9 Saving, Investment, and Gold: A Reassessment of Historical Current Account Data

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Introduction

This chapter revises pre–World War II current account data for thirteen countries by taking explicit account of the distinction between monetary and nonmonetary international flows of gold. The new data are used to examine the historical cross-sectional correlation between national saving and domestic investment rates. Our statistical analysis is based on an econometric specification that is appropriate for a world in which gold serves as both domestic and international money.

In a seminal paper, Feldstein and Horioka (1980) demonstrated that industrial countries with high saving rates also tend to have high investment rates in post-1960 data. The interpretation of this finding has proven controversial, and has spawned a vast literature. Feldstein and Horioka interpreted their result as indicating a long-term international immobility of capital: national savings, rather than seeking out the most productive uses anywhere in the world, remain in their country of origin. Current account imbalances thus do not allow countries to finance long-run capital needs with foreign savings. Many subsequent authors have been reluctant to embrace this vision, because it contradicts other evidence pointing to a high degree of capital mobility within the modern industrial world.[1]

A natural question to consider, therefore, is whether the Feldstein-Horioka regularity persists in data from the classical gold standard, a period of presumed high capital mobility. An affirmative answer would tend to support the critics of Feldstein and Horioka who have argued that common determinants of saving and investment rates, not capital immobility per se, generate the high post-war saving-investment correlations. Bayoumi (1990) and Eichengreen (1992a) both examined gold standard data, but reached different conclusions. Bayoumi, who

worked with data from 1880–1913 for eight countries, found no significant cross-sectional correlation for any sub-period of the gold standard. In contrast, using different data for a sample of nine countries (the additional country being the United States), Eichengreen found much higher and marginally significant coefficients in cross-sectional regressions of investment on saving.

Both Bayoumi and Eichengreen relied heavily on standard data sources such as Mitchell (1981, 1983, 1988, 1992). While these data are often useful for the purposes of historical comparison, they have at least two shortcomings. One shortcoming that is particularly worrisome for an analysis of current accounts during the gold standard era is the treatment of gold in trade statistics. For many countries in the available sample, official balance of payments statistics confound net exports of commodity gold with monetary gold flows. Some countries exclude all gold flows, while others attempt to make a distinction between nonmonetary and monetary gold trade. Nonmonetary gold exports are a valid current account credit, while exports of monetary bullion and coin should be treated as a capital account credit, and not a current account credit. This misclassification can introduce substantial errors into saving rates, which in the absence of direct observations must be estimated residually as the sum of investment and the current account. As we shall see, however, it is often impossible to classify particular gold transactions as either monetary or nonmonetary.

A further shortcoming of Mitchell's data is their omission of inventory changes from many countries' investment data. When data are available, estimates of gross capital formation should include changes in stocks or inventories as well as gross fixed capital formation. Overlooking inventory accumulation may give an upward bias to estimates of the correlation between saving and investment.[2]

Our yearly data on saving and investment rates from the late nineteenth century through World War II expands the sample of countries examined in previous work.[3] The data we report include inventories for a larger number of countries and treat international flows of gold on a more consistent basis. Our basic finding is that the cross-sectional correlation between gold-standard-era saving and investment rates is somewhat lower, and less significant, than Eichengreen's (1992a) estimates suggest, but it is still greater than the correlation Bayoumi (1990) reports. The explanatory power of these regressions is uniformly much lower under the gold standard than in post–World War II data.

Although we present a specific application of these data, they obviously have many other uses. Researchers interested in studying long-

run saving behavior or economic growth, for example, should find the data we present useful.

The Treatment of Gold Flows in Current Account Data

Under the classical gold standard (ca. 1870–1914), gold was the predominant means of official international settlement, as well as being the lodestar of monetary policy in most market economies.

> Prior to 1914 the major nations had alternated between gold and silver and bimetallic standards, but by 1870 gold ruled the roost. Gold was the anonymous monarch in a world of creative nationalism, and it counted for more than a mere medium of exchange and contract; it symbolized internationalism and the rule of international law. (Mundell 1968, 288)

In addition to its monetary role, however, gold was also a traded commodity, the product of mineral exploitation. Indeed, the growth of world monetary gold reserves depended on new production and discovery. For gold producing countries, official statistics on gold exports and imports usually did not attempt to distinguish between exports of nonmonetary gold (such as exports of newly produced unrefined gold) and shipments of preexisting monetary stocks. Exports of newly produced gold, for example, represent a current account credit, just like any other merchandise or service export; ceteris paribus they add to national saving. Net shipments to foreigners of monetary gold, however, are a capital account credit.

Why worry at all about distinguishing monetary from nonmonetary gold flows in the balance of payments? After all, exports of monetary gold and newly produced gold alike serve the purpose of allowing an economy to consume more of other commodities, now or in the future. Our motive for pursuing the distinction is to preserve the traditional conceptual separation that balance of payments statistics make between current and capital transactions, or between transactions on goods and asset account. In the traditional framework, an economy's current account balance measures its accumulation of negotiable foreign claims—of which gold was the example par excellence during the period we study here. It is especially important to maintain the identity of the current account as net foreign asset accumulation when we are obliged to measure saving indirectly, as the sum of the current account and investment. Thus, despite the manifest imperfections in the period's data, some attempt at an appropriate adjustment of the standard current account figures seems warranted.

Of course, the preceding rationale for hoping to distinguish monetary from nonmonetary gold flows leads to well-known ambiguities. Why not consider silver to be an international asset and separate monetary from nonmonetary silver flows as well? Why not do the same with diamonds, or other precious items often hoarded as part of wealth? While there is a coherent conceptual case for proceeding in this manner, especially as regards silver, in practice we must draw the line somewhere, and in this study we have chosen—arbitrarily, some will conclude—to draw the line at gold. Our basic reason is that over our sample period as a whole, gold stood without peer as a universally acceptable reserve asset, and as the clear leader in quantitative importance.[4]

Historians have dealt with the problem of classifying gold flows by using several different methodologies. One practice (Feinstein 1972, 115 n. 1) has been to classify all gold movements as monetary in nature, and to subtract them from measured export balances in calculating the current account. A second procedure is to leave all gold shipments in the current account (Viner 1924). A third approach, theoretically preferable to the first two, is to attempt to distinguish monetary from nonmonetary gold movements. Doing so is not always straightforward, however, as we shall see. The next section describes the assumptions that underlie proper application of this third approach.

Gold Flows in the Balance of Payments

It might appear feasible to adjust official current account data simply by subtracting some measure of the net shipments of monetary gold. Typically, countries classified gold flows into three different categories: specie (coin), bullion, and unrefined gold. Unfortunately, these three categories do not correspond directly to monetary and nonmonetary flows of gold. For example, circulating coins may be melted down to bullion and exported to finance the balance of payments. This would imply that monetary gold flows were not fully captured by the data on specie exports. As Morgenstern (1955, 5) observes:

> The separation of monetary and non-monetary gold is neither simple nor conclusive. Gold can move from one category into the other within one country and domestic gold production can affect the stocks of both. During the classical gold standard period it was impossible to know, in the vast majority of cases, whether gold leaving and arriving came from one or the other of these sources and whether it was going—or in which proportions—to industrial or monetary use.

Figure 9.1 illustrates the problem by showing two equivalent international transactions.[5] In the first, indicated in the upper half, an ounce of newly mined gold ore is shipped directly from an Australian mine to an industrial user in the United Kingdom. This transaction raises Australia's official current account surplus (in terms of gold) by one ounce. Since the transaction clearly is not a monetary gold shipment, any reasonable measure of the current account surplus would rise by one ounce.

The lower half of figure 9.1 shows what happens when the U.K. industrial user satisfies his or her demand by purchasing an ounce of monetary gold in Australia, instead of relying on a direct shipment of ore. In this version of the transaction, the gold ore enters the Australian monetary gold stock in the form of bullion but is then immediately shipped abroad for industrial end use (so that Australia's monetary gold stock is not affected within the accounting period).[6] Is the gold shipment to be considered monetary or nonmonetary? If it were labeled as "monetary" and subtracted from Australia's exports to the United Kingdom, then, arguably, Australia's current account deficit would be overstated by one ounce of gold and Britain's surplus correspondingly overstated.

To avoid such problems, it is standard practice in balance of payments accounting to classify all movements of gold from domestic nonmonetary sources into the domestic money supply as nonmonetary gold exports. To offset this current account credit in the balance of payments, an equal capital account debit is added. The debit reflects the

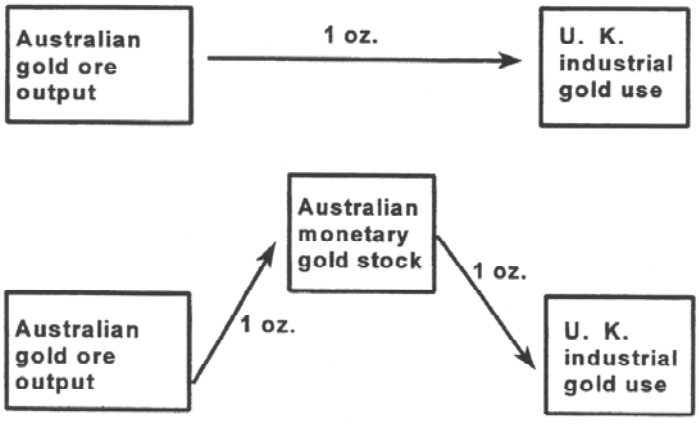

Figure 9.1
Equivalence of different gold transactions

acquisition of foreign assets and is a monetary gold import.[7] The rationale for this practice is that any increase in the monetary gold stock is an increase in national foreign exchange reserves. As Gardner (1953, 159) writes:

> Gold is peculiar . . . in the way it affects international monetary reserves. Sales of ordinary merchandise increase those reserves only if the sale is to foreigners. Domestic sales of newly mined gold . . . to the Central Bank or Treasury of the producing country effect the same additions to the country's international reserves as if the gold has been exported and sold abroad. Foreign exchange or its equivalent is created in the hands of the monetary authorities by either process. Hence newly mined gold is regarded as an export of the country whether sold abroad or directly to the local monetary authorities.

Similarly, domestic consumption out of the monetary gold stock is regarded as a simultaneous import of nonmonetary gold and export of monetary gold (the latter being a capital inflow). A key implication is that *any* increase in the domestic monetary gold stock is deemed a monetary gold import (and an "international" capital outflow).

Under this convention, it becomes straightforward to separate monetary from nonmonetary gold flows. Let ΔMG be the change in the monetary gold stock. Since ΔMG also equals net monetary gold imports, net nonmonetary gold exports can be calculated as total net gold shipments to foreigners, SG, less net monetary gold exports, $-\Delta MG$:

$$\text{Net nonmonetary gold exports} = SG - (-\Delta MG) = SG + \Delta MG. \tag{9.1}$$

On this definition, the true current account, CA, is the sum of the current account excluding all gold flows, CA^{NG}, and net nonmonetary gold exports from equation (9.1):

$$CA = CA^{NG} + SG + \Delta MG. \tag{9.2}$$

Notice that any monetary gold shipments in SG are canceled by the corresponding decrease in the monetary gold stock MG and thus do not affect the true current account. Equation (9.2) also has the following interpretation: under a gold standard, the current account equals total net foreign asset accumulation including all net accumulation of monetary gold.

Returning to the examples in figure 9.1, neither transaction sequence changes Australia's monetary gold stock, so both of the gold shipments shown raise Australia's current account balance as measured in equation (9.2) by one ounce of gold.

Application

We now describe the standard historical data and the adjustments that we have made to them. Our adjustments amount to adding the change in the domestic monetary gold stock to the current account inclusive of all international gold shipments.[8] Given the unrivaled universality of gold as an international reserve asset in our sample period, this adjustment is appropriate even when a country is not formally on the gold standard; we therefore apply it in every year for which we have data. We treat Australia and Canada individually and then discuss more briefly the treatment of other countries.[9]

Australia

The standard historical data on the Australian current account are those compiled by N. G. Butlin (1962). He adjusts the Australian current account figures by using data on gold production instead of net exports:

$$CA^{BUTLIN} = CA^{NG} + YU = CA^{O} - SG + YU, \tag{9.3}$$

where CA^{O} is the current account inclusive of all gold shipments SG, and YU is Australia's total output of unrefined gold. Butlin argued that gold production was the appropriate current account credit for a gold producing country. Boehm (1965) criticized N. G. Butlin's treatment of gold, and argued that this procedure overstates the extent of gold exports, and consequently understates the current account deficit. We can see that the approach adopted by Butlin omits some of the terms that appear in equation (9.2), and is, therefore, a less accurate correction of official statistics. No doubt Butlin proposed this approximation because the problem of identifying monetary gold flows is particularly acute for a gold producing country such as Australia. For instance, one might hope to identify monetary gold movements with gold shipped by banks and then adjust the trade figures accordingly. Unfortunately, it is not clear from the data that banks were always shipping gold to reduce desired domestic monetary gold holdings. To get the appropriate current account figure for Australia, we can modify equation (9.3) to get

$$CA = CA^{BUTLIN} + SG - YU + \Delta MG. \tag{9.4}$$

We applied this procedure to Australia to calculate a new current account series. Estimates of the change in the monetary gold stock were derived as follows. Specie flows into and out of New South Wales,

Victoria, and Western Australia (as reported in Annual Report of United Kingdom, Deputy Master of the Mint) were added to the change in the total bullion holdings of Australian trading banks. The mint reports document the flow of gold specie into and out of the three colonies only. However, this measure of the change in Australia's monetary gold stock appears to be the best available. For data after 1900, we use the estimates of the gold coin and bullion stock compiled by S. J. Butlin et al. (1971).

Canada

Viner's (1924) classic study assembled balance of payments data for Canada between 1900 and 1913. Viner's current account estimates, however, included all international gold shipments (monetary as well as nonmonetary). Thus, Viner's empirical measure of the current account corresponded to CA^O. Hartland (1954) extended Viner's methodology to cover the years 1868–1899.

