HISTORICAL EVIDENCE ON BUSINESS CYCLES*

The international experience

U. Michael Bergman[a], Michael D. Bordo[b] and Lars Jonung[c]

[a]Department of Economics, Lund University, P.O. Box 7082, S-22007 Lund, Sweden; e-mail: Michael.Bergman@nek.lu.se

[b]Department of Economics, Rutgers University, New Jersey Hall - 75 Hamilton Street, New Brunswick, NJ 08901-1248 and NBER; e-mail: bordo@econ.rutgers.edu

[c]Department of Economics, Stockholm School of Economics, S-11383 Stockholm, Sweden; e-mail: nelj@hhs.se

Abstract

This paper examines the characteristics of business cycles within and across thirteen countries for more than a century of observations adopting a monetary regime perspective. We search for empirical regularities of business cycle fluctuations during three monetary regimes; the classical gold standard, the interwar period and the post-World War II period. Our empirical results, based on bandpass filtered data, suggest that business cycle fluctuations have remained surprisingly stable across monetary regimes and across countries. In particular, the procyclical pattern for consumption, investment, exports and imports is stable across regimes and countries. We find a rise in the frequency of significant cyclical comovements across countries, possibly reflecting a recent rise in economic integration. Our evidence suggests that both the amplitude and the symmetry of business cycles have changed over time. The post-World War II period is marginally less volatile than the gold standard period while the interwar period is more volatile.

Keywords: Business cycles, monetary regimes, amplitude, symmetry and comovement of cycles.

JEL classification: E32

*For helpful comments we thank Richard Cooper and Christina Romer. We also thank Pontus Hansson, Jesper Hansson and Antu Murshid for data assistance.

1. Introduction

This paper adopts a historical perspective to examine the characteristics of business cycle fluctuations within and across a large set of countries. Following the classical work by Burns and Mitchell (1946), we define business cycles as recurrent, but not necessarily periodic, fluctuations in economic activities with a duration of two to eight years. According to them, business cycles are characterized by their average duration, amplitude and the comovement of economic activities. Our objective is to document regularities of these cyclical movements both across countries and across time.

Most recent empirical work within this strand of research has dealt with the American record, see for example Lucas (1977), Kydland and Prescott (1990), and Stock and Watson (1998). A number of recent studies have made international comparisons of business cycles, among others Sheffrin (1988), Baxter and Stockman (1989) and Backus and Kehoe (1992), or dealt with the record of other countries than the US, among others Englund, Persson and Svensson (1992).[1] Our study focusing on many countries including the US should be looked upon as fitting into this tradition of comparative international research on the business cycle. The issues we address in this paper concern first the behavior of cycles within countries ("country-specific" cycles), second, the sources of business cycles and third, the interaction between business cycles across countries (the "international business cycle").

The approach we take in this paper is an empirical one, not guided directly by any one theory of the business cycle, although we are cognizant that meaningful empirical work is always driven by theory. Business cycle theory has evolved from an emphasis on the cycle as an independent well identified entity earlier in the century, to the Keynesian approach in the 1940's and 1950's emphasizing exogenous fluctuations in aggregate demand, to the monetarist approach of the 1960's and 1970's stressing the role of monetary shocks, to the recent real business cycle approach close to the classical view, stressing technology shocks, and the new-Keynesian emphasis on sticky prices and menu costs.[2]

Our approach also complements the traditional narrative approach to the study of business cycles, best exemplified in Thorp (1926) and Gayer, Rostow and Schwartz (1953). In this approach contemporary press and periodical literature and similar sources are culled to give a picture of what contemporary opinion viewed as both a chronicle of business events and a list of causal factors. To follow such an approach is a gigantic task which is beyond the limits of an essay. Instead, we present a birds eye view of central features of the cyclical experience of advanced countries. We search for a number of empirical regularities as suggested by past and contemporary business cycle research.

We pay special attention to monetary regimes, more specifically to the institutions determining monetary arrangements within the economy as well as between economies. We focus on three distinct regimes; the classical gold standard, the interwar period and the post-World War II period, which we split into the Bretton Woods period, and the post-Bretton Woods period.[3] The

[1]Also see Zarnowitz (1992) for earlier international cyclical comparisons.

[2]See Zarnowitz (1992, ch. 2).

[3]The rational for this chronology is spelled out in Bordo and Jonung (1997) and Bordo and Schwartz (1998).

following thirteen "advanced" countries are included in our sample; the US, the UK, Germany, France, Japan, Italy, Canada, Belgium, the Netherlands, Denmark, Finland, Norway and Sweden. There is an emphasis on the European experience through our choice of countries, partly by choice and partly by data limitation.

Our empirical work extends the earlier literature in several directions. First, we examine a broader set of countries than did Backus and Kehoe (1992), who studied ten countries. We have also extended their historical data backwards and forwards in time.

Second, we apply the Baxter-King (1995) bandpass filter to extract all variations of a variable at business cycle frequencies. We use the data extracted in this way to perform empirical tests of the hypothesis that the volatility of business cycle fluctuations has been dampened during the post-World War II period compared to the classical gold standard era. We reconsider this hypothesis and perform empirical tests allowing us to examine this issue both for each country individually and for all thirteen countries in our sample.

Third, we apply the bandpass filter to the components of national expenditure to determine whether their cyclical patterns are similar across cycles. We also use a panel data regression to ascertain the extent to which various expenditure components predict recessions.[4]

Fourth, we present evidence on common cyclical movements between countries. We observe patterns of the interrelationships between countries under different monetary regimes that reflect the growth and interdependence of markets and changing patterns of economic performance among countries.

The paper is organized in the following manner. Section 2 briefly discusses the relationship between monetary regimes and the business cycle. Section 3 seeks to document regularities (the amplitude and the asymmetry) of country-specific business cycles measured by bandpass filtered GDP during the three major monetary regimes. In section 4 we explore some issues concerning the comovement of country-specific national income and the expenditure components — consumption, investment, government expenditures and revenues, exports and imports — as well as the money supply and the price level. We also extract expenditure components during recessions to explore whether these can account for shortfalls in real GDP. Section 5 then examines some aspects of the international business cycle experience. The main question in this section is whether we can identify common cyclical patterns across groups of countries. Finally, section 6 summarizes.

2. Monetary Regimes and the Business Cycle

Demarcating the data by monetary regimes we believe is a fruitful approach for an empirical study such as ours as different cyclical patterns may emerge within as well as between countries under different monetary regimes. Traditional theory posits that a convertible regime, such as the classical gold standard which prevailed from around 1880 until the outbreak of World War I, is characterized by a set of self-regulating market forces that tend to ensure long-run price level stability. These forces operated through the mechanism commonly described by the classical

[4]It was not possible to amass the data required to analyze the impact of technology shocks, the variable emphasized by the real business cycle approach, on the business cycle.

commodity theory of money (Bordo (1984)). According to that theory, changes in gold production will eventually offset any inflationary or deflationary price level movements. The problem, however, is that unexpected shocks to the supply or demand for gold can have significant short-run effects on the price level and on real output in the face of nominal rigidities.

In an international convertible regime, pegging nations' currencies to the fixed price of gold provides a stable nominal anchor to the international monetary system. Such stability, however, comes at the expense of exposure to foreign shocks which can produce volatile output and employment. Adherence to the international convertible regime also implies a loss of monetary and fiscal independence since under such a regime the authorities' prime commitment is to maintain convertibility of their currencies into the precious metal and not to stabilize the domestic economy.

In a fiat money regime, in theory, monetary authorities could use open market operations, or other policy tools, to avoid the types of shocks that may jar the price level and real activity under a specie standard and hence provide both short-run and long-run nominal stability. It also allows greater fiscal policy autonomy. In addition to giving the authorities policy independence, adhering to a flexible exchange rate fiat regime provides insulation against foreign shocks[5].

As in a convertible regime, countries following fiat money regimes can adhere to fixed exchange rates with each other. The key advantage of doing so is to avoid the transaction costs of exchange in international trade. However, a fixed rate system based on fiat money does not provide the stable nominal anchor of the specie convertibility regime unless all the members define their currencies in terms of the currency of one dominant country, for example the US under Bretton Woods or Germany in the EMS, which in turn follows a rule which requires it to maintain price stability.

Finally, in a fiat money flexible rate regime, the absence of the nominal anchor of the fixed price of specie opens up the possibility that monetary authorities, to satisfy the political goals of the government, for example its fiscal demands or demands to maintain full employment, could use the printing press to engineer high inflation.

