls, the log of the level of real per capita GDP in 1959, the ratio of government consumption to GDP, the ratio of trade to GDP, a dummy variable for nondemocracies, the average turnover rate of central bankers, and an index of the legal independence of the central bank.[55]

12.4.4 Results

The full set of results is available from the authors on request. Here we summarize our principal findings. We concentrate on the regressions with no country or year controls (the reader should assume this except where stated to the contrary), although we discuss the other results where the estimates are particularly sensitive to the inclusion or exclusion of controls.

The results in table 12.5 suggest that countries with controls run significantly higher inflation. This is consistent with the notion that such countries limit capital mobility as a way of making more active use of the inflation tax.[56] For the industrial countries, most of the explanatory power appears to reside with the measure of capital account restrictions; for the developing countries, multiple currency practices are particularly important. According to the ordinary least squares (OLS) regressions on the full sample, both capital account restrictions and multiple currency practices affect inflation for the sample of both industrial and developing countries, but the correction for heterogeneity eliminates the first of these effects.

While our heterogeneity correction does not much modify the overall conclusions, there are some interesting differences from the OLS regressions. In

53. This last specification is designed to mitigate autocorrelation problems.

54. While we would have liked to extend the data set back to 1953 or 1955 to coincide with the end of the counterfactual transition period we describe above, this turns out to be difficult, as data constraints on our exercise become increasingly binding the further back we go. The year 1959 is quite close to the beginning of our counterfactual period of capital account convertibility, though.

55. To conserve space, we do not report the coefficients on these variables, which are broadly similar to those reported and discussed by Grilli and Milesi-Ferretti (1995). The regressions for the real interest rate include also the average number of executive changes per year, a dummy variable indicating that a left-wing government is in power, a dummy variable indicating that a coalition government is in power, and the lagged value of the ratio of the government budget deficit to GDP.

56. Grilli and Milesi-Ferretti (1995) note the possibility that capital controls, by enlarging the inflation tax base, may cause the optimal rate of inflation to fall, but they find the same positive coefficient on a more limited sample.

Table 12.5 **Effect of Capital Controls on Inflation: Ordinary Least Squares and Heterogeneity-Corrected Estimates**

Variable	Full Sample	*t*-Statistic	Subsample Regressions by Quintile					Average of Subsample Regressions	*t*-Statistic
			1	2	3	4	5		
			A. Inflation Rate, Industrial Countries Only						
Capital account restrictions	2.344	4.516	3.504	1.977	2.705	2.292	2.532	2.602	2.873
	(0.519)		(1.008)	(0.778)	(1.672)	(3.258)	(2.339)	(0.906)	
Current account restrictions	0.187	0.314		−0.188	1.442	−0.618	−1.487	−0.213	−0.295
	(0.595)			(1.208)	(1.371)	(1.291)	(1.827)	(0.772)	
Multiple currency practices	−0.059	−0.090		1.148	0.013	−3.795	0.133	−0.625	−0.732
	(0.654)			(1.120)	(1.471)	(2.144)	(1.915)	(0.854)	
Principal component	2.151	4.727	3.849	2.072	3.009	1.335	1.891	2.431	3.204
	(0.455)		(1.107)	(0.722)	(1.462)	(2.484)	(2.084)	(0.759)	
S.E.	5.044								
R^2	0.148								
N	581								
			B. Inflation Rate, All Countries						
Capital account restrictions	2.008	2.349	0.996	5.670	−1.243	−5.827	5.337	0.987	0.961
	(0.855)		(1.155)	(1.662)	(2.090)	(2.925)	(3.052)	(1.026)	
Current account restrictions	0.224	0.257	7.445	0.501	3.092	−1.882	−5.14	0.802	0.883
	(0.872)		(1.818)	(1.786)	(1.694)	(2.299)	(2.448)	(0.909)	
Multiple currency practices	5.329	6.571	6.629	2.932	4.371	2.544	7.174	4.730	5.468
	(0.811)		(1.984)	(1.670)	(1.519)	(2.442)	(1.926)	(0.865)	
Principal component	2.802	4.498	5.114	5.217	3.874	−4.595	2.538	2.430	3.341
	(0.623)		(0.998)	(1.286)	(1.508)	(2.185)	(1.877)	(0.727)	
S.E.	11.277								
R^2	0.265								
N	1,244								

Notes: S.E. = standard error of regression. Numbers in parentheses are standard errors.

the industrial countries, capital account restrictions are significantly associated with inflation only for the first and second quintiles (those countries least likely to have controls). An interpretation is that in industrial countries most likely to impose controls, market participants discovered means of evading them and that only where controls were unexpected did they have major effects.