In a meticulous analysis, Rich (1988) adjusted the Canadian data to account properly for monetary gold flows. Rich's current account estimates for Canada, however, omit net interest and dividend flows, despite his recognition that they constituted "a sizeable item in the Canadian balance of payments" (Rich 1988, 248). His motive in this omission was the unreliability of available estimates of net foreign asset income.

We calculate Canada's current account for the years 1870–1926 as follows. We take the current account including all gold shipments from Urquhart 1986. As in equation (9.2), we add the change in the total domestic monetary gold stock, as calculated by Rich (1988) for 1872 through 1913, supplemented by our own estimates for 1869–1871 and 1914–1926. Thus our approach corresponds to Rich's, except that Urquhart's data include superior estimates of net dividend and interest payments.[10] For 1927 onward, we use the Dominion Bureau of Statistics estimates presented in Urquhart and Buckley 1965, which appropriately separate monetary from nonmonetary gold flows.

Other Countries

Given the predominance of gold as an international reserve asset for the entire period, we perform the gold adjustment for all countries in every year of our sample.

For Denmark, France, Germany, Italy, Japan, Norway, Russia, Sweden, and the United Kingdom, the standard current account data

exclude all gold flows. The Finnish data on the current account include all gold shipments. The standard data for the United States current account include all gold shipments prior to 1874; thereafter they include nonmonetary gold exports (calculated appropriately as the sum of total net gold shipments and the change in the monetary gold stock).

For Denmark, Norway, and Finland, data limitations lead us to proxy the monetary gold stock by the stock of gold at the central bank. Data on net shipments of gold for Denmark and Norway are derived by taking the change in the monetary gold stock, supplemented by League of Nations data and trade statistics. For Sweden the gold holdings of the central bank were used to calculate changes in the monetary gold stock for several periods, supplemented by data on gold in banks. Data on net gold shipments and the monetary gold stock for Germany are reported by the Bundesbank.

For France, the data on net shipments of gold include silver until 1870, then subsequently include gold only.[11] Up until 1913, estimates of the French monetary gold stock are based on the work of Flandreau (1995) and Sicsic (1989); later data come from the *Annuaire Statistique* (France, Ministère des Finances et des Affaires Économiques 1966). For Italy and Japan, the specie component of the monetary gold stock is estimated in a manner similar to the Australian calculations: taking the sum of inflows and outflows of coin from the mints and trade statistics.[12] The Italian data relating to monetary bullion are fragmentary and difficult to interpret, so we make no use of them. For Japan, the change in the monetary gold stock is calculated as the change in the estimated stock of specie in the country, less net exports of bullion. Use of bullion exports is problematic, as we have discussed, but should induce less serious errors than in the case of a gold producer like Australia. For Russia, the monetary gold stock is proxied by the sum of gold holdings in the treasury and state bank until 1891; thereafter gold in circulation is included.

For the United Kingdom, estimates of the monetary gold stock outside the Bank of England are provided by Capie and Webber (1985) up to 1921. We add to their numbers data on Bank of England gold holdings. After 1921 data limitations lead us to proxy the U.K. monetary gold stock essentially by the gold holdings of the Bank of England. Trade statistics provide the estimates of net gold shipments from the United Kingdom. For the United States prior to 1874, the treasury figures on the monetary gold stock are used throughout: we add

changes in the monetary gold stock to the official pre–1874 current account numbers, which include all gold flows across United States borders.

From the preceding discussion it is obvious that the data on monetary gold flows and net shipments of gold are far from perfect. Our reliance (in some cases) on central bank gold holdings for estimates of changes in the monetary gold stock overlooks the important role often played by changes in private hoards. The gaps in the trade data for some countries also force us to rely on central bank gold stocks to proxy gold trade figures, a procedure that effectively ignores industrial consumption of gold. Thus we are often left with imprecise measures of gold flows.

However, it is difficult even today to obtain accurate estimates of currency in the hands of the public, because of unrecorded flows into and out of a country. The object of this chapter is to obtain estimates of gold flows for a wide group of countries and then ensure the consistent treatment of gold in the current account statistics. The inaccuracies of the data must be considered in light of that objective. Bearing in mind these caveats, the data we have compiled should provide a superior estimate of the current account and savings flows, one that is less distorted by the conflicting national treatments of gold in the balance of payments.

The end result of the estimation of gold flows is presented in figure 9.2, which shows average current account-to-GDP ratios over 1885–1913 for the countries in our sample.[13] The figure presents the original current account figures given in the standard historical sources, along with the gold-adjusted figure, as per equation (9.2). We can see from this figure that correcting for gold flows can make a substantial difference to the measured current account, even when averaged over relatively long periods of time.

Adjusting for gold flows has the biggest impact on the averaged original data for Australia, Canada, France, Japan, Russia, and the United Kingdom. We would expect Australia, Canada, and Russia, as major gold producers, to be prime candidates for current account mismeasurement. The standard current account figures for both France and Japan exclude all gold flows. Therefore, the differences between the original current accounts and the gold-adjusted figures represent nonmonetary gold flows, which seemingly were substantial for these two countries.[14] Both of these instances should be treated with caution, since they may reflect mismeasurement of the change in the monetary gold

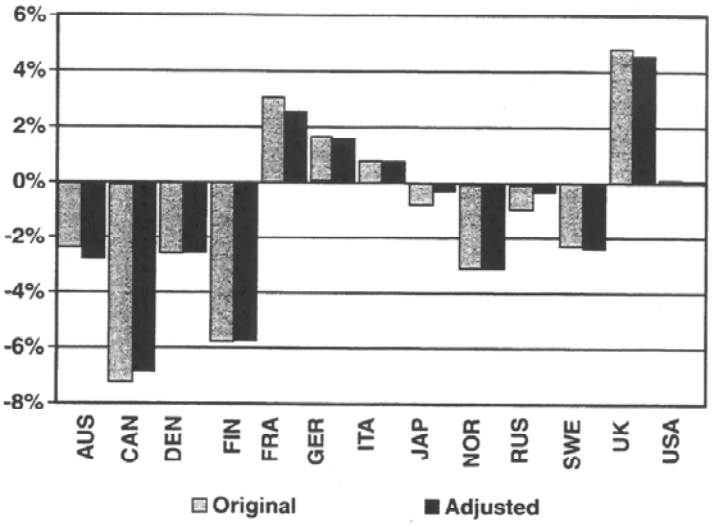

Figure 9.2
Current account with original and gold-adjusted data, 1885–1913, period averages (percentage of GDP)

stock. For example, French gold imports that did not find their way into the measured stock of monetary gold may well have entered private hoards rather than industrial use, and in that form could have been highly substitutable for monetary gold. Our skepticism regarding the adjusted Japanese numbers led us to check all the econometric results reported below for their sensitivity to our adjustment of Japan's customary current account data. That adjustment made no discernible difference to our results.

Table 9.1 shows the effect of adjusting the current account statistics for gold flows for each country. We can see from this table that our treatment of gold provides current account estimates that diverge from the standard historical measures. The mean absolute deviation (MAD) measure presented in the table suggests that for some countries the absolute divergence is frequently large, especially for Denmark, France, Japan, and Russia.

Inventories Data

An analysis of saving and investment flows requires a measure of total gross investment. Gross investment consists of the sum of fixed investment plus changes in stocks or inventories. As Eichengreen (1992a) points out, previous compilations of historical statistics have often

Table 9.1
Effect of gold adjustment on current accounts: Means and standard deviations of original data, gold-adjusted data, and mean absolute difference (expressed as a percentage of GDP)

	Full sample period					1885 to 1913				
	Original CA		Adjusted CA			Original CA		Adjusted CA		
Country	Mean	Std. dev.	Mean	Std. dev.	MAD	Mean	Std. dev.	Mean	Std. dev.	MAD
Australia	–3.9	6.2	–4.2	6.1	0.5	–2.4	6.0	–2.8	6.0	0.5
Canada	–3.5	5.7	–3.4	5.7	0.3	–7.2	3.7	–6.9	3.6	0.4
Denmark	–0.2	4.6	–1.2	2.1	1.2	–2.6	1.5	–2.6	1.4	0.2
Finland	–5.2	5.5	–5.1	5.6	0.2	–5.8	2.5	–5.8	2.5	0.1
France	2.6	3.9	2.6	3.9	0.9	3.1	1.1	2.6	1.2	0.6
Germany	1.2	1.3	1.2	1.3	0.1	1.6	0.7	1.6	0.7	0.1
Italy	–1.3	4.5	–1.3	4.5	0.1	0.8	2.3	0.8	2.3	0.0
Japan	–0.2	3.2	0.1	3.2	0.3	–0.8	3.0	–0.3	2.9	0.5
Norway	–1.7	4.0	–1.7	4.0	0.2	–3.2	2.8	–3.1	2.9	0.2
Russia	–1.0	1.5	–0.4	2.5	1.4	–1.0	1.5	–0.4	2.5	1.4
Sweden	–0.8	3.3	–0.8	3.5	0.3	–2.3	2.1	–2.4	2.1	0.1
U.K.	2.3	3.8	2.3	3.7	0.5	4.8	2.5	4.6	2.6	0.3
U.S.	0.5	1.6	0.5	1.6	0.0	0.1	1.2	0.1	1.2	0.0

Note: The full sample period consists of Australia: 1861–1945; Canada: 1870–1945; Denmark: 1874–1914, 1921–1945; Finland: 1872–1945; France: 1851–1913, 1919–1938; Germany: 1877–1913, 1925–1938; Italy: 1861–1936; Japan: 1885–1944; Norway: 1865–1939; Russia: 1885–1913; Sweden: 1875–1945; United Kingdom: 1869–1945; United States: 1870–1945.

Table 9.2
Estimates of changes in stocks/inventories (as a percentage of GDP), period averages

Country	Sample period	Stocks ratio	Country	Sample period	Stocks ratio
Australia	1861–1945	1.00	Japan	1885–1944	2.79
Canada	1926–1945	0.57	Norway	1900–1939	–0.04
Denmark	—	—	Russia	1885–1913	1.69
Finland	1860–1945	3.74	Sweden	1861–1945	0.03
France[1]	1850–1938	2.08	United Kingdom	1850–1945	0.48
Germany[2]	1872–1938	0.97	United States	1869–1945	2.05
Italy	1861–1945	0.12			

[1] No data for 1914 to 1918.
[2] No data for 1914 to 1924.

ignored the role of inventories in gross investment. We have gathered additional data on inventories, so that the investment numbers for Australia, Canada, Finland, France, Germany, Italy, Japan, Norway, Russia, Sweden, the United Kingdom, and the United States now include estimates of changes in stocks or inventories. The details are discussed in appendix 9.2.[15]

The omission of inventories introduces a source of bias into regression estimates of saving-investment correlations. Table 9.2 shows the magnitude of changes in stocks and inventories for countries with available data. It is evident from the magnitude of the numbers in this table that adjusting for inventory changes may have potentially large effects.[16]

Empirical Analysis

In a world on the gold standard, the two principal outside financial assets are capital and monetary gold. In a closed economy, all saving must flow into one of these two assets. Thus,

$$I = S - \Delta MG. \tag{9.5}$$

Under a gold standard, the Feldstein-Horioka capital immobility hypothesis (in its most extreme form) is that all trade imbalances are financed by international gold flows, rather than by private capital flows (which could involve repayment or political risk). This implies that equation (9.5), which was derived as a closed-economy identity,

also applies to open economies when international borrowing and lending are impossible. For example, a country's investment can increase above its saving only if it exports monetary gold abroad or transforms some of its monetary gold into plant and equipment.

Because of the imprecise or inadequate nature of historical national accounts data, historical estimates of saving must be calculated residually as the sum of investment and the current account:

$$S = I + CA. \tag{9.6}$$

Under a gold standard, the appropriate definition of saving recognizes that the current account is equal to net foreign asset accumulation, including monetary gold acquisitions. The typical (post–gold standard) implementation of the Feldstein-Horioka test is a cross-sectional regression of I on S, with both variables defined as ratios to Gross Domestic Product (GDP) or Net National Product (NNP). The more appropriate test under the gold standard is a regression of I on $S - \Delta MG$, according to equation (9.5).

There are thus two ways to implement the Feldstein-Horioka test in a world where gold plays an important monetary role. The first is to run the cross-section regression

$$\frac{I}{Y} = \alpha + \beta \frac{S}{Y} + \gamma \frac{\Delta MG}{Y} + u. \tag{9.7}$$

The Feldstein-Horioka hypothesis is that $\beta = 1$ and $\gamma = -1$. Alternatively, one could impose the constraint that saving and the change in the monetary gold stock have coefficients equal in absolute magnitude but of opposite sign. This procedure leads to the specification

$$\frac{I}{Y} = \alpha + \beta \frac{(S - \Delta MG)}{Y} + u. \tag{9.8}$$

The Feldstein-Horioka hypothesis implies that $\beta = 1$.

Notice that $S - \Delta MG$ is the saving measure one derives by adding to investment the current account inclusive of *all* gold shipments, CA^{O}, as per Viner's (1924) current account estimates for Canada, described above. Why is Viner's concept, rather than the one used to construct true saving, S, the appropriate one to use on the right hand side of equation (9.8)? Suppose a country imports gold coin to add to its money stock ($\Delta MG > 0$) with true saving, S, unchanged. If investment does not fall by an equal amount, then the country would necessarily

be borrowing abroad to maintain an unchanged path of national wealth. If international borrowing and lending are ruled out (as implied by the Feldstein-Horioka hypothesis), however, it follows that increases in national saving (given ΔMG) and decreases in monetary gold holdings (given S) both feed through fully to increased investment.[17]

Our empirical analysis is based on data from thirteen countries: Australia (1861–1945), Canada (1870–1945), Denmark (1874–1914, 1921–1945), Finland (1872–1945), France (1851–1913, 1919–1938), Germany (1877–1913, 1925–1938), Italy (1861–1936), Japan (1885–1944), Norway (1865–1939), Russia (1885–1913), Sweden (1875–1945), the United Kingdom (1869–1945), and the United States (1870–1945). The data sources are described in appendix 9.2. Figure 9.3 presents scatter plots of the average saving and investment rate data for two subperiods, 1885–1913 and 1919–1936. (Rather than giving true saving, S, the horizontal axes in figure 9.3 give the independent variable in equation (9.8).)