2.1 The Classical Gold Standard

Under the pre World War I classical gold standard where nations money supplies were determined by their monetary gold stocks, the business cycle was strongly influenced by shocks to the gold market such as gold discoveries and changes in the demand for gold as new countries adopted the standard. Monetary and fiscal policies had a limited role in this era.

Central banks were supposed to follow the "rules of the game" and accommodate gold flows. Although violations were common and monetary authorities on occasion sterilized gold flows and geared their policies to domestic objectives such as smoothing interest rates and possibly offsetting cyclical disturbances, in addition to serving as a lender of last resort to provide adequate liquidity to allay banking panics, the violations were never serious enough to force any

[5]Theoretical developments in recent years have complicated the simple distinction between fixed and floating exchange rates. In the presence of capital mobility, currency substitution, policy reactions and policy interdependence, floating rates do not necessarily provide complete insulation from either real or monetary shocks (Bordo and Schwartz (1989)). Moreover, according to recent real business cycle approaches, there may be no relationship between the international monetary regime and the transmission of real shocks (Baxter and Stockman (1989)).

of the advanced countries to abandon gold convertibility (Bordo (1998)). The only situation when expansionary monetary policy was deliberately used was in the case of a major war when convertibility would be temporarily suspended and government expenditures financed by the issue of inconvertible notes (Bordo and Kydland (1995)). Fiscal policy also had a very limited role in this period. Debt financed government expenditures were temporarily expanded during wartime as a form of tax smoothing (Bordo and Jonung (1997)).

Financial crises (banking panics) were important sources of cyclical disturbances under the gold standard. They occurred regularly in England as part of the upper turning point of the business cycle in the years before 1866, after which the Bank of England learned to act as a lender of last resort. Similar experiences occurred on the continent. In the U.S., which did not have an effective lender of last resort and which had a unit banking system unable to diversify their portfolios in the face of shocks to various regions, banking panics were an important source, if not aggravating factor to the business cycle.

Finally, the pre-1914 era was considerably less industrialized than the subsequent years in most of the countries in our sample. Hence disturbances to the agricultural sector such as harvest failures constituted important sources of disturbances. These country-specific shocks were in turn transmitted between countries via the fixed exchange rate linkages of most countries adhering to gold parity. They were transmitted via the current account and via capital flows in an era absent controls. Despite the presence of business cycles, the era was one of rapid growth and relative stability compared to the interwar years. Many attribute its success to the fact that it was dominated (in terms of trade flows and cyclical flows) by the U.K., which generally followed very stable financial policies.

2.2 The Interwar Period

The interwar period was a mixed regime of floating in the beginning, convertibility in the middle and managed floating with extensive capital and exchange controls at the end. The early years were characterized by chaotic monetary and fiscal conditions on the continent of Europe and floating exchange rates in most countries. The attempt to restore gold convertibility after the war was responsible for a very serious worldwide recession in 1919-21.

The restored gold exchange standard from 1925-1931 reintroduced many of the attributes of the classical gold standard including the conduit of international business cycle transmission via the monetary standard (Fisher (1935), Choudhri and Kochin (1980)). It also suffered from fatal flaws which both made it more fragile and imposed deflationary pressure on world monetary gold stocks (Bordo and Eichengreen (1998)).[6] The most serious problem of that era which was a key cause of the Great Depression was the pursuit of pro-gold contractionary policies by the U.S. and France. The Great Depression originated in the U.S. but was transmitted abroad by the gold

[6]The fatal flaws included: the adjustment problem (asymmetric adjustment between deficit countries (Britain) and surplus countries (France and the United States); the failure by countries to follow the rules of the gold standard game, (e.g., both the US and France sterilized gold flows); the liquidity problem (inadequate gold supplies, the wholesale substitution of key currencies for gold as international reserves leading to a convertibility crisis when countries subsequently tried to convert the key currencies back into gold); and the confidence problem leading to sudden shifts among key currencies and between key currencies and gold (Bordo (1993), Eichengreen (1992)).

standard. Only when the links with gold were cut did recovery take place.[7]

Although the interwar period was by far the most unstable in our comparison, the 1920's was characterized by relative stability. Many attribute this experience to the effective use of monetary policy in the U.S. (Friedman and Schwartz (1963a)) and central bank cooperation (Eichengreen (1992)). The considerable instability that followed in the 1930's is explained by these authors by the failure of Federal Reserve policy and the breakdown of cooperation.

2.3 The Postwar Period: Bretton Woods

The Bretton Woods System was designed to incorporate the perceived lessons of the monetary turmoil of the interwar period. Bretton Woods was the last convertible global regime.

The Articles of Agreement signed at Bretton Woods, New Hampshire in 1944 represented a compromise between American and British plans. They combined the flexibility and freedom for policy makers of a floating rate system which the British representatives wanted, with the nominal stability of the gold standard rule emphasized by the US. The system established was a system of pegged exchange rates but members could alter their parities in the face of a fundamental disequilibrium. Members were encouraged to use domestic stabilization policy to offset temporary disturbances. Thus the Agreement explicitly made room for discretionary monetary and fiscal policies, whose use at best was minimal under the classical gold standard. These policies would be effective because of the presence of capital controls. The International Monetary Fund was to provide temporary liquidity assistance and to oversee the operation of the system.

The era was characterized by rapid growth, especially in Europe and Japan, and few serious recessions. The international transmission of cyclical disturbances were muted by capital controls and domestic financial policies. As was Britain under the gold standard, the United States was the dominant country of the Bretton Woods era and Bretton Woods became a gold dollar standard. The system eventually broke down because of fatal flaws similar to the gold exchange standard and because the US followed inappropriate policies for the center country (Bordo (1993)).

2.4 The Postwar Period: The Managed Float

The move to a managed floating exchange rate regime in the 1970's gave greater independence to monetary and fiscal policies. This is exhibited in higher money growth rates, rising fiscal deficits and high debt to GDP ratios (Bordo and Jonung (1997)). Most countries in this period followed full employment policies and exploited the Phillips curve trade-off to high inflation. The oil shocks of the 1970's were important aggravating factors (see Daniel (1997)). Many believe that they precipitated serious recessions which were transmitted between countries despite the policy independence afforded by floating rates. In this period, return to greater capital mobility made the world more close knit and also may have more closely interconnected the business cycle. The high inflation period of the 1970's was followed by disinflation in the 1980's and 1990's and a return to more stable monetary and fiscal policies in the mid-1990's (Bordo and Jonung (1997)).

[7]An alternative explanation for the Great Depression focuses on real factors: structural and demographic adjustments to the upheavals of World War I (Temin (1989)).

To conclude, it has proven fruitful to adopt a monetary regime perspective to examine long-run patterns. Monetary regimes are an important determinant of the long-run behavior of nominal variables such as the money stock, the price level and nominal interest rates. There is no clear cut relationship between monetary regimes and the long run behavior of real variables, however.

Here we focus instead on the relationship between monetary regimes and the short-run behavior of the economy as there are a priori reasons suggesting that the regime may influence cyclical behavior as well. However, we are aware that any cyclical differences found across regimes may be due to a host of factors. Various structural changes may be at work such as the decline of agriculture and the industrial sector, the rise of the service sector and the public sector and the welfare state in a large number of countries in our sample. These structural developments may have exerted an influence on the characteristics of the business cycle.

3. Properties of Country-Specific Business Cycles

In this section we examine the business cycle properties of real GDP. We examine and compare the data for three different monetary regimes: the classical gold standard 1873-1913, the interwar period 1920-38, and the postwar period 1948-95. The latter period is also split into the Bretton Woods-period 1948-72, and the post-Bretton Woods-period 1973-95. The data sources are presented in Appendix A.

Prior to our empirical analysis we must extract the cyclical component from the macroeconomic time series. Recently, Baxter and King (1995) have developed a band-pass filter that isolates cyclical components of economic time series. This filter can be designed to isolate cyclical components of the data with durations conforming to the Burns-Mitchell definition of the business cycle, i.e., cycles with durations between two and eight years.[8] We use a third order two-sided filter following Baxter and King (1995) that produces cyclical components with lengths between two and eight years. When applying this filter, we lose three observations at both ends of our sample. Initial conditions for the filter are actual observations on GDP for the three years preceding 1876 and projections of GDP from 1995 until 1998 based on fourth order univariate autoregressive models.[9]

The NBER chronology has long been a common starting point for business cycle analysis. To evaluate our band-pass filter technique we compare the NBER-chronology for the US with our estimated cyclical component in Figure 1. This figure demonstrates a striking resemblance between NBER peaks and troughs and peaks and troughs estimated by the band-pass filter. Our filter detected 22 out of 26 troughs indicated by the NBER chronology since 1885. In 15 cases, our filter correctly date the troughs and we miss four troughs by plus/minus one year. Three troughs cannot be dated correctly by our filter. This result supports the findings in Stock and Watson (1998) who also apply the bandpass filter to US real GDP. Our interpretation is that the

[8]Baxter and King (1995) compare the properties of cyclical components of US GNP generated by different detrending techniques and find that the band-pass filter usually is superior to other filters in isolating cyclical variation within certain frequency bands.