These results are likely to be important for economic activity if they affect relative prices. Consider, for example, the (ex post) real interest rate on government bonds. Like Grilli and Milesi-Ferretti (1995), we find that capital controls are associated with significantly lower real interest rates, as if countries used controls to bottle up financial capital domestically (table 12.6). In the equations not corrected for heterogeneity, all three measures of controls border on statistical significance at conventional levels, and all enter negatively.[57]

Insofar as controls are associated with significantly lower real interest rates, we might expect investment rates to be higher. This is what we find for the industrial countries (table 12.7), although different kinds of controls seem to have different effects. Capital account restrictions are associated with higher investment rates, while current account restrictions and multiple currency practices have the opposite effect.[58] For the full sample including developing countries, the signs are the same but the net effect is negative, since the depressing impact of current account restrictions and multiple currency practices is larger. An interpretation is that capital account restrictions worked to channel domestic savings into domestic investment, but current account restrictions increased the shadow price of imported capital goods and reduced the marginal efficiency of investment. It makes sense that these last effects should be largest in developing countries.

We can explore this hypothesis further by looking at the determinants of the current account as a share of GDP (since domestic saving is the sum of investment, considered above, plus the current account). For the industrial countries, the regression with no country or year dummies suggests that all three measures of capital controls have a statistically significant effect on the current account (table 12.8). Capital account restrictions enter with the largest coefficient and negative sign (in the OLS regression), and the summary measure of capital controls suggests that these worked to depress the current account surplus and, by implication, domestic saving. The OLS results for the full sample similarly indicate a negative effect of capital account restrictions, but significance is eliminated by the correction for heterogeneity. While the evidence is

57. However, the heterogeneity correction eliminates the effect of current account restrictions and multiple currency practices in the equations for industrial countries, and that for current account restrictions in the equation for the full sample of industrial and developing economies. This is notable insofar as Grilli and Milesi-Ferretti (1995) lay considerable stress on the current account restrictions variable, which they interpret as a proxy for the extent of financial repression and the intensity of capital controls.

58. The effect of the latter is eliminated by the correction for heterogeneity.

Table 12.6 **Effect of Capital Controls on Real Interest Rates: Ordinary Least Squares and Heterogeneity-Corrected Estimates**

Variable	Full Sample	*t*-Statistic	Subsample Regressions by Quintile					Average of Subsample Regressions	*t*-Statistic
			1	2	3	4	5		
			A. Real Interest Rate, Industrial Countries						
Capital account restrictions	−2.251	−6.270	−2.280	−0.645	−1.322	−8.971	−4.431	−3.530	−4.625
	(0.359)		(0.924)	(0.614)	(0.958)	(2.692)	(2.273)	(0.763)	
Current account restrictions	−1.260	−2.897		0.031	1.577	−0.606	0.1192	0.549	1.062
	(0.435)			(1.046)	(0.941)	(0.813)	(1.277)	(0.517)	
Multiple currency practices	−0.728	−1.717		−1.673	2.885	0.468	−0.040	−1.033	−1.836
	(0.424)			(0.898)	(0.878)	(1.086)	(1.518)	(0.562)	
Principal component	−2.619	−7.960	−2.445	−0.975	−1.214	−4.904	−3.364	−2.580	−4.922
	(0.329)		(0.981)	(0.575)	(0.931)	(1.557)	(1.512)	(0.524)	
S.E.	3.398								
R^2	1.582								
N	545								
			B. Real Interest Rate, All Countries						
Capital account restrictions	−2.659	−5.026	−1.985	−0.943	0.948	−8.132	−6.878	−3.777	−3.345
	(0.529)		(0.745)	(0.757)	(1.092)	(4.780)	(2.590)	(1.129)	
Current account restrictions	−1.267	−2.263		−0.238	−0.481	−0.9020	−1.289	−0.728	−1.130
	(0.560)			(0.915)	(0.803)	(1.816)	(1.362)	(0.644)	
Multiple current practices	−2.583	−4.548		−2.078	−1.871	−9.847	−2.142	−3.985	−4.835
	(0.568)			(0.866)	(0.865)	(2.537)	(1.712)	(0.824)	
Principal component	−3.175	−7.024	−2.232	−1.849	−1.732	2.324	−5.232	−2.674	−3.253
	(0.452)		(0.831)	(0.649)	(0.923)	(3.448)	(1.743)	(0.822)	
S.E.	5.159								
R^2	0.134								
N	631								

Notes: S.E. = standard error of regression. Numbers in parentheses are standard errors.