Table 9.3 presents the basic Feldstein and Horioka (1980) cross-sectional regression of average investment rates on average saving rates, using the specification of equation (9.8).[18] The estimates of the slope parameter range from just under 0.5 to close to 1. The later samples (after World War I) tend to have stronger correlations and, after 1931, much more explanatory power. (After 1931, the R^2 statistics are above 0.90.) Prior to 1914 the R^2 statistics are much lower than those

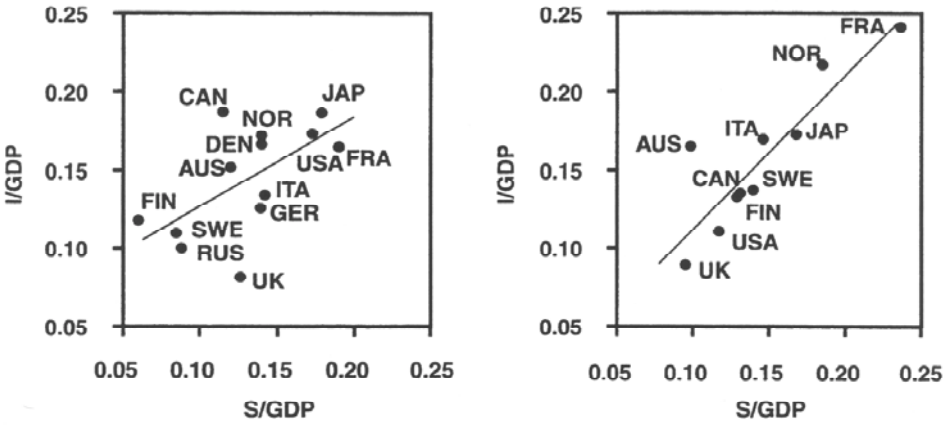

Figure 9.3
Saving and investment rates (expressed as ratios to GDP): 1885–1913 and 1919–1936

Table 9.3
Parameter estimates from regression of investment on savings ($S \equiv I + CA^{NG} + SG - \Delta MG$)

Sample period	Number of countries	Coefficient on S	Standard error	Adj. R^2
1880–1913	11	0.45	0.26	0.16
1885–1913	13	0.55**	0.22	0.30
1880–1890	11	0.44	0.28	0.13
1891–1901	13	0.62***	0.16	0.54
1902–1913	13	0.60**	0.27	0.25
1919–1924	10	1.00**	0.36	0.43
1925–1930	12	0.70***	0.15	0.66
1931–1936	12	0.91***	0.09	0.90
1937–1939	9	0.92***	0.09	0.92

Notes: The estimates for 1880–1913 and 1880–1890 exclude Japan and Russia; for 1919–1924 they exclude Denmark, Germany, and Russia; for 1925–1930 and 1931–1936 they exclude Russia; and for 1937–1939 they exclude France, Germany, Italy, and Russia.
*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

found for industrial countries in the 1960s (usually around 0.90) and even lower than those found for the 1980s (usually around 0.5 to 0.7, depending on the period of estimation).[19]

The results presented in the table suggest that the saving-investment correlation has been lower in periods when the gold standard prevailed. The immediate post–World War I period (1919–1924) and later samples (1931–1936, 1937–1939), periods when many countries were not on strict gold standards, both have higher correlations. These periods also saw rather widespread use of capital controls. Because these controls became much more stringent in the 1930s, they probably are the major explanation for the very high R^2 statistics reported in table 9.3 post 1931.[20]

Even though the R^2 statistics tend to be low before the 1930s, and especially before World War I, the 1891–1901 decade is an exception, with an R^2 not far from those one finds in Organization for Economic Cooperation and Development (OECD) data from the 1980s and 1990s. In addition, the slope coefficient is sometimes significant under the classical gold standard, notably after 1891, when its magnitude is comparable to the estimates from recent OECD data. The results for the late nineteenth century seem even more comparable with those in recent data when one observes that several of the countries in the gold-standard sample could be classified as developing then. Even in post–World War II samples that include the developing countries, the

empirical saving-investment link appears weaker prior to the 1982 debt crisis; see Dooley, Frankel, and Mathieson 1987 and Summers 1988.

Having estimated the regression equation, we now turn to tests of some hypotheses. The first question to consider is whether there is sufficient evidence to believe that the coefficient on saving is equal to 1, that is, that saving and investment are perfectly correlated in cross-section. We see from figure 9.4 that the 95 percent confidence intervals for most of the slope estimates are quite wide. Because most of the point estimates are clustered around 0.5, we perform a t test of the hypothesis $\beta = 0.5$ against the alternative $\beta \neq 0.5$. We also perform the one-tailed test of the restriction that $\beta = 1$ against the alternative hypothesis that $\beta < 1$. We present the results of these hypothesis tests in table 9.4. The column labeled *p Value of Test* $\beta = 0.5$ gives the result of the hypothesis test that the coefficient on savings, β, is equal to one-half, against the alternative that β differs from one-half. The p value is the probability of incorrectly rejecting the null hypothesis when it is true, so a low p value implies strong evidence against the null hypothesis that $\beta = 0.5$. We see from this column that we can reject the hypothesis $\beta = 0.5$ only for the last two sub-samples in our data set: 1931–1936 and 1937–1939. The column labeled *p Value of Test* $\beta = 1$ shows we can reject that hypothesis for all sample periods except 1919–1924 and 1931–1939.

To summarize the results of the previous two tables, we do not find strong evidence against the coefficient on saving being equal to 0.5. We have evidence that the coefficient is less than 1 for most periods examined. There is some evidence of a positive relationship between saving

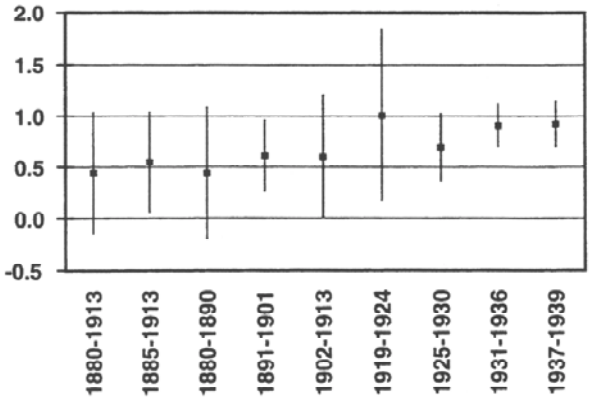

Figure 9.4
Slope estimates (β) and 95-percent confidence intervals

Table 9.4
Hypothesis tests from regression of investment on savings ($S \equiv I + CA^{NG} + SG - \Delta MG$)

Sample period	Coefficient on S	p value of test, $\beta = 0.5$	p value of test, $\beta = 1$
1880–1913	0.45	0.84	0.03
1885–1913	0.55**	0.82	0.03
1880–1890	0.44	0.85	0.04
1891–1901	0.62***	0.48	0.02
1902–1913	0.60**	0.71	0.08
1919–1924	1.00**	0.20	0.50
1925–1930	0.70***	0.21	0.03
1931–1936	0.91***	0.00	0.17
1937–1939	0.92***	0.00	0.22

Notes: The estimates for 1880–1913 and 1880–1890 exclude Japan and Russia; for 1919–1924 they exclude Denmark, Germany, and Russia; for 1925–1930 and 1931–1936 they exclude Russia; and for 1937–1939 they exclude France, Germany, Italy, and Russia. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

and investment rates even under the classical gold standard. This last result stands in contrast to Bayoumi (1990), who found no significant cross-sectional relationship between saving and investment for any period from 1880–1913. However, Eichengreen (1992a) reported relatively high estimates of the β coefficient over some sub-samples.[21] The results in tables 9.3 and 9.4 indicate slope coefficients generally lower than those found by Eichengreen but higher and more significant than the ones Bayoumi estimated.

Table 9.5 presents the parameter estimates of Bayoumi (1990) and Eichengreen (1992a) for comparison. Using the same countries and time periods, we estimated the correlations using our gold-adjusted data. For instance, the third column, labeled *Adjusted Bayoumi*, shows the results of the regression using our gold-adjusted data, but with only the eight countries that Bayoumi included in his sample. Similarly, the column labeled *Adjusted Eichengreen* shows the results of the regression using our gold-adjusted data for the nine countries in Eichengreen's sample. The column labeled *Full-Sample Estimates* shows the results from table 9.3, that is, the slope coefficient estimates using the gold adjusted data for all available countries. Bayoumi's conclusions appear to stem mainly from the use of a small sample of countries. Eichengreen's addition of the United States raises the slope coefficients and increases the statistical power available. But our addition of more countries to Eichengreen's sample moderates his findings somewhat.

Table 9.5
Comparison of parameter estimates from Bayoumi, Eichengreen, and gold-adjusted data

Sample period	Bayoumi estimates	Adjusted Bayoumi	Eichengreen estimates	Adjusted Eichengreen	Full-sample estimates
1880–1913	0.29	0.43	0.63*	0.57	0.45
1880–1890	0.48	0.14	0.59*	0.50	0.44
1891–1901	0.69	0.63	0.71***	0.68*	0.62***
1902–1913	−0.10	0.89	0.72	0.86	0.60**
1924–1936	—	0.70**	1.06***	0.76**	0.80***
1925–1930	—	0.56	1.22***	0.55	0.70***

Notes: Bayoumi's sample of countries consisted of Australia, Canada, Denmark, Germany, Italy, Norway, Sweden, and the United Kingdom. Eichengreen added the United States. Our data set adds Finland, France, Japan, and Russia and adjusts for gold flows. The full sample estimates for 1880–1913 and 1880–1890 exclude Japan and Russia; for 1924–1936 they exclude Germany and Russia; for 1925–1930 they exclude Russia.
*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table 9.5 suggests that the selection of countries in the cross-sectional average is of key importance. Indeed, this appears to matter as much as the gold adjustment we perform. As we show in appendix 9.1, the parameter estimates are sensitive to the choice of countries in the cross-sectional average. Changing the countries in the sample can alter the estimated slopes by as much as 0.3, and the explanatory power of the investment-on-saving regression can vary by as much as 40 percent. Despite these caveats, the significance of parameter estimates seems fairly robust in the face of single deletions from the sample of countries. Thus, despite the sensitivity of the estimates to outliers, the broad thrust of the full-sample results suggested by the preceding two tables remains valid.

A sample period of particular interest is 1925–1930, during which Britain adhered to the interwar gold standard, and most market economies in the world likewise rejoined the gold standard. Eichengreen (1992a) estimates a highly significant slope coefficient of 1.22 under the resuscitated gold standard that prevailed during the years 1925–1930 (see table 9.5), much higher than those found for the classical, pre-1914 gold standard. On that basis he disputes the theory, advanced by the *Economist* magazine among others (*Economist* 1989), that the greater nominal exchange rate certainty prevailing under gold-standard regimes necessarily leads to greater international capital mobility and thereby to lower saving-investment coefficients.

Table 9.5 shows, however, that for Eichengreen's original sample of nine countries, our adjusted data lead to a statistically insignificant slope coefficient of only 0.55, which is quite comparable to those one finds for pre-1914 data.[22] In our fully-sized sample the estimated slope is somewhat higher, at 0.70, and is significantly different from zero at the 1 percent level. Nonetheless, our estimated slope for 1925–1930 seems markedly lower than those we estimate for any other subperiod of the interwar span (see table 9.4).

Thus, there is indeed some evidence that the interwar gold standard made a difference for the cross-country saving-investment relationship. Exchange rate volatility could be only a minimal part of the reason, however. The restored interwar gold standard was accompanied by a general relaxation of exchange controls, which may well have had a much greater impact on capital mobility than the nominal exchange rate regime.

If the cross-sectional averages used in the saving-investment regression correspond to the years when each country was on the gold standard, then the estimated correlations actually are higher.[23] However one cannot conclude from this result that gold standard adherence resulted in a tighter saving-investment link. Countries may have been more likely to be on gold in periods when their current accounts were near balance.

Conclusions

In this chapter we have presented revised estimates of saving and investment for thirteen countries over the period from 1850 to 1945. We have constructed a measure of the current account that treats gold flows on a consistent basis across countries, and also adjusted investment data to account for changes in inventories.

Our methodology for removing monetary gold flows from current account data led naturally to a gold standard version of the Feldstein-Horioka (1980) hypothesis on capital mobility. Our regression results are in broad agreement with Eichengreen (1992a), who found a significantly positive cross-sectional correlation between saving and investment even during some periods when the gold standard prevailed. Despite the high level of capital mobility that prevailed under the gold standard, it seems that average national saving and domestic investment rates were cross-sectionally correlated, contrary to the Feldstein-Horioka hypothesis. Nonetheless, the explanatory power of the

pre-1914 regressions is usually much lower than in the corresponding post-1960 regressions.

Despite reaching broadly similar conclusions, we estimate correlations between saving and investment that are somewhat lower than those Eichengreen (1992a) found. In particular, we find that in comparison to other interwar subsamples, the saving-investment correlation is markedly low during the fleeting years of a revived world gold standard, 1925–1930. The proportions in which this phenomenon should be ascribed to greater exchange rate predictability as opposed to relaxed capital controls is a topic for future research.

Appendix 9.1 Omitted Variables Bias, Alternative Specification, and Parameter Sensitivity

This appendix deals with the sensitivity of the parameter estimates in the paper to the inclusion of gold flows and inventory data, and to the set of countries included in the cross-sectional average.

Gold Flows

We argued in the text that in regressions of investment on saving, figures for the current account should include all data on gold flows. This choice leads to the specification in equation (9.8). Omitting data on total net gold shipments introduces an omitted variables bias into the estimates.