[9]Stock and Watson (1998) also use univariate autoregressive models to construct predicted values used as initial conditions.

bandpass filter produces a good measure of the US business cycle as it conforms quite closely to the NBER chronology. Therefore, we apply this filter for our thirteen countries to both national income and the components of national income. Plots of bandpass filtered real GDP for the other twelve countries are shown in Appendix B.

Table 1 displays the average length of business cycles using band-passed filtered data for the three monetary regimes. The number of cycles identified is given in parentheses in Table 1. A comparison across regimes indicates that the typical business cycle lasted on average 3.8 years in the thirteen countries in our sample for the classical gold standard period. In this period, cycles ranged from 2.9 years in Italy to 4.7 years in Sweden. The general impression from this table is that the duration increased to on average 5.4 years during the interwar years and then fell back to 4.8 years in the postwar period. We suggest that the business cycle has been a fairly regular empirical phenomena across time and that the duration is quite similar across our sample of countries.

3.1 Mild versus Serious Recessions

One theme in the literature on the business cycle states that severe downturns are of a different character from mild recessions (Burns and Mitchell (1946) and Friedman and Schwartz (1963)). According to this view, the severe recessions that occurred before World War II were commonly associated with financial crises. As can be seen from Figure 1 and the graphs in Appendix B, severe recessions generally occurred before 1946. In the case of the United States and a few other countries these recessions were associated with financial crises, Bordo (1986).

A striking feature of Figure 1 and the graphs in Appendix B is the lower amplitude displayed for the postwar period. However, disregarding the severe recessions in these graphs, volatility seems to have remained fairly constant over time. Next we perform empirical tests of the hypothesis that the business cycle has been dampened.

3.2 Has the Business Cycle Been Dampened?

A recent controversy concerns whether the volatility of the business cycle has been reduced comparing the post World War II period with the pre World War II period. Many have argued that the evidence that business cycles have been dampened since World War II reflects the institution and successful application of stabilization policies including automatic stabilizers (DeLong and Summers (1986) and Zarnowitz (1992)). However, Romer (1989), disputes the basic evidence for the United States. Her reworking of Kuznets' national income series leads to the conclusion that there is little difference in cyclical amplitude between the pre and post World War II eras. The counter argument for the U.S. case is provided by Balke and Gordon (1986). International evidence which generally supports the traditional view has been provided by Sheffrin (1988), Backus and Kehoe (1992) and others. Bergman and Jonung (1993), however, do not find strong support for a dampening of the Swedish business cycle.

To provide evidence for this issue for the thirteen countries in our sample, we measure the amplitude of the business cycle as the variance of bandpass filtered real GDP. Our empirical analysis extends previous studies. Besides using bandpass filtered data, we examine a larger set of countries than in previous studies. Sheffrin (1988) covers six European countries whereas Backus and Kehoe (1992) cover ten countries. In addition to testing whether the variance of the business cycle is invariant to monetary regimes for each country separately, we also test to see whether volatility has changed simultaneously across all thirteen countries.

According to the standard deviations in Table 2 for the band-pass filtered data (the cyclical component of GDP), volatility was considerable higher during the interwar years than during the pre-World War I gold standard and the post-World War II-period. This result confirms the conclusions from earlier studies showing that the interwar years displayed relatively high volatility.[10] There is consensus on this point. The deflation and depression of the early 1920's and the Great Depression of the 1930's brought havoc to the world economy in these years.

Table 2 also throws light on the issue of the possible dampening of the business cycle over time when comparing the classical gold standard with the post-World War II period. The point estimates of volatility displayed in Table 2 are lower during the later period for ten out of thirteen countries. Figure 2 plots standard deviations of the cyclical component taken from Table 2 for two sub-periods; the pre World War I and the post World War II periods. It shows that the point estimates of volatility are lower during the post World War II period for all countries except for Belgium, Norway and Denmark.

To construct a formal test of the hypothesis that volatility measured by the variance of the bandpass filtered GDP declined over time, we set up a Seemingly Unrelated Regression (SUR) system with thirteen equations where the dependent variable is the variance of the bandpass filtered GDP and the independent variables are two dummy variables. The first dummy has the value one for the classical gold standard period and zero otherwise whereas the latter dummy takes on the value zero for the gold standard period and one otherwise. In this setup, each coefficient on the two dummy variables is a measure of the variance of the business cycle under each regime.

To test whether the variance is constant for each country separately and also test the joint hypothesis that the variance is constant for all countries simultaneously, we use Wald tests. The results from these tests are summarized in Table 3. Judging from the p-values in this table, this hypothesis can often be rejected for each country by itself, i.e., we reject constant variance in six out of thirteen cases. Most notable is that we cannot reject constant variance for Sweden, the country most associated with an active stabilization policy, but we can reject the null for the US, see Table 3. A joint test covering all countries also rejects this hypothesis at very low significance levels. Thus, although the evidence is not overwhelming, the business cycle does appear to have changed its amplitude when testing this hypothesis simultaneously for all countries.

Empirical evidence of lower volatility in the postwar data has often been interpreted as resulting from successful stabilization policies. One alternative interpretation is that the international business cycle has been diversified such that developments in one core country no longer influence all other countries. For example, the United Kingdom dominated the world economy prior to the World War I period and mistakes of the Bank of England could initiate severe recessions not only in the domestic economy but also in its trading partners (see Levy-Leboyer (1982)). The increased integration of the world economy would therefore limit negative influences from dominating economies, thus reducing the amplitude of the business cycle, a pattern consistent with both the plots in Figure 1 and Appendix B, as well as the empirical tests above.

Other explanations include structural changes in the economy linked to the rise of the service sector and the public sector (both which are less cyclical than the primary and secondary sectors)

[10]See for example, Backus and Kehoe (1992, p. 873).

and the incidence of smaller macroeconomic disturbances after World War II than during the classical gold standard (see Zarnowitz (1992)).

3.3 Is the Business Cycle Symmetrical?

The symmetry of the business cycle has been an issue for a long time. Mitchell (1927) and Keynes (1936), among others, were of the opinion that the business cycle was asymmetrical: the upswing being longer and more gradual than the downswing. A large number of empirical studies have dealt with tests of asymmetry without reaching a consensus, see for example Neftçi (1984), DeLong and Summers (1986), Falk (1986), Hamilton (1989), Stock (1987), and Bergman and Jonung (1992).

Here, using bandpass filtered data we present evidence on this unsettled issue using estimates of the skewness of the cyclical component. If the business cycle is symmetric, skewness would be zero. A negative skewness indicates that upturns are longer than downturns.

Table 2, reporting the skewness of the cyclical component of GDP, reveals that the business cycle is negatively skewed for a majority of the countries in our sample (including the major countries) during the classical gold standard period (ten out of thirteen countries) and to some extent during the interwar years (eight out of thirteen countries). However, during the post World War II period only five out of thirteen countries display negative skewness. Splitting this postwar period into a Bretton Woods and a post Bretton Woods period, we note that skewness has become more pronounced in the latter period. For example, the US business cycle remains asymmetrical across all regimes whereas for all other countries the sign for skewness varies across regimes. These results suggest that the business cycle is still asymmetrical.

4. Country-Specific Comovements

4.1 Cross-Correlations

In Table 4 we study the cyclical behavior of: the components of national income, the money supply, the price level and their relation to the cyclical component of real GDP. All variables are filtered through the bandpass filter. The eight variables we consider are, consumption, investment, exports, imports, government expenditures and revenues, the money stock and consumer prices. The first column of Table 4 reports the volatility ratio measured as the ratio of the standard deviation of each of the eight different variables to the standard deviation of national income. A ratio greater than one implies that this variable has greater volatility than does real output.