Table 12.7 **Effect of Capital Controls on Investment: Ordinary Least Squares and Heterogeneity-Corrected Estimates**

Variable	Full Sample	*t*-Statistic	Subsample Regressions by Quintile					Average of Subsample Regressions	*t*-Statistic
			1	2	3	4	5		
			A. Investment as a Fraction of GDP, Industrial Countries						
Capital account restrictions	3.837	9.739	2.018	3.711	1.604	3.062	8.533	3.786	5.494
	(0.394)		(0.948)	(0.811)	(1.096)	(2.348)	(1.897)	(0.689)	
Current account restrictions	−1.485	−3.300		−1.003	−1.731	−3.313	0.995	−1.761	−3.085
	(0.450)			(1.235)	(0.866)	(0.953)	(1.424)	(0.571)	
Multiple currency practices	−1.143	−2.304		−2.313	−0.511	−0.483	0.082	−0.806	−1.228
	(0.496)			(1.170)	(0.959)	(1.576)	(1.457)	(0.656)	
Principal component	2.548	7.058	2.223	2.584	−0.574	−2.632	7.792	1.879	3.124
	(0.361)		(1.034)	(0.775)	(1.001)	(1.837)	(1.730)	(0.601)	
S.E.	3.819								
R^2	0.443								
N	585								
			B. Investment as a Fraction of GDP, All Countries						
Capital account restrictions	3.041	6.131	2.677	4.147	3.952	1.215	6.857	3.770	6.287
	(0.496)		(0.731)	(0.895)	(1.089)	(1.464)	(2.079)	(0.600)	
Current account restrictions	−3.814	−7.674	−4.924	−2.585	−6.159	−1.291	−6.939	−4.380	−8.011
	(0.497)		(1.117)	(0.892)	(0.943)	(1.163)	(1.785)	(0.547)	
Multiple current practices	−2.060	−4.650	−1.196	−1.360	−0.580	−0.452	−6.255	−1.969	−4.290
	(0.443)		(1.110)	(0.808)	(0.898)	(1.094)	(1.173)	(0.459)	
Principal component	−0.980	−2.792	−0.216	0.766	−2.441	−0.383	−3.400	−1.135	−2.866
	(0.351)		(0.603)	(0.676)	(0.783)	(0.941)	(1.265)	(0.396)	
S.E.	6.67								
R^2	0.365								
N	1,419								

Notes: S.E. = standard error of regression. Numbers in parentheses are standard errors.

Table 12.8 **Effect of Capital Controls on Current Account: Ordinary Least Squares and Heterogeneity-Corrected Estimates**

Variable	Full Sample	*t*-Statistic	Subsample Regressions by Quintile					Average of Subsample Regressions	*t*-Statistic
			1	2	3	4	5		
			A. Current Account as a Fraction of GDP, Industrial Countries						
Capital account restrictions	−1.782	−6.410	−1.390	−1.153	0.611	−1.474	−2.531	−1.187	−2.526
	(0.278)		(0.692)	(0.447)	(0.789)	(1.532)	(1.369)	(0.470)	
Current account restrictions	0.282	0.884		2.113	1.114	−0.461	1.507	1.068	2.752
	(0.319)			(0.694)	(0.647)	(0.607)	(1.069)	(0.388)	
Multiple currency practices	1.151	3.289		1.510	0.720	1.462	2.470	1.541	3.328
	(0.350)			(0.643)	(0.694)	(1.008)	(1.232)	(0.463)	
Principal component	−1.363	−5.452	−1.526	−0.118	1.605	−1.816	−3.956	−1.162	−2.820
	(0.250)		(0.753)	(0.449)	(0.702)	(1.159)	(1.281)	(0.412)	
S.E.	2.704								
R^2	0.161								
N	581								
			B. Current Account as a Fraction of GDP, All Countries						
Capital account restrictions	−0.673	−1.917	−1.693	−1.763	−2.290	0.561	5.338	0.031	0.070
	(0.351)		(0.564)	(0.550)	(0.772)	(0.866)	(1.669)	(0.436)	
Current account restrictions	0.453	1.287	0.408	1.188	1.031	−0.152	−1.316	0.232	0.618
	(0.352)		(0.866)	(0.586)	(0.615)	(0.654)	(1.274)	(0.375)	
Multiple current practices	−0.048	−0.147	3.848	0.785	0.721	−1.195	−2.548	0.322	0.941
	(0.326)		(0.884)	(0.532)	(0.577)	(0.665)	(1.044)	(0.342)	
Principal component	−0.180	−0.717	−0.639	−0.333	−0.222	−0.009	0.948	−0.051	−0.183
	(0.251)		(0.493)	(0.422)	(0.512)	(0.617)	(0.938)	(0.279)	
S.E.	4.730								
R^2	0.100								
N	1,323								

Notes: S.E. = standard error of regression. Numbers in parentheses are standard errors.

not robust, it is consistent with the interpretation of the effect of controls on savings, investment, and capital formation offered above.