We denoted the true variable of interest, the current account including all gold (expressed as a fraction of GDP or NNP), by CA^O. It is defined as the sum of the nongold current account, CA^{NG}, and net shipments of gold to foreigners, SG:

$$CA^O = CA^{NG} + SG. \tag{A.9.1}$$

The true relation we are interested in estimating is

$$I = \alpha + \beta(I + CA^O) + u. \tag{A.9.2}$$

This expression can be rewritten using equation (A.9.1):

$$\begin{aligned} I &= \alpha + \beta(I + CA^{NG} + SG) + u \\ &= \alpha + \beta(I + CA^{NG}) + \beta SG + u. \end{aligned} \tag{A.9.3}$$

Table A.9.1
Comparison of parameter estimates from regression of I on $(I + CA^{NG} + SG)$ with regression of I on $(I + CA^{NG})$

Sample period	Estimated parameter	With SG	Without SG	Percentage bias†
1885 to 1913	Slope: β	0.55**	0.44*	–19.78
All countries	Adj. R^2	0.30	0.20	–33.56
1919 to 1936	Slope: β	0.95***	0.89***	–7.00
Excl. Den, Fra, Ger, Rus	Adj. R^2	0.74	0.66	–9.98

† Percentage bias is calculated by taking the difference in parameter estimates as a proportion of the correctly specified parameter.
*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Excluding gold flows from the measured value of the current account introduces a source of bias into the estimation procedure, as regressing I on $I + CA^{NG}$ (and a constant) only omits the third term on the right hand side of equation (A.9.3). The extent of the omitted variables bias is illustrated in the following table.

The table illustrates that the slope coefficient is underestimated by almost 20 percent when the 1885 to 1913 data are used. When data from the interwar period are used, the extent of the understatement of the slope coefficient is reduced, but it still remains important. In both cases the explanatory power of the regression is reduced. These results are in accord with our intuition of the likely impact of including gold flows, as nongold current account balances tend to be negatively correlated in cross-section with net outward shipments of gold.[24] Adding gold flows to the estimated equation thus has the effect of raising the measured correlation between saving and investment, as the table demonstrates.

Inventories

We pointed out in the paper that figures for gross investment should include the value of changes in inventories or stocks. Omitting data on stocks will introduce another source of bias into the estimates.

Suppose that the true variable of interest is total gross investment, I, which is defined as the sum of gross fixed investment, I^F, and changes in inventories or stocks:[25]

$$I = I^F + \Delta Stocks. \tag{A.9.4}$$

Saving is defined residually, as the sum of the current account and gross investment

$$S = CA + I. \tag{A.9.5}$$

Let the level of *fixed* saving, S^F, be defined as the current account plus gross *fixed* investment,

$$S^F = CA + I^F, \tag{A.9.6}$$

such that $S = S^F + \Delta Stocks$. Now suppose that the true relation we are interested in estimating is given by the expression

$$I = \alpha + \beta S + u. \tag{A.9.7}$$

This expression can be rewritten by using equations (A.9.5) and (A.9.6):

$$I^F = \alpha + \beta S^F + (\beta - 1)\Delta Stocks + u. \tag{A.9.8}$$

Excluding inventory data from the measured value of investment introduces a potential source of bias into the estimation procedure, as regressing fixed investment on fixed saving omits the third term on the right-hand side of equation (A.9.8). The extent of the resulting omitted variables bias is illustrated in table A.9.2.

There is a large effect for the 1885–1913 sample. When inventories data are excluded, the slope coefficient is overstated, as is the explanatory power of the regression.

Alternative Regression Specification

An alternative specification, given in equation (9.7), allows for possibly different coefficients on saving and the change in the monetary gold stock. Results from this specification are presented in table A.9.3.

Table A.9.2
Comparison of parameter estimates from regression of I on (S^F + $\Delta Stocks$) with regression of I^F on S^F

Sample period	Estimated parameter	With $\Delta Stocks$	Without $\Delta Stocks$	Percentage bias†
1885 to 1913	Slope: β	0.55**	0.67***	20.92
All countries	Adj. R^2	0.30	0.60	96.41
1919 to 1936	Slope: β	0.95***	0.93***	–2.47
Excl. Den, Fra, Ger, Rus	Adj. R^2	0.74	0.55	–25.19

†Percentage bias is calculated by taking the difference in parameter estimates as a proportion of the correctly specified parameter.
*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A.9.3
Parameter estimates from regression of I on S and ΔMG ($S \equiv I + CA^{NG} + SG + \Delta MG$)

Sample period	Sample size	Coefficient on S: β	Standard error	Coefficient on ΔMG: γ	Standard error	Wald test $\beta = 1$, $\gamma = -1$	Adj. R^2
1880–1913	11	0.42	0.25	8.33	7.48	3.07	0.20
1885–1913	13	0.55**	0.23	0.03	3.78	1.90	0.24
1880–1890	11	0.37	0.23	11.27**	4.66	6.23**	0.45
1891–1901	13	0.61***	0.17	−0.68	1.76	2.72	0.50
1902–1913	13	0.55*	0.27	5.10	5.71	1.59	0.25
1919–1924	10	1.13**	0.44	−4.37	5.55	0.18	0.38
1925–1930	12	0.75**	0.24	−1.37	2.46	1.96	0.63
1931–1936	12	0.94***	0.09	0.34	0.79	1.85	0.91
1937–1939	9	0.94***	0.10	−0.67	0.70	0.36	0.91

Notes: The estimates for 1880–1913 and 1880–1890 exclude Japan and Russia; for 1919–1924 they exclude Denmark, Germany, and Russia; for 1925–1930 and 1931–1936 they exclude Russia; for 1937–1939 they exclude France, Germany, Italy, and Russia.
*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

We can see from the results in this table that including the monetary gold stock adds little to the previous results. The explanatory power does not change by much, because the coefficient estimates on the change in the monetary gold stock are mostly insignificant, even at the 10 percent level. We can reject the hypothesis that the coefficient on saving equals 1 and the coefficient on changes in the monetary gold stock equals –1 for a single period only: 1880–1890.

Outlier Sensitivity

This section deals with the question of how sensitive the parameter estimates are to outliers. Table A.9.4 presents the results of the regressions for different time periods when one country is dropped from the sample at a time. Using this procedure, the highest and lowest parameter estimates were obtained. For comparison, the full sample estimates of the slope are presented in the final column.

We can see from this table that the parameter estimates are quite sensitive to the sample of countries in the cross-sectional average. The estimated slope coefficient can change by as much as 0.3, and the explanatory power can change by more than 60 percent. For the pre–World War I period, the inclusion of the United States tends to raise the parameter estimates, while Finland tends to lower the estimates. For the post–World War I period, the inclusion of Germany tends to raise the saving-investment correlations, while Australia tends to lower them.[26]

Parameter Estimates: On or Off Gold Standard

Another interesting question to consider is whether being on the gold standard makes a difference to the estimated saving-investment correlation. This question can be addressed by estimating the parameters only for countries that were on the gold standard for the entire sample period, or by using data for the years that a country was on the gold standard.[27] We adopt both approaches here. Table A.9.5 shows the results of estimating the parameters for countries that were on the gold standard, and it shows country averages based on the period for which the country was on the gold standard. For comparison, we include in the final two columns the parameter estimates based on all available data.

We can see from the results presented in this table that including only countries on the gold standard for the entire sample period tends to

Table A.9.4
Maximum and minimum slope estimates from regression of investment on savings

Sample period	Min β parameter	Adj. R^2	Missing country	Max β parameter	Adj. R^2	Missing country	Full sample β
1880–1913	0.38	0.07	SWE	0.50	0.09	FIN	0.45
1885–1913	0.49*	0.23	RUS	0.63**	0.28	FIN	0.55**
1880–1890	0.23	–0.06	USA	0.49	0.18	CAN	0.44
1891–1901	0.53**	0.37	JAP	0.68***	0.57	FIN	0.62***
1902–1913	0.54*	0.18	RUS	0.74*	0.22	FIN	0.60**
1919–1924	0.80**	0.37	NOR	1.14**	0.55	AUS	1.00**
1925–1930	0.55*	0.27	FRA	0.89***	0.94	AUS	0.70***
1931–1936	0.86***	0.87	GER	0.97***	0.92	UK	0.91***
1937–1939	0.87***	0.92	JAP	0.96***	0.95	AUS	0.92***

Notes: The full sample estimate for 1880–1913 and 1880–1890 excludes Japan and Russia; for 1919–1924 it excludes Denmark, Germany, and Russia; for 1925–1930 it excludes Russia; for 1931–1936 it excludes Russia; for 1937–1939 it excludes France, Germany, Italy, and Russia.
*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

Table A.9.5
Slope estimates from regression of investment on savings for countries on the gold standard and for years on the gold standard

Sample period	Including countries on gold standard		Including years on gold standard		All available data	
	β	Adj. R^2	β	Adj. R^2	β	Adj. R^2
1880–1913	0.46	0.17	0.58**	0.33	0.45	0.16
1885–1913	0.44	0.14	0.57**	0.31	0.55**	0.30
1880–1890	0.44	0.12	0.44	0.13	0.44	0.13
1891–1901	0.52**	0.37	0.66***	0.54	0.62***	0.54
1902–1913	0.63*	0.25	0.63*	0.25	0.60**	0.25
1919–1924	—	—	—	—	1.00**	0.43
1925–1930	0.78**	0.87	0.79***	0.71	0.70***	0.66

Notes: The estimates for countries on the gold standard for 1880–1913, 1885–1913, 1880–1890, and 1891–1901 exclude Italy, Japan, and Russia; the estimates for 1902–1913 exclude Italy; the estimates for 1925–1930 include only Germany, Sweden, the United Kingdom, and the United States. The full sample estimates for 1880–1913 and 1880–1890 exclude Japan and Russia; for 1919–1924 they exclude Denmark, Germany, and Russia; for 1925–1930 they exclude Russia.
*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively.

lower the estimated saving-investment correlation. However, taking the country average for years that a country was on the gold standard tends to raise the estimated correlation as well as the explanatory power of the regression. As noted in the text, this result is difficult to interpret because the timing of gold standard adherence was endogenous for many countries.

Appendix 9.2 Data Sources and Methods

The investment ratios estimated in the paper were calculated by taking current price estimates of gross domestic capital formation (gross fixed investment plus changes in stocks/inventories) as a percentage of gross domestic product at market prices.[28] The estimates of stocks may include changes in the value of livestock.[29] The saving ratio was estimated by adding the investment ratio to the current account to GDP or NNP ratio, measured in current prices. The saving ratio is thus defined residually, and hence incorporates all measurement error from both investment and the current account.

Australia

GDP

GDP data from 1861–1900 are from N. G. Butlin 1962, 6, table 1, col. 2, market prices, calendar years, millions of pounds. GDP data from 1900 to 1944 are from M. W. Butlin 1977, 78–79, table IV.1, col. 11, current prices, millions of (Australian) dollars. Data are for financial years (July 1 to June 30), 1900/1901 to 1944/1945.

Capital Formation

Capital formation data for 1861–1900 are from N. G. Butlin 1962, 16, table 4, total public and private gross domestic capital formation, market prices, calendar years, thousands of pounds. Capital formation data include changes in stocks. Changes in stocks data for 1861–1900 are from N. G. Butlin 1962, 22, table 7, livestock accumulation, market prices, calendar years, thousands of pounds. N. G. Butlin (1962, 21) argues that "Livestock assets form a large part of the total private Australian assets, and changes in livestock assets are very large in relation to total private gross capital formation." N. G. Butlin proposed a measure of domestic capital accumulation equal to capital formation plus changes in livestock. This procedure is used for Australian data prior to 1901.

This inclusion of livestock accumulation estimates in capital formation data is controversial, however. As Boehm (1965, 211) argues, "The alternative sequence warrants close attention in income and growth analyses because the general effects on output and expenditure of changes in livestock are not necessarily comparable with the effects of changes in fixed assets." For Australia, increases in livestock average around 1.07 percent of GDP from 1861 to 1900, and then 0.94 percent from 1900/1901 to 1944/1945.

From the perspective of national accounts classification, the System of National Accounts advocates the classification of livestock accumulation into estimates of changes in stocks. According to the United Nations Statistical Office (1952, 80), the value of the increase in stocks should be classified in the same way as fixed capital formation in the national accounts. The System of National Accounts was adopted by many countries in our dataset and applied retrospectively to historical data. Thus, for the purposes of this chapter, we will follow this procedure and include livestock accumulation in estimates of changes in stocks.

Capital formation data from 1900 to 1944 are from M. W. Butlin 1977, 78–79, table IV.1, private plus public fixed capital formation, current prices, millions of dollars. Data are for financial years (July 1 to June 30), 1900/1901 to 1944/1945. Capital formation data include changes in stocks. Data for changes in stocks from 1900 to 1944 are from M. W. Butlin 1977, 78–79, table IV.1, current prices, millions of dollars. Data are for financial years (July 1 to June 30), 1900/1901 to 1944/1945.

Current Account

Current account data for 1861–1900 are from N. G. Butlin 1962, 444, table 265 for current account balance, in millions of pounds. (The number in Butlin's table is defined as an excess of debits, so that number with its sign reversed is used for the current account balance—that is, a positive number implies surplus.) Current account data for 1900–1944 are from M. W. Butlin 1977, 108–109, table IV.17 for data on exports, imports, and net property income paid overseas (cols. 1, 2, and 4 respectively). Data are in current prices, millions of dollars. Data are for financial years (July 1 to June 30), 1900/1901 to 1944/1945. The value of exports less imports less net property income paid overseas gives the current account balance. For the current account data prior to 1901, N. G. Butlin excluded net exports of gold and included gold production, "treating gold production as the proper current account credit of a gold producing country" (Butlin 1962, 435). M. W. Butlin also followed this procedure for data from 1900/1901 to 1944/1945. To arrive at figures for the current account excluding all gold flows, we subtracted gold production from the Butlin current account figures.