Looking first at the expenditure components, a clear result emerges. All expenditure components, with the exception of consumption, are more volatile than output. The volatility ratio is greater than one for all countries and for all regimes with one single exception, that of the Netherlands for the gold standard period. The ratio for investment is in all countries in the range between 2 and 5 with the exception for Italy during the gold standard and the interwar period. The volatility ratio for the other components is as a rule within the same range as for investment. The volatility ratio for exports and imports are generally larger for the small European countries like Belgium, the Netherlands, Denmark, Finland, Norway and Sweden than for larger countries like the US and Germany.

The volatility ratio of consumption is close to one, actually in 14 out of 25 cases below one. We regard this as indicating consumption smoothing over the business cycle — aside from the fact that consumption is the major component of national income which implies that its volatility should be similar to that of national income.[11]

The variability of the money stock is greater than the variability of output for all countries and for all regimes with the exception of the US, UK and Italy during the gold standard and for Canada, Denmark and Norway during the interwar period. We also note that money stock variability has remained higher than output variability during the post World War II-period.

Turning to consumer prices, Table 4 reveals that the US price level is less variable than is output for all regimes. The same holds for Germany excluding the interwar years. For Japan, the UK, France and Italy, except during the gold standard, and for the small European countries, with the exception of the Netherlands during the gold standard and the post Bretton Woods period, consumer prices are more variable than output.

The next three columns (columns 2 to 4) show cross-correlations of each variable with national income at a one period lead and lag as well as the contemporaneous correlations. These columns reveal first of all that most of the significant correlations are registered for simultaneous observations. The business cycle is in this sense a phenomenon that occurs at the same time for most of the expenditure components. There is no clear cut pattern across countries and across regimes.

Consumption and investment are strongly procyclical according to Table 4. The same holds for exports and imports; in particular for imports. The volume of imports, as expected, seems to be determined by domestic activity. Exports are less frequently significantly correlated with domestic output, consistent with the common view that foreign demand is driving exports. This result suggests that cyclical activity across countries is not perfectly correlated, otherwise exports would more frequently display a significant simultaneous correlation with output.[12]

Government expenditures and revenues do not display any clear-cut pattern, neither being procyclical or countercyclical. The level of significance is low for most observations. Concerning leads and lags, there is no clear pattern either across countries or regimes in Table 4.

The correlation between money and output — where significant — is always positive for all countries and all regimes except for the Netherlands during the gold standard and Belgium during the post-Bretton Woods period. The US is an exception in the sense that money and output are significantly and positively correlated for all three major regimes and, of particular interest, that the largest correlations are for the interwar, as found in earlier studies such as Friedman and Schwartz (1963b). For other countries there is no clear pattern. The same conclusions hold for money leading and lagging output by one year.

Consumer prices and output are negatively related in fourteen cases and positively related in three cases (with the U.S. before World War II the most notable) counting only significant correlations. It is always negative during the post-World War II period. The price level thus tends to be countercyclical — a result found in other studies as well.

---

[11]These results are in line with those of Backus and Kehoe (1992) where comparable.

[12]This issue could be explored by a breakdown of exports on a country-by-country basis — a task that is beyond this paper.

The lead and lag patterns can also be analyzed using regression analysis. For example, we can compare the R^2 from a regression of real GDP (y) on lags of real GDP and consumption (x) with the R^2 from the same regression but excluding lags of consumption. The difference between these two R^2 values, $R^2(y.x)$, then represents the additional explanatory power of lags of consumption for real GDP. Similarly, we can reverse the variables to illustrate the explanatory power of lagged real GDP for consumption, $R^2(x.y)$. These tests correspond to standard block-exogeneity tests (or Granger-causality tests) within vector autoregressive systems. A high relative $R^2(y.x)$ from these regressions does not imply causality however. The tests only indicate that including the x-component in the information set increases our ability to predict the y-variable one period ahead.

Columns 1 and 2 in Table 5, reports the marginal R^2 from these regressions using 2 lags. A high $R^2(y.x)$ in column 1 implies that the addition of lags of the x-variable increases the prediction of real GDP, thus the x-variable leads real GDP. Similarly, a high relative $R^2(x.y)$ in column 2 indicates that lags of real GDP increase the ability to predict the x-variable implying that the x-variable lags real GDP.

There are a few cases with large relative improvements for the R^2 but in most cases the percentage increase is below 20 per cent, see Table 5. This result confirms our previous finding that most of the cyclical comovement occurs for simultaneous observations and that there is no clear-cut pattern across countries and regimes.

Looking more closely at the empirical results, we find that the leads and lags relationship between cyclical components of consumption and the business cycle remains fairly stable over time for the nine countries for which data are available. Consumption leads the business cycle for about half the sample of countries in all monetary regimes. During the postwar period, for example, consumption leads output in the G7 countries with the exceptions of France and Italy, but it lags the business cycle in the small open European countries.

A similar pattern is also observed for investment. In all small European countries except Norway, investment lags the business cycle whereas it leads the business cycle in the G7 countries except the UK and Germany. Comparing the relationship between investment and output across monetary regimes reveals that investment tends to lag the business cycle more often during the postwar period than in earlier periods.

This tendency is also evident for government expenditures. The cyclical component of government expenditures lags output in four out of thirteen countries during the gold standard period and in seven out of thirteen countries during the postwar period.

The money stock leads the business cycle in six out of thirteen countries during the gold standard period, in nine out of thirteen countries during the interwar period, and in ten out of thirteen countries during the postwar period. There is also a tendency that the money stock lags the business cycle in the small open European countries but leads output in the G7 countries. A similar pattern is also evident for the price level.

The annual pre-World War I data used to generate the results in Tables 4 and 5 may have significant deficiencies making the empirical results less than completely reliable, as discussed in Romer (1989). In addition, using annual data surpresses potential lead and lag relationships more evident in high frequency data. For these reasons it is useful to compare our results (for the postwar period when comparable higher frequency data is available) with results using quarterly data.

Stock and Watson (1998) employ the same empirical approach as we do, but use quarterly data. They find empirical results remarkably similar to the ones reported in Table 4. For example, they also find that consumption, investment and imports are strongly procyclical whereas consumer prices are countercyclical and all these variables lead the business cycle (two quarters in Stock and Watson and one year in our study). Money is procyclical with a lead of one or two years when using our annual data, whereas using quarterly data, Stock and Watson find that the money stock is procyclical with a lead of two quarters. Thus, the historical US data we use in our study exhibit similar behavior to quarterly data which we believe buttresses our findings. Whether the same holds for the other countries is a subject for further research.

4.2 The Behavior of Economic Aggregates During Recessions

The cross-correlations examined in the previous section provide information on the comovements of economic aggregates and real GDP over both upturns and downturns. To explore the behavior of these aggregates during recessions, we pick out data for the trough years for all countries of our sample. The dates for the troughs are selected from the bandpass filtered real GDP shown in Figure 1 and in Appendix B. As mentioned earlier, the cyclical components represent deviations from trend and are measured in percent.

In Table 6, we report the average deviation from trend of bandpass filtered real GDP, the components of national income and the nominal money stock. The first column reports the number of troughs identified in the sample for each country and the second column shows the average deviation during recessions of real GDP from its trend. From this column, we observe that recessions tend to be deeper in large countries compared to the small open European countries. The average deviation from trend in the US, Germany, France, Canada and Italy is considerably higher than the average of the four Nordic countries and Belgium.

The deviations from trend of real GDP can be compared to deviations from trend of the components of national income, i.e., private consumption (C), gross fixed capital formation (I), government expenditures (G), government revenues (T), exports (X) and imports (M). Consider, for example, the behavior of economic aggregates in the US during recessions. The average deviation of real GDP from trend is -3.8 percent. From Table 6, we note that both capital formation, which was on average 7.1 percent below trend, and foreign trade (exports and imports) represent large fractions of the downturns in the US economy, whereas private consumption and government expenditures represent only a minor proportion.

Similar results also hold for other countries, in particular for Germany, Canada, Belgium, Denmark, Norway and Sweden even if the relative importance of these three economic aggregates differ. In France, the Netherlands and Finland, foreign trade and government revenues represent the major part of the shortfall in real GDP. For example, for the Netherlands government revenues were 7.4 percent below trend whereas real GDP was 4.2 percent below trend.

The last column of Table 6, shows the average shortfall of the money stock during recessions. From this column, we find that the nominal money stock only represents a minor share of the troughs in real GDP except for the US where the nominal money stock was 2.2 percent below trend during recessions.

Another way to characterize the behavior of the economic aggregates during recessions is to stack the data for our sample of countries and formulate a regression model to study the effects of

deviations from trend of economic aggregates on deviations from trend of real GDP. The OLS estimates of this pooled regression is shown in Table 7. We constrain all parameters to be equal across the thirteen countries. We also include country dummies in the regression to capture potential differences in units.