Exports were the other engine of growth according to most studies of the post–World War II growth process.[59] We find little evidence that the growth of exports (in constant dollars) was affected by capital controls (table 12.9). The basic regression for the industrial countries, with and without corrections for heterogeneity, suggests a small positive effect of multiple currency practices, but the measures of capital controls are consistently insignificant as a group, and the addition of year and country controls eliminates even the multiple currency regime effect. The same is true for the full sample including the developing countries: while there are some sign reversals on the individual measures of controls, our three capital control proxies as a group have no significant impact on export growth.

Our regressions for the industrial countries show little effect on economic growth (table 12.10). The basic regression with no year or country controls suggests that capital account restrictions had a small, statistically significant, positive effect on growth. The quintile regressions suggest that this effect is concentrated mainly in countries relatively unlikely to have controls. But the three measures of controls are insignificant as a group, and the addition of year effects eliminates even that impact.

Interestingly, the effects on growth of our three measures of controls have the opposite sign when the sample includes also developing countries. This result is driven by a larger (negative) effect of multiple currency practices, which—the quintile regressions correcting for heterogeneity suggest—significantly depress growth in these countries. On balance, our three measures of controls just border on significance at conventional confidence levels when the industrial and developing countries are combined.

12.4.5 Summary of Results

Our results tell a consistent story. They suggest that controls had a significant effect on international financial flows and were associated with higher inflation and lower ex post real interest rates. Lower interest rates were associated with higher domestic investment but discouraged saving. Additional investment did not translate into faster economic growth, however, due perhaps to the higher cost of imported capital goods associated with current account restrictions and a lower marginal efficiency of investment. There is some evidence that current account restrictions and multiple currency practices tended to depress growth in developing countries, although the effect is marginal statistically and economically.

These results suggest that the greater international capital mobility associ-

59. These studies tend to disagree about whether investment and exports were dual engines of growth (as in Eichengreen's 1996 model of the advanced industrial countries), whether rising investment induced the increase in exports (as in Rodrik's 1995 model of the East Asian growth miracle), or whether exports induced the rise in investment (as in models of export-led growth).

Table 12.9 **Effect of Capital Controls on Growth of Exports: Ordinary Least Squares and Heterogeneity-Corrected Estimates**

Variable	Full Sample	*t*-Statistic	Subsample Regressions by Quintile					Average of Subsample Regressions	*t*-Statistic
			1	2	3	4	5		
			A. Growth Rate of Exports, Industrial Countries						
Capital account restrictions	0.026	2.811	−0.043	0.039	−0.013	0.062	0.053	0.020	1.101
	(0.009)		(0.029)	(0.017)	(0.031)	(0.061)	(0.046)	(0.018)	
Current account restrictions	−0.017	−1.604		−0.034	0.004	−0.048	−0.001	−0.020	−1.384
	(0.011)			(0.027)	(0.025)	(0.024)	(0.036)	(0.014)	
Multiple currency practices	0.034	2.873		0.049	0.027	0.033	0.045	0.039	2.325
	(0.012)			(0.025)	(0.027)	(0.040)	(0.038)	(0.017)	
Principal component	0.016	1.956	−0.047	0.038	0.006	−0.042	0.019	−0.005	−0.339
	(0.008)		(0.032)	(0.016)	(0.027)	(0.047)	(0.041)	(0.015)	
S.E.	0.090								
R^2	0.049								
N	581								
			B. Growth Rate of Exports, All Countries						
Capital account restrictions	0.017	1.133	0.004	0.028	0.029	0.007	0.089	0.031	1.504
	(0.015)		(0.017)	(0.021)	(0.032)	(0.043)	(0.084)	(0.021)	
Current account restrictions	−0.026	−1.746	0.004	−0.036	−0.027	−0.034	−0.022	−0.023	1.376
	(0.015)		(0.026)	(0.022)	(0.026)	(0.033)	(0.064)	(0.017)	
Multiple current practices	−0.032	−2.338	−0.055	0.012	−0.008	−0.008	−0.136	−0.139	−2.617
	(0.014)		(0.026)	(0.020)	(0.024)	(0.033)	(0.053)	(0.015)	
Principal component	−0.014	−1.321	−0.004	0.001	−0.008	−0.026	−0.026	−0.013	−0.990
	(0.011)		(0.014)	(0.016)	(0.021)	(0.031)	(0.047)	(0.013)	
S.E.	0.199								
R^2	0.039								
N	1,324								

Notes: S.E. = standard error of regression. Numbers in parentheses are standard errors.