Gold

Data on the gross value of gold production from 1861 to 1900 are from N. G. Butlin 1962, 115, table 55. Data on gold production from 1900 to 1945 are from McLean 1968, 83–86, row 2, gold production, millions of pounds. Data from 1901 to 1913 are for calendar years, data from 1914 are for financial years (July to June). Data on net exports of gold coin and bullion from 1861 to 1900 are from N. G. Butlin 1962, data on current account credits for gold and specie exports from 410–411, table 247, line 12, and gold and specie imports are from 413–414, table 248, line 11. Data on net exports of gold coin and bullion from 1901 to 1945 are from the *Official Yearbook of the Commonwealth of Australia* (Australia, Commonwealth Bureau of Census and Statistics, various years), exports of gold bullion and specie less imports of gold bullion and

specie. The *Yearbook* data from 1901 to 1913 are for calendar years, data from 1914 are for financial years. Data from 1901 to 1914 are converted to financial years by averaging with the data from the previous year.

The monetary gold stock includes coin and bullion held by the treasury, mints, banks, and the public. According to the *Statistical Register* of New South Wales (Colony of New South Wales 1876, 255, and 1890, 255), data on gold coin and bullion held by the New South Wales Treasury and mint for 1867–1876 and 1881–1890 suggest that mint holdings of coin are negligible (maximum value of £804). Bullion held at the mint reaches a maximum of £136,904 in 1874. Treasury holdings of bullion and coin are listed as being negligible. Data on bullion in the hands of the public (outside of banks) are not available. The bullion component of the monetary gold stock held by the public and official agencies is therefore ignored in these calculations.

For data on the monetary gold stock of Australia, the flows of gold reported by the three mints (Sydney, Melbourne, and Perth) can be added to provide an estimate of changes in the total coin stock of the country. For New South Wales, data on gold coin in banks of issue and private hands from 1855 to 1890 are taken from the *Statistical Register* of New South Wales (Colony of New South Wales 1890, 234). Data for 1891 to 1899 are taken from the *Annual Report* of the United Kingdom (United Kingdom, Deputy Master of the Mint, various issues). Data for 1900 and 1901 are estimated by adding gold coin issued by the mint less gold coin withdrawn, plus coin imported less coin exported by the Colony of New South Wales, using data from the *Annual Report* (United Kingdom, Deputy Master of the Mint 1901, 138).

For Victoria, there is little data available on the stock of gold coin in banks and private hands. However, the *Annual Report* (United Kingdom, Deputy Master of the Mint 1893, 123; 1899, 123; 1901, 138) gives data on gold coin flows for the colony of Victoria from the opening of the Melbourne mint in 1872. The sum of the data on gold coin issued less coin withdrawn, plus gold coin imported less coin exported from the colony of Victoria gives the change in gold coin in the colony.

For Western Australia, the *Annual Report* (United Kingdom, Deputy Master of the Mint 1901, 138) gives data on gold coin flows for the colony of Western Australia from the opening of the Perth mint in 1899. The sum of the data on gold coin issued less coin withdrawn, plus gold coin imported less coin exported from the colony gives the change in gold coin in Western Australia.

Data on the stock of gold bullion held by the banks is taken from S. J. Butlin et al. 1971, 113, table 1, average of weekly figures for December quarter until 1900, then average of weekly figures for June quarter. The data are for total bullion, but according to the notes on page 77, bank bullion holdings are mainly gold bullion.

For the years 1861–1900, changes in the monetary gold stock for Australia are then estimated as the sum of changes in the stock of gold coin in banks of issue and private hands in New South Wales, plus the sum of changes in the gold coin stock in the colonies of Victoria and Western Australia, plus the change in bullion held by Australian Trading Banks. Data from 1861 to 1900 are for calendar years. Data on the monetary gold stock for 1901 to 1944 are taken from S. J. Butlin et al. 1971, 453–457, table 42, total gold coin held by banks and the public, and bullion held by Australian Trading Banks from S. J. Butlin et al. 1971, 115, table 1, end of financial year (June quarter averages). An estimate of the gold stock for the financial year 1899 was calculated as the average of the gold stock in 1899 and 1900. The estimated gold stock at the end of 1899 and 1900 was calculated by taking the cumulative sum of net additions to coin in the colonies of Victoria and Western Australia from 1872 to 1899 and 1900 (i.e. the sum of gold coin issued less coin withdrawn, plus gold coin imported less coin exported), plus the stock of gold coin in banks of issue and private hands in New South Wales in 1899 and 1900, plus the gold bullion holdings of Australian Trading Banks. Data on changes in the monetary gold stock from 1900/1901 onwards are calculated as the first difference of the sum of coin stock held by banks and the public plus bullion held by trading banks, listed in S. J. Butlin et al. 1971.

The main drawback with estimating the monetary gold stock using this method is that it tends to overstate the actual gold stock. As S. J. Butlin et al. (1971, 92) caution: "Because of inadequacies in the gold production figures and the freedom until 1914 with which coins in circulation in Australia were imported and exported and the probable statistical significance thereafter of unrecorded imports and exports of coins, it is not possible to produce satisfactory estimates of coinage in use in the nineteenth century, or to be more exact, it would not be possible to do so without conducting much more detailed research." Another relevant comment on the accuracy of the statistics is made in the *Annual Report* (United Kingdom, Deputy Master of the Mint 1902, 138): "The above return shows that only 13.73 percent of the gold coined at the Melbourne, Sydney, and Perth Mints during the last 29

years has been retained in the States coining it. The amount actually retained is probably much less than this, for considerable quantities are taken away by passengers for Europe which do not appear in the Customs House Returns, and which probably are not counterbalanced by sums brought in by incoming passengers. . . ." Since reliable data are not available on funds taken overseas and inbound by passengers, there is little that can be done to the estimated figures for the monetary gold stock to adjust for this source of error.

Canada

GDP

GDP data from 1870 to 1926 are calculated by subtracting net interest and dividend payments from abroad from the figures for GNP. Data for GNP are from from Urquhart (1986, 11–15, table 2.1, row 25), market prices, thousands of (Canadian) dollars. GNP data from 1927 to 1944 are from Urquhart and Buckley (1965, 131, series E27), gross national expenditure at market prices, millions of dollars. Data for net interest and dividend payments from 1870 to 1926 are from Urquhart (1986, 11–15, table 2.1, row 8 less row 21), interest and dividends credits less interest and dividends debits, market prices, thousands of dollars. Data from 1927 to 1944 are from Urquhart and Buckley (1965, 160, series F60 less F66), current receipts of interest and dividends less current payments of interest and dividends, millions of dollars.

Capital Formation

Capital formation data for 1870 to 1926 are from Urquhart (1986, 16–17, table 2.2, col. 8), grand total, gross fixed capital formation, current dollars, millions. Data from 1927 to 1944 are from Urquhart and Buckley (1965, 131, series E17), total business gross fixed capital formation, millions of dollars. Capital formation data for 1927–1944, unlike pre-1927 data, include changes in stocks. Changes in stocks data for 1927–1944 from Urquhart and Buckley (1965, 131, series E21), total value of the physical change in inventories, millions of dollars.

Current Account

Current account data from 1870 to 1926 are from Urquhart (1986, 20–25, table 2.4, rows 9 and 22), total current credits and total current debits, thousands of dollars. These data include net exports of gold coin and bullion. Data from 1927 to 1944 are from Urquhart and Buckley (1965,

160, series F71), net balance, all countries, millions of dollars. Data include net exports of nonmonetary gold. Data for the current account excluding all gold flows from 1870 to 1926 are calculated by subtracting net exports of gold coin and bullion from the current account. Data on the current account excluding gold from 1927 to 1944 are calculated by subtracting net exports of nonmonetary gold from the current account.

Gold

Data on net exports of gold coin and bullion for 1870 to 1926 are from Urquhart (1986, 20–25, table 2.4, rows 2 and 16), exports of gold coin and bullion, less imports of gold coin and bullion, thousands of dollars. Data on net exports of nonmonetary gold for 1868 to 1899 are from Rich (1988, 245–246, table A-3, col. 3), millions of dollars. Data on net exports of nonmonetary gold for 1900 to 1913 are calculated by taking the sum of net gold exports and the change in the monetary gold stock. Data on net gold exports are from Urquhart (1986) as listed above. Data on the change in the monetary gold stock are from Rich (1988) as listed below. Data on net exports of nonmonetary gold from 1927 to 1944 are from Urquhart and Buckley (1965, 160, series F58), current receipts, net exports of nonmonetary gold, millions of dollars, all countries. Data on net exports of monetary gold from 1927 to 1937 are from Urquhart and Buckley (1965, 164, series F99), monetary gold movement (net). Data for 1938–1939 are calculated as the change in the gold holdings of the Bank of Canada, from *The Canada Yearbook* (Canada, Dominion Bureau of Statistics 1939, 934 and 1941, 805). Data for 1940–1945 are from Canada, Dominion Bureau of Statistics 1949, 57, statement 8—Canada's holdings of gold and U.S. dollars converted to Canadian dollars at the official exchange rate of US$0.909090 = C$1. Net exports of gold from 1927 to 1944 are calculated as net exports of nonmonetary gold minus the change in the monetary gold stock.

Data on the monetary gold stock from 1869 to 1871 are calculated as the sum of bank gold and subsidiary coin plus the stock of gold held against Dominion notes. Data on bank gold and subsidiary coin are from Curtis 1931, 36, current gold and subsidiary coin, thousands of dollars, December figures. Data on gold held against Dominion notes are from Curtis 1931, 92, thousands of dollars, December figures. Data on the monetary gold stock from 1872 to 1913 come from Rich 1988, 239–242, table A1, Dominion government gold holdings plus the gold holdings of chartered banks, end of year. Data on the monetary gold stock from 1914 to 1926 are calculated as the sum of official Canadian

gold reserves, plus bank gold and subsidiary coin holdings, plus bank gold held in the central reserves of the banking system (a private gold reserve managed by trustees from the Ministry of Finance and the Canadian Bankers Association). Data on the offical gold reserves are from *The Canada Yearbook* (Canada, Dominion Bureau of Statistics 1927–1928, 857, table 3), total Canadian gold reserves, end of year figure. Data on bank gold and subsidiary coin are from Curtis (1931, 36) current gold and subsidiary coin, thousands of dollars, December figures. Data on bank gold held in the central gold reserves are from Curtis (1931, 35), gold coin, thousands of dollars, December figures.

Denmark

GDP

GDP data from 1850 to 1944 are from Hansen 1977, 261–263, table 5, gross factor incomes (*bruttofaktorindkomst*) plus net import of goods and services (*netto import af varer og tjenester*) plus indirect taxes less subsidies (*indirekte afgifter—pristilskud*), equaling disposal of merchandise and services (*varer og tjenester til radighed*), current market prices (*lobende markedspriser*), millions of kroner.

Capital Formation

Capital formation data from 1850 to 1944 are from Hansen 1977, 264–266, table 6, col. 2, gross investment (*brutto-investering*), current prices, millions of kroner. Data do not include stocks.

Current Account

Current account data from 1874 to 1944 are from Bjerke and Ussing 1958, 152–153, table VI, col. 4, net imports of goods and services, millions of kroner. According to the League of Nations 1927, 85, Danish trade statistics exclude gold bullion and all specie. Silver bullion is included in merchandise trade. Thus the current account data should not include gold trade.

Gold

Data on the monetary gold stock from 1874 to 1906 are from the United States, Bureau of the Mint 1876–1920. Data on the gold stock for 1875 and 1894 are calculated by adding net exports data for the following year to gold stock figures for the previous year. Data on the gold stock for 1877 and 1886–1888 are calculated by subtracting net exports data

for the year from the gold stock figures for the previous year. Data on the gold stock for 1874 and 1878 are calculated as the average of the preceding and following years. U.S. dollar values are converted to kroner at the exchange rate of 0.268 U.S. dollars per kroner. Data on the gold holdings of the central bank (*Danmarks Nationalbank*) from 1907 to 1944 are from Denmark, *Danmarks Statistik* 1897–1947. The change in the monetary gold stock is assumed to equal the change in the gold holdings of the central bank.

Data on gold exports and imports for 1874 to 1906 are from the United States, Bureau of the Mint 1876–1920. Data on gold imports and exports from 1910 to 1930 are from the League of Nations 1924, 1927, 1931, 1932, bullion and specie import, bullion and specie export, then gold import and export. The figures for bullion and specie import include some non-gold coin. However, there is a close correspondence between gold bullion and specie trade and total bullion and specie trade from the League of Nations figures for the years with overlapping data (1922–1930), suggesting that the non-gold element of bullion and specie trade was small. On this basis, the figures for total bullion and specie trade were used from 1910 to 1921, then gold bullion and gold specie trade figures were used from 1922 to 1930. Net exports of gold from 1907 to 1909 and from 1931 to 1934 are assumed to equal minus the change in the monetary gold stock (i.e., an increase in the monetary gold stock implies and equal amount of gold imports). Data on monetary gold exports for 1935 to 1944 are from Denmark, *Danmarks Statistik* 1897–1947. Again due to lack of data, total net exports of gold for 1935 to 1944 are assumed to equal monetary gold exports.

Finland

Finland became an autonomous Grand Duchy connected with Russia in 1809, and declared independence from Russia on December 6, 1917. Finland had its own monetary system from 1860 and was on the gold standard from 1877 to 1914. The unit of currency was the Finnmark (*Finnish markka*, FIM), equivalent to one French gold franc. Finland returned to the gold standard on January 1, 1926 and remained on the gold standard until October 1931.

GDP

GDP data from 1860 to 1944 from Hjerppe 1989, 201–203, table 3A1, col. 1, market prices, thousands of FIM.

Capital Formation

Capital formation data from 1860 to 1938 from Hjerppe 1989, 201–203, table 3A1, col. 5, gross fixed capital expenditure, market prices, thousands of FIM. Changes in stocks data from 1860 to 1938 from Hjerppe 1989, 201–203, table 3A1, col. 7, increase in stocks plus statistical discrepancy, market prices, thousands of FIM.

Current Account

Current account data from 1860 to 1938 from Hjerppe 1989, 201–203, table 3A1, cols. 2 and 6, imports of goods and exports of goods, market prices, thousands of FIM. The statistical discrepancy includes data on net exports of services. Since these are not reported separately by Hjerppe, we exclude them from our current account data for Finland. According to the League of Nations (1927, 104), Finnish merchandise trade statistics include gold specie and bullion movements in the data for manufactured gold and unwrought gold, respectively.