Since we lack data on private consumption for four countries (Belgium, Denmark, Finland, Norway), we exclude them from the data set. The estimates of the parameters associated with the dummy variables are not reported in Table 7. However they are all statistically different from zero at conventional significance levels. According to the estimates in Table 7, three expenditure components, private consumption, investment and export, are statistically significant at the 5 percent level. This conclusion is consistent with the averages presented in Table 6 above and implies that deviations of real GDP from trend can be allocated to these three economic aggregates.

Two measures of economic policy, government expenditures and revenues as well as the money stock are not significant in this regression and account only for small fractions of the shortfalls in real GDP during troughs as is also the case in Table 6.

The fact that the money stock is not significant in these regressions may reflect the pooling of small open economies with larger, less open ones like the U.S., and the pooling across fixed and flexible exchange rate regimes. Under fixed exchange rates which covered much of the period investigated in the regression, one would not expect domestic monetary factors to be significant determinants of recessions for small open economies except indirectly via the balance of payments, whereas with larger, less open economies they could have significant effects. Under flexible exchange rates, monetary factors could have significant effects even for small open economies.

Although these results suggest that recessions are strongly associated with sharp declines in consumption, investment and exports, we cannot infer causality from them. Cyclical declines in the various expenditure components may be due to factors not explicitly included in our analysis such as productivity shocks. Thus, like the recent study by Cochrane (1994) for the postwar US, the cross-country evidence over a century of data does not suggest a single cause of recessions.

5. International Comovements of Output and Prices

In this section we examine the comovements of bandpass filtered real GDP and price levels between countries. We retain the regime division used in the previous section.

5.1 Real Output Comovements

In Table 8 we report contemporaneous correlations of output for thirteen countries. A major impression from this table is that the correlations tend to increase over time. Most of the significant correlations are reported from the post-Bretton Woods period. We view this as indicating an increase in integration of the world economy in the past 20 years. Table 8 also reveals that the correlation has been high between the US and Canada during all regimes for

concomitant changes.[13]

Under the gold standard UK output was significantly and positively correlated with output for only one country — Japan. The corresponding number for the post Bretton Woods period is six. A similar picture emerges for Germany. The lack of apparent real output correlation under the gold standard in an era of high mobility in both good and factors of production is a puzzle. It may reflect the quality of the data. However, our results are consistent with earlier empirical evidence, see e.g. Baxter and Stockman (1989).

In the interwar period significant correlations are observed between the U.S. and seven other countries. Such correlation is not found for any other country. These results seem consistent with the view that the U.S. was the epicenter of the Great Depression.

Linkages between European countries have become more prevalent in the postwar period. The Netherlands is a nice illustration of this. Dutch output was not significantly correlated with output of any other country prior to 1914. During the post-Bretton Woods period the correlation between Dutch output and that of ten other countries turned significant.

The high and significant correlation between countries output during the post-Bretton Woods period within a trade bloc consisting of Germany, France, Italy, Belgium, the Netherlands and Denmark most likely demonstrates the establishment of a common market in Europe. It is tempting to speculate about this pattern as a prerequisite for a future EMU. Indeed five of these six countries are identified as core EU countries by Bayoumi and Eichengreen (1993) suitable for forming a monetary union.

The more frequent incidence of significant international comovements during the post-Bretton Woods period may also be due to large common shocks hitting in particular Europe, for example OPEC I and OPEC II.

5.2 Price Level Comovements

In Table 9 we report contemporaneous international price level correlations across five different periods. The main impression of Table 9 compared to Table 8 covering international output correlations is the higher frequency of significant correlations. The incidence has also — as in Table 8 — increased over time. For example, the US price level was correlated with only two countries during the gold standard but nine during the post Bretton Woods period. In a similar way, Canadian prices were significantly correlated with prices in four countries under the gold standard. During the post Bretton Woods period this number rose to twelve, covering all countries in our sample. In the postwar period German prices are linked significantly to the prices of all other countries in our sample. These results we believe are consistent with evidence of increased global integration of goods markets in recent decades.

However, in contrast to the historical trend of increasing intercountry correlations over time, UK prices during the gold standard were significantly correlated with prices in eight other countries. This pattern is most likely due to the central position held by Great Britain prior to 1914. Germany, another major economic power, also displayed significant correlations with many smaller European countries during the gold standard. This evidence we believe is consistent with

[13]We also calculated correlations across countries for leads and lags up to two years. These calculations, not reported here, but available from the authors on request, generally suggest no significant patterns. Most of the international comovements seem to take place concurrently.

the operation of the 'law of one price' under the gold standard and integration of global goods and factor markets before 1914 (See McCloskey and Zecher (1976, 1984) and O'Rourke and Williamson (1998)).

6. Summary

This paper has examined business cycle fluctuations in a large sample of countries for more than a century of observations adopting a monetary regime perspective. Our sifting through the empirical evidence suggests a number of conclusions bearing on current business cycle research. Among them, we would like to emphasize the following.

First, concerning the properties of country-specific business cycles, our evidence suggests that both the amplitude as well as the symmetry of cycles have changed over time. Echoing the conventional view, the interwar period is found to be more volatile than the classical gold standard and the post-World War II period. In addition, the post-World War II period is marginally less volatile than the gold standard period. Formal empirical tests do not reject the hypothesis that the amplitude was equal during the classical gold standard and postwar periods for the majority of the countries in our sample. However, when testing whether the amplitude was constant in all countries simultaneously in these two periods, we strongly reject this hypothesis. In our opinion, it is an open question what may have caused the decline in volatility. It could be due to a host of structural changes, the conduct of stabilization policies, the construction of the data used etc.

Second, concerning the relationship between cycles in real GDP, and the expenditure components, we find a clear procyclical pattern for consumption, investment, exports, and imports across all countries and all monetary regimes. The variability of investment, exports, and imports is higher than that of real GDP for all countries and periods. Consumption and real GDP display roughly the same variability. There is no clear cyclical pattern across countries and across regimes in the correlation between on the one hand real GDP and on the other hand government expenditure and government revenue.

For the money stock there is evidence for a number of countries of a positive correlation with output and that the money stock leads the business cycle. For the U.S. it is of interest to note that the largest correlations are for the interwar period. This result is consistent with the view attributing the Great Depression to inept Federal Reserve policy (Friedman and Schwartz (1963a)). Also with the key exception of the U.S. during the pre-World War II period, the price level is found to be procyclical.

Third, it is striking that roughly all significant cyclical comovements occur for concomitant observations. This pattern roughly holds for all countries and across all regimes, making it difficult to find lead and lag structures with our approach based on annual data.

Fourth, examining the behavior of cyclical variation during recessions, we find that the major proportion of the decline of real GDP can be accounted for by declines in three expenditure components, consumption, investment and exports. According to our analysis, neither government expenditures and revenues nor the money stock significantly contribute to the recessions as measured with our technique. However, the lack of significance of the money stock may reflect the pooling of open and closed economies across fixed and flexible exchange rate

regimes. We did not possess the data for our thirteen countries to determine whether technology shocks, a variable stressed by recent approaches, could be a possible significant determinant of recessions.

Fifth, the cyclical comovements for real GDP and prices across countries suggest growing international linkages over time. They also suggest global integration which began under the gold standard and significant linkages between the U.S. and many other countries during the unstable interwar period.

Finally, it is tempting to speculate about the influence on the business cycle from technological changes, structural shifts of the economy, the rise of stabilization policies and the public sector as well as other long run developments. We do not rule out that such features may have influenced the business cycle but taken together we do not see any clear pattern over time supporting any single "structural" interpretation. There is one major exception, however. We find a rise in the frequency of significant cyclical comovements across countries. This pattern is consistent with the view that international economic integration has increased over time.

In our opinion, the cyclical pattern in a number of respects thus appears to remain surprisingly stable across time, regimes and countries — ignoring any potential measurement error due to low quality data etc. We do not want to claim that "all cycles are alike", only that the business cycle is always and everywhere apparent in a broad sense and that we see no serious signs that this will not hold in the future as well.

References

Backus, D. and P. Kehoe (1992), "International Evidence on the Historical Properties of Business Cycles," *American Economic Review*, 82:864-88.

Balke, N. and R. Gordon (1989), "The Estimation of Prewar Gross National Product: Methodology and New Evidence," *Journal of Political Economy*, 97:38-92.

Baxter, M. and R. King (1995), "Measuring Business Cycles Approximate Band-Pass Filters For Economic Time Series," NBER Working Paper No. 5022.