Table 12.10 **Effect of Capital Controls on Economic Growth: Ordinary Least Squares and Heterogeneity-Corrected Estimates**

Variable	Full Sample	*t*-Statistic	Subsample Regressions by Quintile					Average of Subsample Regressions	*t*-Statistic
			1	2	3	4	5		
			A. Growth Rate of Real Per Capita GDP, Industrial Countries						
Capital account restrictions	0.007	2.273	0.006	0.013	0.019	0.034	0.001	0.014	2.441
	(0.003)		(0.009)	(0.006)	(0.008)	(0.022)	(0.015)	(0.006)	
Current account restrictions	−0.009	−2.576		−0.001	0.008	−0.018	−0.008	−0.005	−1.068
	(0.003)			(0.009)	(0.007)	(0.009)	(0.011)	(0.005)	
Multiple currency practices	0.004	1.226		0.010	−0.001	−0.002	0.008	0.004	0.737
	(0.004)			(0.009)	(0.007)	(0.014)	(0.012)	(0.005)	
Principal component	0.003	0.870	0.006	0.014	0.019	−0.007	−0.008	0.005	0.941
	(0.003)		(0.009)	(0.006)	(0.007)	(0.017)	(0.013)	(0.005)	
S.E.	0.028								
R^2	0.078								
N	581								
			B. Growth Rate of Real Per Capita GDP, All Countries						
Capital account restrictions	0.007	1.721	0.005	0.013	0.015	0.004	−0.021	0.003	0.648
	(0.004)		(0.006)	(0.006)	(0.012)	(0.010)	(0.017)	(0.005)	
Current account restrictions	−0.011	−2.698	−0.019	−0.012	−0.006	−0.007	−0.012	−0.011	−2.379
	(0.004)		(0.106)	(0.006)	(0.010)	(0.009)	(0.015)	(0.005)	
Multiple current practices	−0.009	−2.598	−0.032	0.000	−0.028	−0.040	0.017	−0.010	−2.499
	(0.004)		(0.009)	(0.006)	(0.009)	(0.008)	(0.010)	(0.004)	
Principal component	−0.005	−1.776	−0.009	0.002	−0.006	−0.004	−0.013	−0.006	−1.955
	(0.003)		(0.005)	(0.004)	(0.008)	(0.007)	(0.009)	(0.003)	
S.E.	0.052								
R^2	0.045								
N	1,324								

Notes: S.E. = standard error of regression. Numbers in parentheses are standard errors.

ated with a post–World War II gold exchange standard would not have much affected the rate of economic growth. The literature features two interpretations of the connections between capital mobility and growth. In one, the postwar growth process (especially in developing countries) had to be initiated by government interventions to boost savings and investment rates and solve coordination problems. In the other, such interventions depressed the efficiency with which savings and investment were deployed. Our results suggest that the two effects canceled out in the industrial countries, while the latter may have depressed the rate of economic growth on balance in the developing world.

12.5 Implications for Institution Building and International Cooperation

A final implication of the depression for the development of the international monetary system concerns the institutions of international monetary cooperation, specifically the IMF. The design of the Bretton Woods institutions was powerfully shaped by the experience of the 1930s: Keynes, White, and their colleagues sought a structure that would prevent any recurrence of the international monetary instability of that decade. In addition to providing for capital controls and parity adjustments in the event of a fundamental disequilibrium, they established the IMF to oversee the operation of their new international system.

Had the interwar gold standard operated smoothly up to the outbreak of World War II, there would have been no comparable impetus to establish Bretton Woods–like institutions thereafter. The post–World War II gold exchange standard would have operated without an IMF to provide exceptional liquidity, apply policy conditionality, and encourage international cooperation.

The question is how much difference the Fund's absence would have made. One conceivable answer is "not very much." The interwar gold exchange standard operated without the support of a comparable institution, and our counterfactual analysis is predicated on the assumption that this system functioned smoothly throughout the 1920s and 1930s without the supervision of an international monetary institution. If so, why should the 1950s have been different?