Gold

Net exports of gold from 1860 to 1909 from Pihkala 1970, 80–91, table 2, value of exports [43: *Raha* (coinage)] less Pihkala 1970, 112–123, table 7, value of imports [1252: *Hopea, kulta, platina* (silver, gold, platinum)]. These data include some silver and platinum trade. Net exports of gold from 1910 to 1930 are from the League of Nations 1924, 1927, 1931, 1932, gold bullion and specie export less gold bullion and specie import. Net exports of gold from 1931 to 1944 are from Finland, *Suomen Virallinen Tilasto* 1929–1947, item numbers 951–953, precious metal imports: *Kultaa: valmistamatonta ja jatteita, lankaa ja levya, teoksia muunlaisia, rahaa, muita* (gold, manufactured and unmanufactured, coin), then from 1939 items 61-005, 61-102 to 61-014, and 62-001. Exports data are given in series 61-002 (*Kultaa: valmistamaton seka jatteet ja romu*) and 62-001 (*Kultaraha* or gold coin).

Data on the monetary gold stock from 1871 to 1944 are taken from Finland, *Tilastollinen Paatoimisto* 1907–1951, gold assets of the Bank of Finland. The change in the monetary gold stock is calculated as the first difference of the gold assets of the Bank of Finland. Data on the current account excluding gold are calculated by subtracting net gold exports (which include some silver and platinum) from the current account data.

France

GDP

GDP data from 1850 to 1900 are from Lévy-Leboyer and Bourguignon 1985, 329–332, table A-III, series 1, *produit interieur brut, millions de francs courants*. Data from 1901 to 1944 are from Villa 1993, 459, series PIBQ, *production interieure brute en valeur–en gros francs courants*.

Capital Formation

Capital formation data from 1850 to 1900 are equal to gross fixed capital formation plus changes in stocks. Capital formation data are from Lévy-Leboyer and Bourguignon 1985, 329–332, table A-III, series 4, *investissements, bruts* (gross fixed capital formation), *millions de francs courants*. Changes in stocks data from 1850 to 1900 are from Lévy-Leboyer and Bourguignon 1985, 329–332, table A-III, series 8, *variations des stocks* (change in stocks), *millions de francs courants*. Capital formation data from 1901 to 1944 are equal to gross fixed capital formation plus changes in stocks. Capital formation data are from Villa 1993, 439, series IE, IG, IM, *investissement des entreprises, investissement des administrations, investissement des menages, en valeur, en gros francs courants* (sum of investment by businesses, government, households). Changes in stocks data are from Villa 1993, 457, series DS, *variations de stocks en valeur–en gros francs courants* (changes in stocks).

Current Account

Current account data from 1850 to 1900 are from Lévy-Leboyer and Bourguignon 1985, 329–332, table A-III, series 5, 6, and 7, *exportations* (exports) *plus gains invisibles* (invisible earnings) minus *importations* (imports), *millions de francs courants*. Current account data from 1901 to 1923 are from Villa 1993, 435–448 series EXPORT, plus series SUS, plus series IDVX, plus series DREX, series DOMX, minus series IMPORT minus series ODRX, *exportations en valeur* (exports), plus *solde des utilisations de services* (balance of services), plus *interets et dividendes verses par l'exterieur* (interest and dividends), plus *depenses et recettes exterieurs* (external expenditures and revenues), plus *dommages de guerre verses par l'exterieur* (war reparations), minus *importations en valeur* (imports), minus *operations diverses de rapartitions exterieur* (sundry external transactions), all *en gros francs courants*. Current account data from 1924 to 1944 are from Villa 1993, 436, series EBX, *epargne brute de l'exterieur–en gros francs courants*.

According to France, Ministère des Finances et des Affaires Économiques 1952, 195, external trade data exclude gold, silver, and copper coin, raw gold and silver, gold and silver in bars, ingots, and powder. On this basis, the current account data excluding gold were assumed to equal the original current account data.

Gold

Data on net exports of gold and silver for 1850 to 1875 are from the United States, Bureau of the Mint 1900, 424–425. U.S. dollar values are converted to French francs at the par exchange rate of 0.193 U.S. dollars per franc.

Data on net exports of gold from 1876 to 1914 are from the National Bureau of Economic Research series 14114, excess of gold exports over imports, sum of 12 months data. Data for 1915 to 1930 are from the League of Nations 1924, 1927, 1931, 1932, gold bullion and specie exports less gold bullion and specie imports. Data from 1931 to 1944 are from France, Ministère des Finances et des Affaires Économiques 1966, 365, table I, *mouvements d'or, million de francs* 1928. The figures for net exports of gold include gold and silver from 1850 to 1870.

Estimates of the French monetary gold stock for 1850 to 1878 are reported by Flandreau 1995, 308. (Indeed, his estimates reach back to 1840.) According to him (see his footnote 54), the figures includes gold holdings of the Bank of France. Data from 1879 to 1913 are estimated using data from Sicsic 1989, 728, table 4, and 732, table 11. Sicsic provides revised estimates of the monetary gold stock, apparently including Bank of France holdings, in 1878, 1885, 1891, 1897, 1903, and 1909. These estimates are regressed on a constant and the annual monetary gold stock data for the corresponding years as calculated by J. Denuc (method of M. Pupin), which Sicsic reports in his table 4. The coefficients from this regression are then used together with the Denuc-Pupin annual data to arrive at predicted figures for the monetary gold stock from 1878 to 1913. To avoid a discontinuity in 1879 from changing over from Flandreau's data to Sicsic's, the change in the monetary gold stock for 1879 is calculated as the difference between our predicted 1879 value based in the Denuc-Pupin data Sicsic reports and Sicsic's own estimate for 1878.

Data on the monetary gold stock from 1913 to 1927 are from France, Ministère des Finances et des Affaires Économiques 1966, 517, table III, *Banque de France encaisse d'or* (Bank of France gold holdings, annual average). Data from 1928 to 1945 are from France, Ministère des

Finances et des Affaires Économiques 1966, 562, table II, *Banque de France encaisse d'or* (Bank of France gold holdings, year end), multiplied by the price of gold from France, Ministère des Finances et des Affaires Économiques 1966, 562, table II, *cours de l'or à Paris, cours d'achat par la Banque de France*. Price data from 1938 to 1945 are from France, Ministère des Finances et des Affaires Économiques 1952, 503, *cours de l'or à Paris et à Londres depuis 1938*, end of December figures.

Germany

GDP

GDP data from 1850 to 1939 are from Hoffman 1965, 825–826, table 248, col. 5, *Nettosozialprodukt zu Markt-preisen* (NNP at market prices), raised 8.4 percent to approximate GDP following the procedure in Maddison 1991.

Capital Formation

Capital formation data from 1850 to 1939 from Hoffman et al. 1965, 825–826, table 248, col. 2, *Nettoinvestitionen* (net investment). Data include stocks. Hoffman et al. 1965 report separate inventory figures only for the years 1924–1939 and 1950–1959; see Hoffman et al. 1965, 237, table 32, col. 4, *Investitionen der Landwirtschaft, Vorrate* (investment in agriculture, stocks), plus 247, table 36, col. 3, *Investitionen im Gewerbe, Vorrate,* (investment in trade/industry, stocks). Our pre-1913 numbers on stocks in trade and industry (used only for illustrative purposes in appendix 9.1) are estimated by calculating the average of stocks to the sum of fixed investment and stocks for the years 1924–1939, 1950–1959, and multiplying that average by the annual sum data on total investment.

Current Account

Current account data from 1860 to 1938 are from Hoffman et al. 1965, 825–826, col. 4, *Saldo der Leistungsbilanz*. The current account data exclude net exports of precious metals. The current account excluding gold is calculated by adding net exports of precious metal to the current account and subtracting net exports of gold.

Gold

Exports data from 1872 to 1942 from Germany, Deutsche Bundesbank 1976, 324, table J 1.03, col. 11, *Ausfuhr, darunter gold* (exports of gold)

and col. 13, *Einfuhr, darunter gold* (imports of gold). Exports data for 1872 to 1879 are estimated by taking the average of gold exports to total exports of precious metal for the period 1880 to 1913 and multiplying by the corresponding figure for total precious metal exports. Imports data for 1872 to 1875 are estimated by taking the average of gold imports to total imports of precious metal for the period 1876 to 1913 and multiplying by the figure for corresponding figure for total precious metal imports.

Gold holdings of the Reichsbank for 1876–1945 from Germany, Deutsche Bundesbank 1976, 36, table C 1.01, col. 2, *Aktiva*: *Gold in Barren and Munzen* (gold in bars and coin). Data for 1878, 1879, 1883, 1887, 1888, 1890 are not shown separately, but data are given for sum of *Gold in Barren und Munzen* and *Deutsche Scheidemunzen* (total gold in bars and coin and German subsidiary coin). Data for 1878, 1879, 1883, 1887, 1888, 1890 are estimated by taking the ratio for the previous year of gold in bars and coin to the sum of gold in bars and coin plus subsidiary coin, and multiplying by the corresponding sum for the missing year. Gold coin in circulation from 1876 to 1913 from Germany, Deutsche Bundesbank 1976, 14, table B 1.01, col. 7, *Munzen, Goldmunzen* (coin, gold coin). The monetary gold stock is calculated as the sum of gold coin in circulation plus the gold holdings of the Reichsbank.

Italy

GDP

GDP data are calculated by taking the figures for GNP and subtracting net factor incomes and current transfers received from the rest of the world. GNP data from 1861 to 1925 are from Italy, Instituto Centrak di Statistica (ISTAT) 1957, 249–250, table 36, col. 6, *reddito nazionale lordo ai prezzi di mercato* (gross national product at market prices), *milioni di lire*. Net factor incomes from abroad are from Italy, ISTAT 1957, 249–250, table 36, col. 3, *esterno redditi netti dall'estero, milioni di lire*. Current transfers are from Italy, ISTAT 1957, 255, table 39, col. 4, *trasferimenti correnti, saldo, milioni di lire*. GNP data for 1926 to 1945 are from Italy, ISTAT 1986, 143, table 8.1, col. 1, *reddito nazionale netto* (net national income), plus col. 2, *ammortamenti* (depreciation). Net factor incomes from abroad are from Italy, ISTAT 1986, 151, table 8.11, cols. 2, 7, *exportazione redditi dei fattori* less *importazione redditi dei fattori* (exports of factor income less imports of factor income).

Capital Formation

Data from 1861 to 1925 are from Italy, ISTAT 1957, 264–265, table 44, col. 6, *investimenti lordi* (gross investment), current prices. Data includes stocks. Data for 1926 to 1945 are from Italy, ISTAT 1986, 143, table 8.1, col. 6, *investimenti lordi* (gross investment). Data on changes in stocks from 1861 to 1925 are from Italy, ISTAT 1957, 264–265, table 44, col. 5, *variazioni scorte* (change in stocks). Data on changes in stocks for 1926 to 1945 are from Italy, ISTAT 1986, 166, table 8.28, col. 5), *variazione delle scorte* (change in stocks).

Current Account

Data from 1861 to 1925 are from Italy, ISTAT 1957, 255, table 39, col. 5, *bilancia dei pagamenti correnti, conto transazioni e trasferimenti correnti* (balance of current payments, including current transfers) Data for 1926 to 1945 are from Italy, ISTAT 1986, 151, table 8.11, col. 11, *saldi, transazioni correnti* (settlement of current transactions), equal to the sum of net exports of goods, services, factor income, and transfers. Merchandise trade figures include silver bullion, but exclude gold bullion and silver coin of the Latin Union. The current account excluding gold is therefore taken to be the the same as the original current account figure.

Gold

Data for 1861 to 1936 are from Di Mattia 1967. Data for gold and silver coin withdrawn from 473–474, table 8, cols. 1 and 2 (withdrawn coins, gold and silver). Data for gold and silver coined and recoined from 477–478, table 9, col. 1 (coinage and recoinage, gold and silver). Imports and exports data from 481–482, table 10, cols. 1, 2, 5, 6 (exports unrefined gold, exports gold coin, imports unrefined gold, imports gold coin).

Since gold and silver flows are not shown separately prior to 1878, our 1861–1877 data for gold specie exports are calculated by taking the average of gold specie to total specie exports for the years 1878–1936 and multiplying by the annual figure for total specie exports. Similarly, 1861–1877 data for unrefined gold exports are calculated by taking the average of gold specie to total specie exports for the years 1878–1936, and multiplying by the annual figure for total unrefined gold and silver exports. The data for gold imports are calculated similarly.

The change in the monetary gold stock is calculated as the sum of specie imports less specie exports plus coinage and recoinage less with-

drawn coin. Data on official reserves of gold from Italy, ISTAT 1968, 105, table 83, col. 11.

Japan

The New Coinage Act of 1871 declared the gold yen as the standard unit of value and legal tender for transactions of any value. Silver coins were relegated to subsidiary money, legal tender up to 10 yen. However, the Act also declared the silver Yen Trade Dollar as legal tender within the confines of treaty ports. An amendment in May 1878 made the silver Trade Dollar legal tender throughout the Empire of Japan. Thus both gold and silver were legal tender within Japan and for all foreign transactions from 1878 to 1897. It was not until the Coinage Act of 1897 declared the gold yen as the standard unit of value and legal tender that Japan officially adopted the gold standard. The coinage of the Yen Trade Dollar ceased, and they were gradually withdrawn from circulation.

GDP

GDP calculated by subtracting net factor incomes and transfers received from the rest of the world from GNP. Gross national expenditure (GNE) data from 1885 to 1929 are from Ohkawa et al. 1979, 251–253, table A1, col. 7, gross national expenditure at market prices, millions of yen, current prices. GNE data from 1930 to 1944 are from Ohkawa et al. 1979, 254, table A2, col. 7, gross national expenditure at market prices, millions of yen, current prices. GNP figures are calculated as GNE plus the current account balance, as calculated below. Data on net factor incomes received from the rest of the world are from Ohkawa et al. 1979, 332–335, table A31, cols. 3, 6, exports: income from abroad less imports: income from abroad. Data on net transfers from abroad are from Ohkawa et al. 1979, 332–335, table A31, col. 8, net transfers from abroad.