Baxter, M. and A. C. Stockman (1989), "Business Cycles and the Exchange-Rate Regime: Some International Evidence," *Journal of Monetary Economics*, 23:377-400.

Bayoumi, T. and B. Eichengreen (1993), "Shocking Aspects of European Monetary Unification," in F. Torres and F. Giavazzi, eds., *Adjustment and Growth in the European Monetary Union*, Cambridge University Press, Cambridge.

Bergman, M., and L. Jonung (1992), "Is the Norwegian Business Cycle Asymmetric?" chapter 8 in K. Velupillai, ed., *Nonlinearities, Disequilibria and Simulation*, Macmillan, London.

Bergman; M. and L. Jonung (1993), "The Business Cycle Has not been Dampened: The Case of Sweden and the United States 1873-1988," *Scandinavian Economic History Review*, 41:18-36.

Bordo, M. D. (1984), "The Gold Standard: The Traditional Approach," in M.D. Bordo and A.J. Schwartz, eds., *A Retrospective on the Classical Gold Standard*, 1821-1931, University of Chicago Press, Chicago.

Bordo, M. D. (1986), "Financial Crises, Stock Market Crashes and the Money Supply: Some International Evidence: 1870-1933" in F.H. Capie and G. Wood eds, *Financial Crises and the World Banking System*, MacMillan, London.

Bordo, M. D. (1993), "The Gold Standard, Bretton Woods and Other Monetary Regimes: An Historical Appraisal," in *Dimensions of Monetary Policy: Essays in Honor of Anatole B. Balbach*, Federal Reserve Bank of St. Louis Review, Special Issue, April-May.

Bordo, M. D. (1998), "The Gold Standard and Related Regimes: Introduction to the Collection," Ch. 1 of *Essays on the Gold Standard and Related Regimes*, Cambridge University Press, New York.

Bordo, M. D. and B. Eichengreen (1998), "The Rise and Fall of a Barbarous Relic: The Role of Gold in the International Monetary System," NBER Working Paper No. 6436.

Bordo, M. D. and L. Jonung (1997), "A Return to the Convertibility Principle? Monetary and Fiscal Regimes in Historical Perspective. The International Evidence," manuscript prepared for the IEA conference in Trento, Italy, September 4-7, 1997.

Bordo, M. D. and F. E. Kydland (1995), "The Gold Standard As a Rule: An Essay in Exploration," *Explorations in Economic History*, 32:423-464.

Bordo, M. D. and A. J. Schwartz (1989), "Transmission of Real and Monetary Disturbances Under Fixed and Floating Rates," in J. A. Dorn and W. A. Niskanen, eds., *Dollars, Deficits and Trade*, Kluwer, Boston.

Bordo, M. D. and A. J. Schwartz (1998), "Monetary Policy Regimes and Economic Performance: The Historical Record," in J. Taylor and M. Woodford, eds., *Handbook of Macroeconomics*, forthcoming.

Burns, A. and W. Mitchell, (1946), *Measuring Business Cycles*, NBER, New York

Choudhri, E. U. and Kochin, L. A. (1980), "The Exchange Rate and the International Transmission of Business Cycle Disturbances: Some Evidence from the Great Depression," *Journal of Money, Credit, and Banking*, 12:565-74.

Cochrane, J. H. (1994), "Shocks," *Carnegie Rochester Conference Series on Public Policy*, 41:295-364.

Daniel, B. (1997), "International Interdependence of National Growth Rates: A Structural Trends Analysis," *Journal of Monetary Economics*, 40:73-96.

DeLong J. and L. Summers, (1986), "The Changing Cyclical Variability of Economic Activity in the United States," chapter 12 in R. Gordon, ed., *The American Business Cycle. Continuity and Change*, NBER, Chicago.

Eichengreen, B. (1992), *Golden Fetters: The Gold Standard and the Great Depression, 1919-1939*, Oxford University Press, New York.

Englund, P., M. Persson and L.E.O Svensson (1992), "The Swedish Business Cycles: 1861-1988," *Journal of Monetary Economics*, 30:343-71.

Falk, B., (1986), "Further Evidence on the Asymmetric Behavior of Economic Time Series over the Business Cycle," *Journal of Political Economy*, 94:1096-1109.

Fisher, I. (1935), "Are Booms and Depressions Transmitted Internationally through Monetary Standards?" *Bulletin of the International Statistical Institute*, 28:1-29.

Friedman, M and A.J. Schwartz, (1963a), *A Monetary History of the United States, 1867-1960*, Princeton University Press, Princeton.

Friedman, M. And A.J. Schwartz (1963b). "Money and Business Cycles." *Review of Economics and Statistics*, 45:32-64.

Friedman, M. and A.J. Schwartz (1982), *Monetary Trends in the United States and the United Kingdom*, NBER, Chicago.

Gayer, Rostow, A. J. Schwartz (1953), *The Growth and Fluctuation of the British Economy 1790-1850*, Clarendon Press, Oxford.

Hamilton, J. D. (1989), "A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle," *Econometrica*, 57:357-384.

Keynes, J. M. (1936), *The General Theory of Employment, Interest and Money*, Macmillan, London.

Kydland, F. E. and E. C. Prescott (1990), "Business Cycles: Real Facts and a Monetary Myth," Federal Reserve Bank of Minneapolis, *Quarterly Review*, 14:3-18.

Levy-Leboyer M. (1982), "Central Banking and Foreign Trade: The Anglo-American Cycle in the 1830's," in C. P. Kindleberger and J. P. Laffargue, eds., *Financial Crises*: *Theory, History and Policy*, Cambridge University Press, New York.

Lucas, R. (1977), "Understanding Business Cycles," in K. Brunner and A. Meltzer, eds., Stabilization of the Domestic and International Economy, *Carnegie-Rochester Conference Series*, 5:7-29.

McCloskey, D. N. and J.R. Zecher (1976), "How the Gold Standard Worked, 1880-1913," in I.A. Frenkel and H.G. Johnson, eds., *The Monetary Approach to the Balance of Payments*, University of Toronto Press, Toronto.

McCloskey, D.N. and J.R. Zecher (1984), "The Success of Purchasing Power Parity: Historical Evidence and its Implications for Macroeconomics," in M. D. Bordo and A. J. Schwartz, eds., *A Retrospective on the Classical Gold Standard, 1821-1931*, University of Chicago Press, Chicago.

Neftçi, S. N. (1984), "Are Economic Time Series Asymmetric over the Business Cycle?" *Journal of Political Economy*, 92:307-328.

Mitchell, W. C. (1927), *Business Cycles: The Problem and its Setting*, NBER, New York.

O'Rouke, K. H. and Williamson, J. G. (1998), *Globalization and History: the Evolution of 19th Century Atlantic Economy*, MIT Press, Cambridge.

Romer, C. (1989), "The Prewar Business Cycle Reconsidered: New Estimates of GNP, 1869-1908," *Journal of Political Economy*, 97:1-37.

Sheffrin, S. (1988), "Have Economic Fluctuations Been Dampened? A Look at the Evidence Outside the United States," *Journal of Monetary Economics*, 21:73-83.

Stock, J. H. (1987), "Measuring Business Cycle Time," *Journal of Political Economy*, 95:1240-1261.

Stock, James H. and Mark W. Watson (1998), "Business Cycle Fluctuations in U.S. Macroeconomic Time Series," NBER Working Paper No. 6528.

Temin, P. (1989), *Lessons from the Great Depression*, Lionel Robbins Lectures, MIT Press, Cambridge, Mass. and London.

Thorp, W. L. (1926), *Business Annals*, NBER, New York.

Zarnowitz, V. (1992), *Business Cycles. Theory, History, Indicators, and Forecasting*, University of Chicago Press, Chicago.