They would have been different, first of all, because of the problem of collective action posed by the Triffin dilemma. As we saw in section 12.3, the supply of monetary gold was sufficient after World War I for the interwar gold standard to operate through the end of the 1930s, assuming the absence of the Great Depression, without the official foreign liabilities of the principal reserve currency country, the United States, ever exceeding America's holdings of monetary gold. No problem of collective action would have arisen in which other countries had to agree not to cash in their dollar reserves, since there was no question of the convertibility of those dollars into gold. In the 1950s, in contrast, the wartime rise in the price level and the rapid postwar growth of the

world economy would have so augmented the demand for international reserves that U.S. official foreign liabilities would have quickly come to exceed the country's gold reserves had a dollar-based gold exchange standard been restored in the aftermath of the war. Countries holding dollars as reserves would have continued to do so willingly only if they were confident of the equal willingness of others. This same problem existed under Bretton Woods, of course, although it brought down that system of pegged but adjustable exchange rates only later. One explanation for the lag, and for the length of the interlude of relative stability that preceded it, is that the IMF provided a partial solution to the problem of collective action. The Fund offered a forum for the exchange of information and opinion among governments; as in models of "cheap talk," this helped to facilitate cooperation. The Fund assembled information on central bank policies and monitored international financial transactions, limiting the incentive for governments to renege on their agreement to cooperate by increasing the likelihood of rapid detection. There is reason to think that the Bretton Woods system would have been brought down even earlier by the Triffin dilemma had there been no IMF. It follows that the absence of an IMF-like entity in our postwar gold exchange standard scenario would have brought Triffin's chickens home to roost even sooner.

There are also other, related grounds for arguing that the absence of the Fund would have weakened the operation of our hypothetical postwar gold exchange standard. The IMF played a role under Bretton Woods in lending to countries experiencing exceptional balance-of-payments difficulties. Its loans helped such countries accommodate temporary shocks without having to abandon their Bretton Woods pegs. No comparable institution existed in the interwar period, of course, and when the 1931 financial crisis struck the gold exchange standard, countries had to negotiate foreign financial assistance government to government, on an ad hoc, bilateral basis. The absence of established procedures for the extension of such loans and the inevitable politicization of the intergovernmental process hindered extension of the requisite loans. France hesitated to assist Germany, for example, because Berlin had reportedly concluded a customs union agreement with Austria in violation of the Versailles Treaty and because of the belief that Germany was secretly rearming. One can imagine that political and diplomatic obstacles would have similarly arisen in the 1950s and 1960s had balance-of-payments loans had to be negotiated on an ad hoc basis directly between governments. It is thus likely that the extension of balance-of-payments support for post–World War II currencies in distress would have been less in the absence of the Fund.

The absence of IMF lending would have been felt most strongly by smaller countries of less consequence for the stability of the international monetary system—by the countries and currencies of least concern to the major industrial powers who would have been least likely to receive exceptional bilateral support. One can think of instances to the contrary where the advanced industrial countries have provided financial support for the currency of a smaller, less developed economy: the U.S. loan to Mexico and the French loan to the

Communauté Financière Africaine (CFA) countries in 1995 are recent cases in point. But in both instances the larger country was galvanized into action by exceptional circumstances: in the case of the United States by Mexico's geographical proximity, by the need to support the North American Free Trade Agreement and by Mexico's status as a benchmark for emerging market investors; in the case of the CFA by France's long-standing colonial ties with the region and Paris's foreign policy ambitions. In many other instances where the Fund has provided balance-of-payments support, the advanced industrial countries presumably would not have bothered. Hence, the absence of an IMF-like entity under our no-depression counterfactual would have had negative consequences for the external financial support that such countries could expect.

The Fund has encouraged adjustment in developing countries through its policy conditionality as well, making the negotiation of a mutually acceptable adjustment package a prerequisite for the disbursal of finance. Dominguez (1993) argues that the IMF has functioned as a commitment technology, using its funds and stature to promote course corrections and lock in policy reform. Rodrik (1996) and Gilbert et al. (1996) similarly argue that multilateral lending by the IMF and the World Bank has carried out a function that intergovernmental lending could not. Not only did the IMF and the World Bank provide monitoring and signaling services and threaten sanctions if policy went awry, but the markets had reason to believe that, because the IMF's own purse was at risk, it would take its information-gathering and monitoring functions seriously. And because the policy conditionality that served as a commitment device was applied by a multilateral agency one step removed from national capitals, this intervention in national affairs was more politically palatable. One can argue that policy reform in developing countries would have proceeded more slowly after World War II in the absence of the Fund.