Capital Formation

Capital formation data equal gross domestic fixed capital formation plus changes in stocks. Data from 1885 to 1929 from Ohkawa et al. 1979, 251–253, table A1, col. 3, gross domestic fixed capital formation. Data from 1930 to 1944 from Ohkawa et al. 1979, 254, table A2, col. 3, gross domestic fixed capital formation. Change in stocks data from 1885 to 1929 are calculated by taking inventory change as percent of GNE from

Ohkawa et al. 1979, 63, quoting from Fujino and Akiyama 1973, and multiplying by GNE. Inventories data from 1930 to 1944 are from Ohkawa et al. 1979, 254, table A2, col. 4, increase in stocks.

Current Account

Data for 1868 to 1940 from Ohkawa et al. 1979, 332–335, table A31, col. 9, surplus on current account (excluding reparations). Data do not include nonmonetary or monetary gold shipments. Data from 1940 to 1944 from Ohkawa et al. 1979, 336, table A32, col. 9 surplus on current account (excluding reparations).

Gold

Gold coinage data for 1871 to 1897 are from Matsukata 1899, 13, table II, amount of gold coins issued, and 14, table III, amount of silver coins issued. Data for 1900 to 1939 are from Japan, Ministry of Finance 1901, 1910, 1916, 1926, 1940, coins turned out by the mint. Data for 1913 to 1936 on coinage withdrawn are from Japan, Bank of Japan 1932, 1937, 2, amount of coin melted by the mint.

Data on gold exports and imports for 1872–1933 on exports and imports of gold from Ishibashi 1935, 431–433, 436–437, details of coin and bullion exported, details of coin and bullion imported, gold bullion and total of gold coin and bullion. Data are for Japan Proper (ie excludes Korea and Taiwan after annexation). Data for 1934–1936 on net exports of gold coin and bullion from Japan, Prime Minister's Office 1949, 520–521, table 280, col. 7–8, domestic (Japan Proper) exports and imports of gold coin and bullion. Silver exports and imports data for 1872–1933 are from Ishibashi 1935, 433–435, 437–439, details of coin and bullion exported, details of coin and bullion imported, silver bullion and total of silver coin and bullion. Data are for Japan Proper (i.e., excludes Korea and Taiwan). Data for 1934–1936 on net exports of silver coin and bullion from Japan, Prime Minister's Office 1949, 520–521, table 280, col. 7–8, domestic (Japan Proper) exports and imports of silver coin and bullion. Data on gold coin and bullion imports and exports and silver coin and bullion imports and exports for 1937 to 1945 are from Japan, Bank of Japan Statistics Department 1966, 157, 561.

Data on coins existing in the country from 1868 to 1900 from Japan, Ministry of Finance 1901. Data on coins existing in the country from 1901 to 1914 from Shinjo 1962, 101, table XXB. Data on the estimated stock of specie in the country from 1872 to 1914 is derived from the data on coins existing in the country. Data after 1914 take the previous

years' estimate of specie existing in the country, plus coins turned out by the mint, less coin melted by the mint, less net exports of specie. Changes in the monetary stock take the change in estimated stock of specie, less net exports of bullion. Data after 1934 are based on coinage less recoinage less net exports of gold coin and bullion.

Norway

GDP

GDP data from 1865 to 1938 are from Norway, Statistisk Sentralbyrå 1965, 340–343, table 49, row 11, current prices, millions of kroner.

Capital Formation

Capital formation data from 1865 to 1938 are from Norway, Statistisk Sentralbyrå 1965, 340–343, table 49, row 5, current prices, millions of kroner. Data include increase in stocks from 1909. Data on increase in stocks for 1900–1908 are from Norway, Statistisk Sentralbyrå 1953, 107, table 2, col. 9, *lagerendring* (change in stocks). Data for 1909–1939 are from Norway, Statistisk Sentralbyrå 1965, 340–343, table 49, row 7. Increase in stocks not estimated for the years 1865–1899. For 1900–1913 and 1921–1929 only net increase in standing forests and in livestock are included. From 1930 increase in standing forests is regarded as fixed capital investment.

Current Account

Current account data from 1865 to 1899 are from Mitchell 1993, 922, 927, table J3, current prices, millions of kroner. Current account data for 1900–1929 are from Norway, Statistisk Sentralbyrå 1953, 126, table 12, col. 5, *netto oking eller nedgang i Norges netto fordringer pa utlandet* (net increase or decrease in Norway's foreign assets). Data for 1930–1939 from Norway, Statistisk Sentralbyrå 1965, 184–185, table 25, row 16. The current account data exclude crude gold and silver and coins.

Gold

Data on gold and silver holdings from 1865–1913 are (the two metals are not reporated separately) from Norway, Statistisk Sentralbyrå 1978, 484, table 257, col. 1&6, *metallfondene* (gold and silver) at bank of Norway. Data from 1914–1939 from Norway, Statistiske Oversikter 1948, 300–303, table 159, rows 1 & 4, *gullbeholdning* (gold stock), and *midlertidig anbrakt i gull* (temporarily invested in gold). The change in

the monetary gold stock is calculated as the first difference of the gold stock at the Bank of Norway (gold and silver stock until 1914). According to United States, Bureau of the Mint 1886, 222, "the amount of gold in banks, other than the Bank of Norway, or in circulation, has probably not been considerable."

Data on gold exports and imports for 1865 to 1896 are calculated as the first difference of the gold and silver holdings of the Bank of Norway (the negative of the change in the monetary stock equals the net exports—i.e., an increase in the monetary stock corresponds to an import). Data on gold exports and imports from 1895 to 1909 and for 1931 to 1944 are from Norway, Statistisk Sentralbyå 1897–1947, unwrought platinum, gold and silver and coins and medals. Missing trade returns data for 1897 and 1899 are interpolated linearly from the previous and subsequent years. Data on net exports of gold from 1910 to 1930 are from the League of Nations 1927, 1931, 1932, exports of bullion and specie less imports of bullion and specie (including silver and platinum, as per the trade returns).

Russia

GDP

Data on net national product are from Gregory 1982, table 3.2, net national product, Russian Empire, millions of credit roubles.

Capital Formation

Data on capital formation are from Gregory 1982, table 3.2, net investment, Russian Empire, millions of credit roubles. Data include inventories. Data on inventories are from Gregory 1982, table 3.2, inventories, total, Russian Empire, millions of credit roubles.

Current Account

Data on the current account are from Gregory 1982, table 3.2, net foreign investment, Russian Empire, millions of credit roubles. The current account data include net exports of silver.

Gold

Data on the monetary gold stock are from United States, Bureau of the Mint 1876–1920. Data for 1880–1891 are calculated as the sum of bullion and gold coin of the treasury at the Bank of Russia plus gold specie on hand at the Bank of Russia (belonging especially to the Bank of Russia).

Data on the monetary gold stock from 1891 to 1914 are the sum of gold coin in circulation plus gold coin and bullion in the treasuries and the state bank.

Data on net exports of gold from 1885 to 1913 are from United States, Bureau of the Mint 1876–1920. Missing data for 1900, 1901, and 1912 are estimated using a regression of net exports on net national product and changes in the monetary gold stock for all other years of available data (1885–1899, 1902–1911, 1913). Predicted values from this regression are used to proxy the missing net gold exports data.

United States dollar values are converted to roubles at the exchange rate of 0.7718 roubles per U.S. dollar until the end of 1897, then 0.514556. Data on monetary gold and net exports of gold are converted from roubles to credit roubles by multiplying by a factor of 1.5.

Sweden

GDP

Data on gross domestic product at factor cost data for 1861 to 1945 are from Krantz and Nilsson 1975, 154–155, table 1:2, col. 4. Indirect taxes and customs duties from Krantz and Nilsson 1975, 154–155, table 1:2, col. 3. GDP at market prices calculated as sum of GDP at factor cost plus indirect taxes and customs duties.

Capital Formation

Data on capital formation for 1861 to 1945 are from Krantz and Nilsson 1975, 150–152, table 1.1, col. 6, domestic investment. Data do not include stocks. Data on stocks for 1861 to 1945 are from Johansson 1967, 38–39, table 1, col. 3, changes in livestock. Our data on capital formation are calculated by adding domestic investment to changes in livestock.

Current Account

Data on the current account from 1861 to 1930 from Lindahl et al. 1937, 598–599, table 174, col. 8, net balance on goods and services. Data do not include shipments of gold and silver. Data for 1931 to 1935 from Ohlsson 1969, 123, table B:1., col. 6, *bytesbalansens saldo*. Data do not include net exports of gold and silver. Data for 1936 to 1945 from Sweden, Statistiska Centralbyran 1960, 64, table 33, row 6. Data do not include net exports of gold and silver. Net exports of silver are added to the current account balance. Data on net silver exports, 1861–1910,

are from Lindahl et al. 1937; 1911–1945 data are from Sweden, Statistiska Centralbyran 1960.

Gold

Data on net exports of gold from 1861 to 1874 from Lindahl et al. 1937, 604–605, table 175, col. 1, net imports of gold according to trade statistics. Data on gold and specie flows from 1861 to 1871 included both gold and silver. According to Lindahl et al. 1937, 610, the figures included only insignificant quantities of gold, so the net export of gold is assumed to be zero from 1861–1871. Data from 1875 to 1913 from Lindahl et al. 1937, 604–605, table 175, col. 4, change in bank holdings plus gold absorbed by industry. Lindahl et al. argue that the trade statistics data suffer from several shortcomings with regards to the net exports of gold, so they use the estimated change in the stock of gold held by banks and the value of gold absorbed by industry as the measure of net gold exports. Data from 1914 to 1945 are from Sweden, Statistiska Centralbyran 1960, 62, table 30, cols. 2, 5, 9, 12, imports of unmanufactured gold and gold coins and exports of unmanufactured gold and gold coins. Data on changes in the monetary gold stock for 1875 from Lindahl et al. 1937, 604, table 175, col. 2, increase in bank holdings of gold. Data on the monetary gold stock from 1876 to 1945 from Sweden, Statistiska Centralbyran 1960, 97, table 76 and 98, table 77, gold holdings of banks (including *Riksbank*). Change in the monetary gold stock is calcuated as the change in the gold holdings of banks.

United Kingdom

GDP

From 1850 to 1869 from Mitchell 1988, 831–832, chap. 16, table 5, Gross domestic product at market prices. Data from 1870 to 1944 from Feinstein 1972, T10–T11, table 3, gross domestic product at market prices.

Capital Formation

Data from 1850 to 1869 from Mitchell 1988, 831–832, chap. 16, table 5, gross domestic fixed capital formation plus value of physical increase in stocks. Data from 1870 to 1920 from Feinstein 1988, 462–463, table 17, gross domestic fixed capital formation plus value of physical increase in stocks and works in progress. Data from 1921 to 1944 from Feinstein 1972, T8–T9, table 2, gross domestic fixed capital formation plus value of physical increase in stocks and works in progress.

Current Account

Data from 1850 to 1869 from Imlah 1958, 70–72, table 4, balance on current account. Imlah's data include net exports of gold and silver bullion and specie. Data from 1870 to 1920 from Feinstein 1988, 462–463, table 17, net investment abroad. Feinstein's (1988) current account data are calculated as the balance of current account transactions not involving gold or silver *plus* the net increase in the U.K. stock of monetary gold and silver. Data from 1921 to 1944 are from Feinstein 1972, T38–T39, table 15, net investment abroad. The data from Feinstein (1972) include silver trade after 1913, but, as noted in the body of this paper, exclude all gold flows. Our own data for the current account CA^{NG} excluding all gold flows (but including all silver flows) are calculated as follows. For 1850 to 1869 we take the current account data from Imlah 1958, less net exports of gold and silver, plus net exports of silver (with net exports of the precious metals as calculated below). For 1870 to 1920 we take the current account numbers of Feinstein 1988, less the change in the total gold and silver money stock (as calculated below), plus net exports of silver. For 1921 to 1944 we simply take the Feinstein 1972 series on net investment abroad, which includes all silver trade and excludes all gold trade.

Gold

Imlah (1958, 70–72, table 4), reports data on net shipments of gold and silver for the years 1850–1870. Imlah's data do not separate net gold from silver shipments, but instead aggregate the numbers for both metals. Separate gold and silver net exports data for 1858–1916 and 1920–1945 are from United Kingdom, Board of Trade 1870–1938, exports of (gold, silver) bullion and specie less imports of (gold, silver) bullion and specie. (This source also provides data on the separate levels of gold and silver imports and exports for 1858–1916 and 1920–1945.) Gold net exports data for 1917–1919 are from Morgan 1952, 335, table 52, net exports of gold coin and bullion. Silver net exports data for 1917–1919 from Morgan 1952, 341, table 53, net exports of gold and silver, less net exports of gold from 335, table 52. Although separate silver and gold *exports* data are reported by the board of trade for 1850–1857, separate silver and gold *imports* data are not reported prior to 1858. To calculate net gold shipments for 1850–1857, we therefore must estimate gold imports separately for those years. We do this in three steps as follows. First, we use the 1858–1916, 1920–1945 board of trade data to measure the average ratio k of silver imports to silver

imports plus silver exports. (This ratio is much more stable over time than the corresponding ratio for gold trade, which is why we take this rather roundabout route to estimating 1850–1857 gold imports.) Because we do have yearly silver exports data, X_S, for 1850–1857, we then estimate silver imports in any year as $M_S = kX_S/(1 - k)$. That is the second step in our procedure. The third and final step is to estimate gold imports for 1850–1857 as the sum of gold and silver exports (from Board of Trade) less our estimated silver imports less the Imlah 1958, 70–72, table 4, figures for net shipments of gold and silver together.