Appendix A: Data sources

Belgium
Real national income. 1880-1920: Not available. 1921-39: GNP, E. Buyst (1997), ”New GNP Estimates for the Belgian Economy During the Interwar Period”, *Review of Income and Wealth*, vol. 43, pp. 357-375, table 4. 1940-47: Not available. 1948: NNP, Mitchell (1992). 1949-53: GDP, Mitchell (1992), 1954-94: GDP, *IFS*, series 99B.P. 1995: *OECD Economic Outlook*.
Prices. 1880-1948: CPI, Mitchell (1992), except 1914-20 and 1941-46: Not available. 1949-95: CPI, *IFS*, series 64.
Money stock. 1880-1971: M1, Statistical Appendix in J. Delbeke (1988), *Geld en Bankkrediet in Belgie, 1877-1983*, Klasse der Letteren, Jaargang 50, Nr. 129, Brussel: Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van Belgie, table 1.2, column 7 and table 1.3, column 9, except 1914-19 and 1941-46: Not available. 1972-95: Money, *IFS*, series 34.
Central government expenditures and revenues. 1880-1969: Mitchell (1978), except 1913-19 and 1940: not available. 1970-94: *IFS*, series 82 and 81. (Note: Change of definition in 1970.)
Export. 1880-1988: Mitchell (1992), except 1901 and 1915-1918: not available. 1989-1996: *OECD National Accounts. Main aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992), except 1901 and 1915-1918: not available. 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Consumption. Not available

Canada
Real national income. 1880-1926: GNP, M. C. Urquhart (1986), ”New Estimates of Gross National Product, Canada, 1870-1926: Some Implications for Canadian Development” in S. L. Engerman and R. E. Gallman (eds.), *Long-Term Factors in American Economic Growth*, pp. 9-94, Studies in Income and Wealth, Vol. 51, NBER, Chicago: The University of Chicago Press, table 2.9. 1927-48: GNP, Mitchell (1993). 1949-95: GDP, *IFS*, series 99B.R.
Prices. 1880-1914: Interurban-Intertemporal CPI, R. C. Allen (1990), *Real Income in the English Speaking World*, University of British Columbia Press. 1915-48: CPI, Urquhart and Buckley (1965). 1949-95: CPI, *IFS*, series 64.
Money stock. 1880-1948: M2, definition and sources are given in Bordo and Jonung (1987), pp. 155-154. 1949-95: Money plus quasi-money, *IFS*, series 35L.
Central government expenditures and revenues. 1880-1947: Mitchell (1993). 1948-94: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992) (Note: change of definition in 1959). 1989-1996: *OECD National Accounts. Main Aggregates (1998)*, Volume I
Import. 1880-1988: Mitchell (1992) (Note: change of definition in 1959). 1989-1996: *OECD National Accounts. Main Aggregates (1998)*, Volume I
Consumption. 1926-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I

Denmark
Real national income. 1880-1950: GDP, Mitchell (1992). 1951-95: GDP, *IFS*, series 99B.P.
Prices. 1880-1949: CPI, Mitchell (1992). 1950-95: CPI, *IFS*, series 64.

Money stock. 1880-1971: Borgernes Likviditet (M2), N. Kjærgård (1991), *Økonomisk vækst: En økonometrisk analyse af Danmark 1870-1981*, Copenhagen: Jurist- og Økonomforbundets Forlag, pp. 582-83, table 3, series AM. 1972-95: Money plus quasi-money, *IFS*, series 35L.
Central government expenditures and revenues. 1880-1947: Mitchell (1992). 1948-95: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. Not available

Finland
Real national income. 1880-1980: GDP, Statistical Appendix in R. Hjerppe (1989), *The Finnish Economy 1860-1985, Growth and Structural Change*, Bank of Finland, Helsinki: Government Printing Centre, table 1. 1981-95: GDP, *IFS*, series 99B.P.
Prices. 1880-1980: Cost-of-living index, Hjerppe (1989), table 13. 1981-95: CPI, *IFS*, series 64.
Money stock. 1880-1971: M2, T. Haavisto (1992), *Money and Economic Activity in Finland 1866-1985*, Ph.D. thesis, Lund Economic Studies number 48, Lund University, average of end-of-month figures in table 4A.2. 1972-95: Money plus quasi-money, *IFS*, series 35L.
Central government expenditures and revenues. 1880-81: Not available. 1882-1948: Mitchell (1992). 1949-94: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. Not available

France
Real national income. 1880-1950: GDP, Mitchell (1992), except 1914-20 and 1939-50: GDP, A. Maddison (1995), *Monitoring the World Economy 1820-1992*, OECD, table C-16a. 1951-95: GDP, *IFS*, series 99B.R.
Prices. 1880-1949: CPI, Mitchell (1992). 1950-95: CPI, *IFS*, series 64.
Money stock. 1880-1897: M1, Saint-Marc (1983). 1898-1977: M2, J.-P. Patat and M. Lutfalla (1990), *A Monetary History of France in the Twentieth Century*, London: Macmillan, tables 1.4, A2, A3 and A5. 1978-95: M2, *IFS*, series 38NB.
Central government expenditures and revenues. 1880-1949: Mitchell (1992). 1950-95: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. 1949-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I

Germany
Real national income. 1880-1979: NNP, Sommariva and Tullio (1987), pp. 226-228. 1980-95: GDP, *IFS*, series 99B.R. (Unified Germany from 1991.)
Prices. 1880-1949: CPI, Sommariva and Tullio (1987), pp. 231-234. 1950-95: CPI, *IFS*, series 64.
Money stock. 1880-1913: M2, Data underlying M. D. Bordo (1986), ”Financial Crises, Banking Crises, Stock Market Crashes and the Money Supply: Some International Evidence” in F. Capie and G. Wood (eds.), *Financial Crises and the World Banking System*, London: Macmillan. 1914-25: Not available. 1926-38: M2, Deutsche Bundesbank (1976), *Deutsches Geld und Bankwesen in Zahlen 1876-1975*, Frankfurt am Main: Fritz Knapp Gmbh, pp. 14 and 18. 1939-49: Not available. 1950-71: M2, Deutsche Bundesbank, *Monthly reports* (various issues). 1972-95: Money plus quasi-money, *IFS*, series 35L.
Central government expenditures and revenues. 1880-1951: Mitchell (1978), except 1922-23 and 1935-49: Not available. 1952-95: *IFS*, series 82 and 81. Note: Change of definition in 1970.
Export. 1880-1988: Mitchell (1992), except 1914-1919 and 1944-1947: not available. 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992), except 1914-1919 and 1944-1947: not available. 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. 1885-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London, except 1914-1924 and 1940-1947: not available. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I. Note: change of definition in 1960

Italy
Real national income. 1880-1951: GNP, Mitchell (1992). 1952-60: GDP, Mitchell (1992). 1961-67: GDP, *IFS*, series 99B.R. 1968-95: GDP, IMF (1997), *International Financial Statistics Yearbook 1997*, Washington D.C., series 99B.R.
Prices. 1880-1948: CPI, Statistical Appendix in M. Fratianni and F. Spinelli (1991), *Storia Monetaria d’Italia*, Milan: Arnoldo Mondadori Editore, pp. 66-71, series CLI. 1949-95: CPI, *IFS*, series 64.
Money stock. 1880-1980: M3, Fratianni and Spinelli (1991), pp. 48-51, series U1+U2+D. 1981-95: M2, IMF (1997), series 38N.
Central government expenditures and revenues. 1880-1949: Mitchell (1992). 1950-91: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992), except 1943-1946: not available. 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992), except 1943-1946: not available. 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. 1885-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I. Note: change of definition 1960

Japan
Real national income. 1880-84: Not available. 1885-1929: GNP, B. R. Mitchell (1991), *International Historical Statistics: Asia*, New York: Stockton Press. 1930-56: GDP, Mitchell (1991), except 1945 and 1952: GDP, Maddison (1995), table C-16a. 1957-95: GDP, *IFS*,

series 99B.R.
Prices. 1880-1922: WPI, Mitchell (1991). 1923-48: CPI, Mitchell (1991). 1949-95: CPI, *IFS*, series 64.
Money stock. 1880-1971: M1, data supplied by the Bank of Japan. 1972-95: Money, *IFS*, series 34B.
Central government expenditures and revenues. 1880-1954: Mitchell (1991). 1955-93: *IFS*, series 82 and 81. (Note: Changes of definitions in 1955 and 1976.)
Export. 1880-1988: Mitchell (1991), except 1944-45: not available. 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1991), except 1944-45: not available. 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. 1885-1929: Backus, D. and P. Kehoe, "International Evidence on the Historical Properties of the Business Cycles, *American Economic Review*, September 1992, Vol. 82(4), pp. 864-888. 1930-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London, except 1945: not available. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I

Netherlands
Real national income. 1880-1960: GDP, A. Maddison (1995), *Monitoring the World Economy 1820-1992*, OECD, table C-16a. 1961-95: GDP, *IFS*, series 99B.R.
Prices. 1880-1949: CPI, Mitchell (1992). 1950-95: CPI, *IFS*, series 64.
Money stock. 1880-1900: Currency, data supplied by Mr W. F. Vanthoor at De Nederlandsche Bank. 1901-71: M2, Central Bureau voor de Statistiek (1976), *75 Jaar Statistiek van Nederland*. 1972-95: Money, *IFS*, series 34.
Central government expenditures and revenues. 1880-1899: Not available. 1900-1948: Mitchell (1992). 1949-95: *IFS*, series 82 and 81. Note: change of definition in 1973.
Export. 1880-1988: Mitchell (1992), except 1944-1946: not available. 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992), except 1944-1946: not available. 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. Not available