Initiatives to coordinate macroeconomic policies internationally were hardly pervasive under Bretton Woods, but it is likely that they would have been even less frequent and less successful after World War II had there been no IMF. Policy coordination must overcome costs of assembling and evaluating information, negotiating mutually acceptable course corrections, and monitoring countries' compliance with the terms of their agreement. An international institution can facilitate this process in a number of ways. Because information is a nonrival good, an international institution can presumably assemble it at reduced cost; the role of the IMF in gathering and publishing balance-of-payments and government finance statistics can be thought of in this light. Assessing cross-border spillovers of policy can be thought of as a central function of IMF surveillance. The institutionalized exchange of information and views can facilitate the formation of a consensus. The regular meetings of the IMF Executive Board provide precedents and shape agendas, delineating the policy domain that is fair game for discussion. Staff analyses provide terms of reference, statistics provided in background reports serve as focal points directing officials toward pressing policy problems, and the written record and institu-

tional memory of staff lend continuity to a process that would otherwise be disrupted by changes in government and cabinet composition.

The absence of the IMF would thus have dealt a setback to efforts to coordinate policies after World War II. The failure of interwar monetary and economic conferences at Brussels in 1920, Genoa in 1922, and London in 1933, where attempts were made to coordinate policies without the mediation of an international institution, lends support to this view. It suggests that macroeconomic policy coordination would have been minimal, due to in part to the absence of the Fund, under our postwar gold exchange standard, as it had been in the second part of the 1920s.

If no IMF had been created after World War II, perhaps another, already existing institution would have stepped in to fill the void. The obvious candidate is the Bank for International Settlements (BIS), established in 1930 to oversee the transfer of German reparations. The BIS never played a leading role in the management of the post–World War II international economic order. In part this role was usurped by the IMF, but in part the legitimacy of the BIS was damaged by its inability to mount a concerted response to the financial crises of the early 1930s, events that would not have occurred in our counterfactual. Yet the fact that the BIS was involved in the reparations dispute and that it was accused of abetting the Nazis during World War II led a number of Western countries to oppose granting it a more prominent role (and, in the case of the Dutch, to actively plump for its abolition). This makes it unlikely that the BIS would have filled the opening left by the absence of the IMF.

12.6 Conclusion

How would the international monetary system have evolved in the absence of the Great Depression? Our conclusion is that the depression interrupted but did not permanently alter the development of international monetary arrangements. As a result of the international monetary instability of the 1930s—the unsatisfactory experience with output instability, hot money flows, exchange rate variability, and beggar-thy-neighbor policies—the depression prompted the construction of a very different post–World War II monetary and financial regime characterized by pegged but adjustable exchange rates, highly regulated domestic financial markets, and pervasive controls on international capital flows. The gradual recovery of domestic and international financial transactions from the disruptions of depression and war eventually resulted in the growing porousness of controls, mounting difficulties with operating pegged but adjustable rates, and ultimately the collapse of the Bretton Woods system in 1971. In the absence of the depression, this interlude of pegged but adjustable rates and restrictions on capital mobility would not have occurred; the perception that the interwar gold standard had functioned reasonably smoothly in the 1920s and 1930s would have encouraged the restoration of similar arrangements after World War II. The postwar international monetary system

would have been characterized by very infrequent parity changes and high capital mobility. The world would have experienced mild deflation in the 1930s and after the war, in contrast to the actual roller coaster of sharp deflation and inflation in the 1930s and secular inflation in the 1950s and 1960s.

But the same factors that brought down the Bretton Woods system—the failure of the flow supply of gold to match the bouyant growth of the world economy and hence of governments' demands for international reserves, leading to an overhang of U.S. official foreign liabilities and questions about the convertibility of the dollar into gold—would have brought down this hypothetical postwar gold exchange standard as well, and probably at an earlier date. In the absence of the Great Depression, there would have been little impetus for the creation of an organization like the IMF, and there would have been little institutionalization of international monetary cooperation. Under these conditions, the problems of collective action that had to be solved to successfully navigate the transition from the gold exchange standard to a dollar standard would have been insurmountable. The most likely scenario for subsequent events would have been a transition to freer floating. Somewhat to our own surprise, we conclude that the depression slowed but did not permanently alter the development of the international monetary system; it only delayed the transition to the kind of system with which we live today.

How much of a difference this change in timing made for the development of the world economy is difficult to say. The connections between financial arrangements and economic growth are among the most difficult for economists to analyze; it is not surprising that our findings on this question are less than clearcut. Our best guess is that freer capital mobility in the wake of World War II would have had little effect on economic growth in the advanced industrial countries, across which capital-labor ratios and productivity did not differ greatly, but that it would have permitted a more efficient allocation of resources in the developing world, accelerating at least slightly the process of economic growth and development there.

The Great Depression was a watershed in many respects, as the other chapters in this volume show. But so far as the long-term development of the international monetary system is concerned, it may have made less of a difference than is commonly supposed.