Data on changes in the monetary gold stock from 1868 to 1921 are calculated as the change in the estimated stock of gold coin outstanding, plus the change in the stock of gold in the Bank of England. Data on gold in the Bank of England (issue and banking departments) are taken from the *Economist* 1850–1932 (various issues, last week of December). Data on the change in the monetary stock of gold coin are from Capie and Webber 1985, 198–200, table 7.3. Mid-year data from 1868 to 1904 were converted to year-end data by adding data from the following year and dividing by two (this procedure assumes an even distribution across years). Data on the gold coin stock from 1915 to 1920 are calculated by taking the average of the gold coin stock to the total coin stock for the years 1868 to 1914 and multiplying by the figure for the total coin stock. The silver coin stock from 1905 to 1920 is calculated by taking the average of the silver coin stock to the total coin stock for the years 1868 to 1905 and multiplying by the figure for the total coin stock.

After 1921, our estimates assume that the only sources of change in the monetary gold stock are changes in the gold holdings of the Bank of England or the Exchange Equalisation Account. This procedure was adopted because of the lack of available data on holdings of gold coin outside the Bank of England after 1921. For 1922–1932 we use the *Economist* 1850–1932 data on Bank of England gold holdings. Data from 1933 to 1945 are from United Kingdom, Financial Secretary of the Treasury 1951, gold reserves in the Bank of England Issue Department and the Exchange Equalisation Account until 1939, then gold and dollar reserves from 1940 to 1945 (which were not reported separately).

United States

GDP

Data for 1869 to 1888 from Kuznets 1961, 561–562, table R-25, col. 3, GNP, Variant III, five-year centered moving average and 557–558, table

R-23, col. 1, B. Variant III, billions of dollars. Using annual data from 1889–1892, the five-year moving average number for 1890 is used to deduce the level of GNP in 1888 as five times the five-year centered moving average for 1890 less the actual levels for 1889–1892. Using a similar procedure, the annual data for 1869–1888 are derived by disaggregating the five-year moving averages. Data for 1889 to 1928 are from Kendrick 1961, 296–297, table A-IIb, col. 11, GNP, Commerce concept, millions of dollars. Data from 1929 to 1945 are from United States, Bureau of the Census 1975, 229, series F47, GNP, current prices. GDP data are calculated by subtracting net income from investments abroad and net unilateral transfers from abroad from the figures for GNP. The data on income on investments abroad are from United States, Bureau of the Census 1975, 865, series U13, then 864, series U5, U6, U13, income on investments abroad, private and public (U5 + U6) less income on foreign investments in United States (U13). The data on unilateral transfers are from United States, Bureau of the Census 1975, 866–867, series U16 and U17, unilateral transfers, net private (U16) plus unilateral transfers, net public (U17).

Capital Formation

Data for 1869 to 1888 from Kuznets 1961. Kuznets' figures on capital formation include net changes in claims against foreign countries, so we subtract changes in those claims to get our own figure for gross capital formation. Thus, our capital formation figures are calculated as Kuznets 1961, 572–574, table R-29, col. 1, gross capital formation, five-year centered moving average, less 599–660, table R-34, col. 3, net changes in claims against foreign countries, five-year centered moving average. Annual data are derived from the five-year centred moving average using the same procedure that was applied to the GNP series. Data from 1889 to 1928 are from Kendrick 1961, 296–297, table AIIb, col. 7, gross private domestic investment, commerce basis, millions of dollars. Data from 1929 to 1945 are from United States, Bureau of the Census 1975, 229, series F52, gross private domestic investment, current prices. Data on stocks for 1869 to 1888 from Kuznets 1961, 599–600, table R-34, col. 1, net changes in inventories, current prices, five-year centered moving average, and 490, table R-4, col. 3, net changes in inventories, billions of dollars. Annual data are derived from the five-year centered moving average using the same procedure that was applied to the GNP series, except the data are unscrambled from 1920 backwards. Data from 1889 to 1928 are from Kendrick 1961, 296–297,

table AIIb, col. 8, change in business inventories, millions of dollars. Data from 1929 to 1945 are from United States, Bureau of the Census 1975, 230, series F60, total net change in business inventories, current prices.

Current Account

Data for 1869 to 1945 from United States, Bureau of the Census 1975, 866–868, series U15, balance on goods and services, plus series U16 and U17, net private and government unilateral transfers. Data from 1869 to 1899 are for fiscal year ended June. Data are converted to calendar year basis by adding each year to subsequent year and dividing by two. For instance, fiscal year data for 1869 are added to fiscal year data for 1870 and divided by two, yielding data for calendar year 1869. Data from 1900 are for calendar year. Data to 1873 include exports and imports of gold. Data from 1874–1945 include nonmonetary gold exports. Data for nongold current account for 1869–1873 are calculated by taking the current account balance less net exports of gold. Data for nongold current account for 1874–1945 are calculated by taking the current account balance less net exports of gold less change in the monetary gold stock (equivalent to subtracting nonmonetary gold exports).

Gold

Exports: Data for 1869 to 1914 are from the National Bureau of Economic Research, series 14112, net gold exports, thousands of dollars, monthly data. Annual data are derived by adding the sum of monthly net exports for each year (fiscal or calendar). Data from 1915 to 1945 from United States, Bureau of the Census 1975, 884–885, series U197 less U198, gold exports less imports, calendar year, millions of dollars.

Monetary gold stock data for 1869 to 1878 are from United States, Bureau of the Census 1975, 993, series X417, billions of dollars, annual average. Monthly data from 1879 to 1945 are supplied by the National Bureau of Economic Research, series 14076, billions of dollars. To construct our own annual data we select the December level of the monetary gold stock.

Notes

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1. See Obstfeld 1995 for a survey.

2. See appendix 9.1 for a discussion of this point.

3. The thirteen countries in our sample are Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, Norway, Russia, Sweden, the United Kingdom, and the United States. Finland was a province of Russia until 1917, when it declared independence. Even before independence, however, Finland had a high degree of economic autonomy, having its own currency and central bank. For further details on sources and methods, see appendix 9.2. Our study is very much in the spirit of Bloomfield (1968), who assembled the available data on net capital movements for a sample of countries that partially overlaps our sample.

4. France, a leading bimetallic power, suspended specie payments in 1870, then ended the free coinage of silver in September 1873 by limiting the daily coinage. Silver coinage was fully suspended in 1876. In January 1878, gold specie payments resumed. See Flandreau 1996 for details. For the United States, we do not consider the period from 1873 to 1878 when the Coinage act of 1873 was in force to be a true bimetallic standard. The act did not allow for unlimited coinage of silver, and excluded the standard silver dollar from the definition of acceptable coinage. Furthermore, no silver coin was to be legal tender beyond the limit of five dollars. According to Friedman (1990, 1165), "The omission of any mention of the standard silver dollar in the Coinage Act of 1873 ended the legal status of bimetallism in the United States." Notwithstanding our own decision to adjust only for gold flows, our data appendix (appendix 9.2) in several cases describes sources for relevant silver data we have encountered, in case other researchers should wish to attempt a full correction of historical current account figures for silver as well as gold flows. These data are available on the NBER website mentioned in the introductory footnote. Where the standard national current account data exclude silver flows, we make no systematic attempt in this paper to reintroduce data on silver shipments into the current account.

5. This example draws on Gardner 1953.

6. Clearly, we are abstracting from costs of turning an ounce of gold ore into an ounce of bullion.

7. This accounting convention is the one recommended by the International Monetary Fund. For further details, see Inter-Secretariat Working Group on National Accounts 1993.

8. Morgenstern (1955) argued forcefully that monthly and quarterly historical data on bilateral gold flows are too inaccurate to be useful. Thus it might seem pointless (and at worst harmful) to adjust the standard series using data on international gold flows. Goodhart (1969), after examining 1900–1912 data on bilateral flows between the United States and United Kingdom, concludes that Morgenstern overstated the case. We use

annual data on each country's total gold flows, which presumably are less subject to error than bilateral monthly data.

9. See appendix 9.2 For a detailed description of the data sources and methods used in this paper. We have attempted to assemble estimated data for all of the components of equation (9.2) for each country, even when not all of them are strictly necessary to adjust the standard current account numbers. The extended data set allows an assessment of the bias that results from alternative current account definitions.

10. See Sinclair 1993 for details. Urquhart's estimates of net dividends and interest payments are based on direct estimates of asset and liability stocks. In contrast, Viner and Hartland used cumulated current account balances to estimate net foreign asset income.

11. We are forced to include data on silver shipments for France before 1870 because of the lack of information that would allow us to separate silver from gold movements.

12. Italy adopted the use of gold and silver as legal tender throughout the country on March 23, 1862. Legislation dated August 24, 1862 gave silver limited legal tender. As Fratianni and Spinelli (1997, 65–66) argue, this had the effect of making gold the only metal of exchange in international dealings, and "introduced a gold-based monometallism in disguise." A government decree of May 1, 1866 proclaimed banknotes no longer convertible into gold or silver, effective May 2, 1866. Inconvertible banknotes circulated until 1884, when gold convertibility was restored, but Italy remained on the gold standard only until 1894. For Japan, the New Coinage Act of 1871 declared the gold yen as the standard unit of value and legal tender for transactions of any value. Silver coins were relegated to subsidiary money, legal tender up to 10 yen. However, the act also declared the silver Yen Trade Dollar as legal tender within the confines of treaty ports. An amendment in May 1878 made the silver Trade Dollar legal tender throughout the Empire of Japan. Thus both gold and silver were legal tender within Japan and for all foreign transactions from 1878 to 1897. It wasn't until the Coinage Act of 1897 declared the gold yen as the standard unit of value and legal tender that Japan officially adopted the gold standard. The coinage of the Yen Trade Dollar ceased, and they were gradually withdrawn from circulation.

13. Net national product is used in place of GDP for Germany and Russia.

14. Nonmonetary gold exports can be calculated as the sum of net gold shipments, SG, plus the change in the monetary gold stock, ΔMG. The ratio of nonmonetary gold exports to GDP for 1885–1913 is Australia: 4.2%, Canada: 0.7%, Denmark: 0.0%, Finland: –0.0%, France: –0.5%, Germany: –0.0% (of NNP), Italy: 0.0%, Japan: 0.5%, Norway: 0.0%, Russia: 0.6% (of NNP), Sweden: –0.1%, the U.K.: –0.1%, the U.S.: 0.2%.

15. Eichengreen (1992a) added inventory data for Canada and the United Kingdom to the countries for which Mitchell (1983) reports inventory changes. Our coverage expands Eichengreen's by adding inventory data for Australia, Finland, France, Japan, Russia, and Sweden.

16. In our 1885 to 1913 sample, omitting data on inventories raises the estimated slope coefficient in the Feldstein-Horioka regression by more than 20 percent, and lowers the standard deviation of the slope coefficient by more than 30 percent. Thus it appears that including estimates of changes in stocks or inventories is an important consideration in any analysis of saving-investment correlations. See appendix 9.1 for a full discussion of the effect of removing stocks/inventories data. For Finland, inventory data are not reported separately but are summed with the statistical discrepancy. We use that total as a proxy for inventories.

17. The regression thus tests the hypothesis that an increase in national saving, net of the increase in monetary gold holdings, flows completely into domestic investment. To see this another way, observe from equations (9.1) and (9.3) that $CA^O = CA^{NG} + SG = CA - \Delta MG$. Thus CA^O equals the difference between an economy's total outward shipments of goods, services, and gold and its total inward shipments, which must equal its net accumulation of nongold foreign claims. This follows from the balance of payments identity that the true current account surplus plus the nongold capital account surplus equals monetary gold acquisitions. Therefore, the Feldstein-Horioka hypothesis implies that $CA^O = S - \Delta MG - I = 0$.

18. Regression estimates of the specification in equation (9.7) are presented in appendix 9.1, third section.

19. See Obstfeld 1995 for a discussion of recent data. Taylor 1996 reviews the behavior of the saving-investment correlation over time since the nineteenth century.

20. On interwar capital controls, see Obstfeld and Taylor 1998.

21. Bayoumi's sample of countries consisted of Australia, Canada, Denmark, Germany, Italy, Norway, Sweden, and the United Kingdom. Eichengreen added the United States. Our data set adds Finland, France, Japan, and Russia.

22. In recomputing Eichengreens's (1992a) estimates using the Mitchell 1992 data (with our Australian, Canadian, and U.S. data, without gold adjustments) and Eichengreen's specification, we found a slope coefficient of 0.656 for 1880–1913, 0.529 for 1880–1890, 0.778** for 1891–1901, 0.749 for 1902–1913, 0.873*** for 1924–1936, and 0.853*** for 1925–1930. When Eichengreen uses alternative data for the United States compiled by Roger Ransom and Richard Sutch, he finds a slope coefficient of 0.58* for 1925–1930. (The asterisks denote alternative significance levels of estimates. See note to table 9.3 for definitions.)

23. See appendix 9.1, fifth section, for more details.

24. For the full sample period, the time-series correlation between net gold shipments and the current account exclusive of all gold flows was negative for Australia, Finland, France, Italy, Japan, Norway, the United Kingdom, and the United States (eight out of our thirteen countries). For the 1885–1913 sub-period, the correlation was negative for Denmark, France, Germany, Italy, Japan, Norway, Sweden, the United Kingdom, and the United States (nine out of our thirteen countries).

25. Expressed as a percentage of gross domestic or net national product.

26. An alternative method to test the sensitivity of the parameter estimates to the sample of countries is to perform bootstrap regressions. Bayoumi (1990) calculates bootstrap estimates for his sample of eight countries and finds parameter estimates quite similar to his least squares calculations.

27. The dates we use for gold standard adherence are as follows. Australia: 1852–1915, 1925–1929; Canada: 1853–1914, 1926–1931; Denmark: 1873–1914, 1927–1931; Finland: 1877–1914, 1926–1931; France: 1878–1914, 1928–1936; Germany: 1871–1914, 1924–1931; Italy: 1862–1866, 1884–1894, 1927–1936; Japan: 1897–1917, 1930–1931; Norway: 1875–1914, 1928–1931; Russia: 1897–1914; Sweden: 1873–1914, 1924–1931; United Kingdom: 1821–1914, 1925–1931; United States: 1879–1933. See Bordo and Kydland 1995, Bordo and Schwartz 1996, and Eichengreen 1992b for surveys of gold standard participation.

28. Net national product if GDP is unavailable.

29. See the notes on capital formation in Australia for a discussion of this point.

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