Appendix A
Data Sources

Part I: Data Sources for Initial Values

The first part of this appendix explains how the initial values given in table 12.2 and used in the simulations were created and gives the sources.

Values for the 1928–38 Simulation

Prices: Calculated as a GDP-weighted average for the following countries: Argentina, Australia, Brazil, Chile, Netherlands, Portugal, Spain, Belgium, Canada, Denmark, Finland, France, Norway, Sweden, Switzerland, Germany, Greece, Italy, Japan, United Kingdom, and United States. GDP weights, price indexes, and exchange rates versus U.S. dollars are from the Bordo-Schwartz database; see Bordo and Schwartz (1996).

Nominal GDP: Same source as prices.

Money supply, M2: Same source as prices.

Money base: Notes and coins in circulation plus central bank deposits from League of Nations, *Monthly Bulletin of Statistics* (Geneva, 1932–39) and Mitchell (1992, 1993, 1995).

International reserves: "Gold and Foreign Reserves," in League of Nations, *Statistical Yearbook* (Geneva, 1926, 1931–32, 1940–41).

Central bank gold reserves: Same source as international reserves.

Gold production: World gold production from *U.S. Gold Commission Report* (1982).

World monetary gold stock: Same source as gold production.

World nonmonetary gold stock: Same source as gold production.

Interest rate: U.S. short-term interest rate (three months) from Bordo-Schwartz database; see Bordo and Schwartz (1996).

Assumed growth rates in the simulation period. Real GDP: 3.9 percent, from Bordo and Schwartz (1996).

Velocity: –2.6 percent, from Bordo and Schwartz (1996).

Productivity: 1.8 percent, from Kendrick (1961, tables A-XXII and A-XXV).

Assumptions for 1938–50

Assumed growth rates in the simulation period. Monetary gold stock: 2.7 percent, from *U.S. Gold Commission Report* (1982).

Productivity: 2.0 percent, from Kendrick (1961, table 3–3).

Values for the 1950–71 Simulation

Prices: Calculated as a GDP-weighted average for the following countries: Australia, Belgium, Netherlands, Portugal, Spain, Canada, Denmark, Finland, Switzerland, France, Norway, Sweden, Germany, Greece, Italy, Japan, United Kingdom, and United States. GDP weights, price indexes, and exchange rates versus U.S. dollars are from the Bordo-Schwartz database; see Bordo and Schwartz (1996).

Nominal GDP: Same source as prices.

Money supply, M2: Same source as prices.

International reserves: IMF (1972).

Central bank gold reserves: IMF (1972).

High-powered money: IMF (1972).
IMF quota: IMF (1972).
SDRs (1970–71 only): IMF (1972).
Gold production: World gold production from *U.S. Gold Commission Report* (1982).
World monetary gold stock: Same source as gold production.
World nonmonetary gold stock: Same source as gold production.
Interest rate: U.S. short-term interest rate (three months).

Assumed growth rates in the simulation period. Real GDP: 4.4 percent, from Bordo and Schwartz (1996).
Velocity: 0.3 percent, from Bordo and Schwartz (1996).
Productivity: 2.2 percent, from Kendrick (1973, table 3–3).

Part II: Data Sources for the Capital Control Regressions

The data on capital and current account restrictions, multiple currency practices, and exchange rate arrangements are from elaborations on IMF, *Annual Report on Exchange Rate Arrangements and Exchange Restrictions* (various issues). Capital account restrictions are defined as "restrictions on payment on capital transactions." Current account restrictions are defined as "restrictions on payments for current transactions." Multiple currency practices are defined as "separate exchange rate(s) for some or all capital transactions and/or some or all invisibles."

Data on the inflation rate, nominal interest rates on government debt, the ratio of the current account deficit to GDP, annual exports measured in U.S. dollars, and the ratio of the government budget deficit to GDP are from IMF, *International Financial Statistics* (various issues), and national sources. The inflation rate is the annual rate of change of the consumer price index. The real ex post interest rate on government debt is the nominal rate less actual inflation.

Data on the growth rate of real per capita GDP, the ratio of government consumption to GDP, the ratio of investment to GDP, and the ratio of the sum of imports and exports to GDP are from Summers and Heston (1991) and Penn World Table 5.5 update.

The index of legal central bank independence and the average yearly turnover rate of central bankers are from Cukierman et al. (1992). Higher values of the index of central bank independence correspond to more bank independence.

Dummy variables indicating a coalition government is in power, a majority government is in power, a left-of-center government is in power, and a nondemocratic government is in power are from elaborations on Banks (various issues).

Data on the number of government changes between 1950 and 1982 is from Taylor and Jodice (1983).

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