Norway
Real national income. 1880-1949: GDP, Mitchell (1992), except 1940-46: Data supplied by J. T. Klovland. 1950-95: GDP, *IFS*, series 99B.P.
Prices. 1880-1948: CPI, Statistisk sentralbyrå (1994), *Historisk statistikk 1994*, Oslo. 1949-95: CPI, *IFS*, series 64.
Money stock. 1880-1971: M2, J. T. Klovland (1978), *Quantitative Studies in the Monetary History of Norway*, Ph.D. thesis, Bergen: Norwegian School of Economics and Business Administration. 1972-95: Broad money (M2), *IFS*, series 38N.
Central government expenditures and revenues. 1880-1953: Mitchell (1992). 1954-94: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. 1880-1987: Backus, D. and P. Kehoe, "International Evidence on the Historical

Properties of the Business Cycles, *American Economic Review*, September 1992, Vol. 82(4), pp. 864-888, except 1941-1946: not available. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I

Sweden

Real national income. 1880-1950: GDP, O. Krantz and C-A. Nilsson (1975), *Swedish National Product 1861-1970: New Aspects on Methods and Measurements*, Lund: C.W.K. Glerup/Liber Läromedel, table 3.1 and table 1:2, columns 2 + 4 (GDP at factor cost plus indirect taxes and customs duties deflated by the implicit GDP-deflator at factor cost). 1951-95: GDP, Statistics Sweden (1996), *Statistiska Meddelanden SM 9601 N10*, table 1.
Prices. 1880-1948: CPI, Statistiska Centralbyrån (1996), *Statistiska Meddelanden P15 SM9501*, p. 22. 1949-95: CPI, *IFS*, series 64.
Money stock. 1880-1971: Money stock (M2), L. Jonung (1975), *Studies in the Monetary History of Sweden*, Ph.D. thesis, Los Angeles: UCLA, Appendix A, table A-1, column (5). 1972-95: Broad money (M3), *IFS*, series 38N.
Central government expenditures and revenues. 1880: Not available.1881-1947: Mitchell (1992). 1948-95: *IFS*, series 82 and 81. (Note: Change of definition in 1966.)
Export. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts, Main Aggregates* (1998), Volume I
Consumption. 1880-1884: Krantz and Nilsson (1975). 1885-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I

United Kingdom

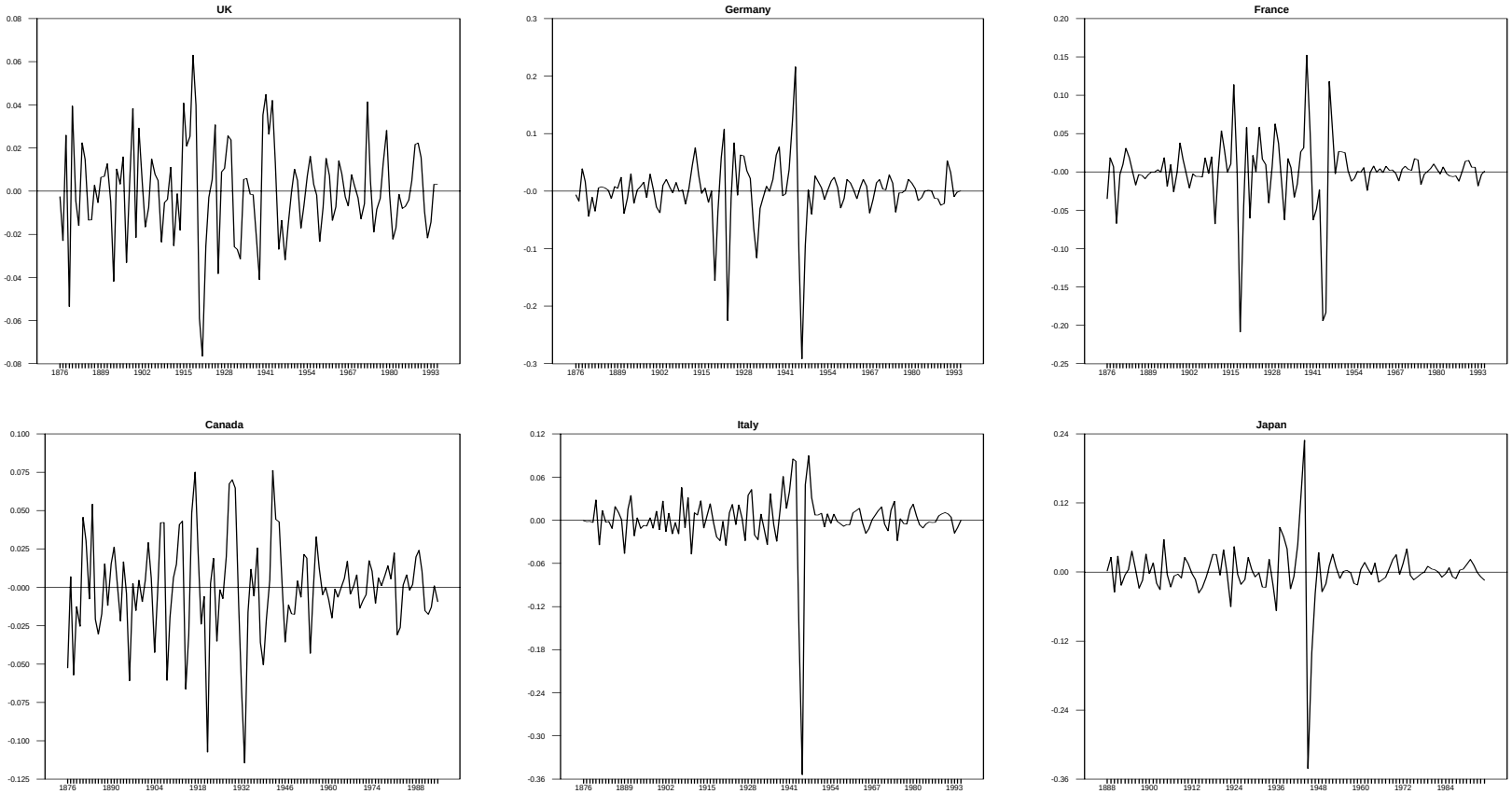
Real national income. 1880-1948 GDP, B. R. Mitchell (1988), *British Historical Statistics*, Cambridge: Cambridge University Press, pp. 831-835. 1949-95: GDP, *IFS*, series 99B.R.
Prices. 1880-1948: Feinstein's retail price series, F. Capie and A. Webber (1985), *A Monetary History of the United Kingdom, Volume 1*, London: George Allen and Unwin, table III, column 12. 1949-95: CPI, *IFS*, series 64.
Money stock growth. 1880-1966: Net money Supply (M2), Sheppard (1986), table A.3.3, column 6. 1967-95: Money plus quasi-money, *IFS*, series 35L.
Central government expenditures and revenues. 1880-1947: Mitchell (1992). 1948-95: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992), except 1813: not available; includes Eire up to and including 1920. 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992), except 1813: not available; includes Eire up to and including 1920. 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Consumption. 1885-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I; includes Eire up to and including 1920

United States

Real national income. 1880-1948 GNP, N. S. Balke and R. J. Gordon (1986), Appendix B, Historical data in R. J. Gordon (ed.), *The American Business Cycle, Continuity and Change*,

Chicago: The University of Chicago Press, pp. 781-783. 1949-95: GDP, *IFS*, series 99B.R.
Prices. 1880-1948: CPI, *Historical Statistics (1975)*, series E135. 1949-95: CPI, *IFS*, series 64.
Money stock. 1880-1971: M2, Balke and Gordon (1986), pp.784-786. 1972-95: Money plus quasi-money, *IFS*, series 35L.
Central government expenditures and revenues. 1880-1958: Mitchell (1993). 1959-95: *IFS*, series 82 and 81.
Export. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Import. 1880-1988: Mitchell (1992). 1989-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I
Consumption. 1889-1987: Liesner, T. (1989): *One Hundred Years of Economic Statistics*, The Economist Publication Ltd., London. 1988-1996: *OECD National Accounts. Main Aggregates* (1998), Volume I

Appendix B: Bandpass filtered GDP.



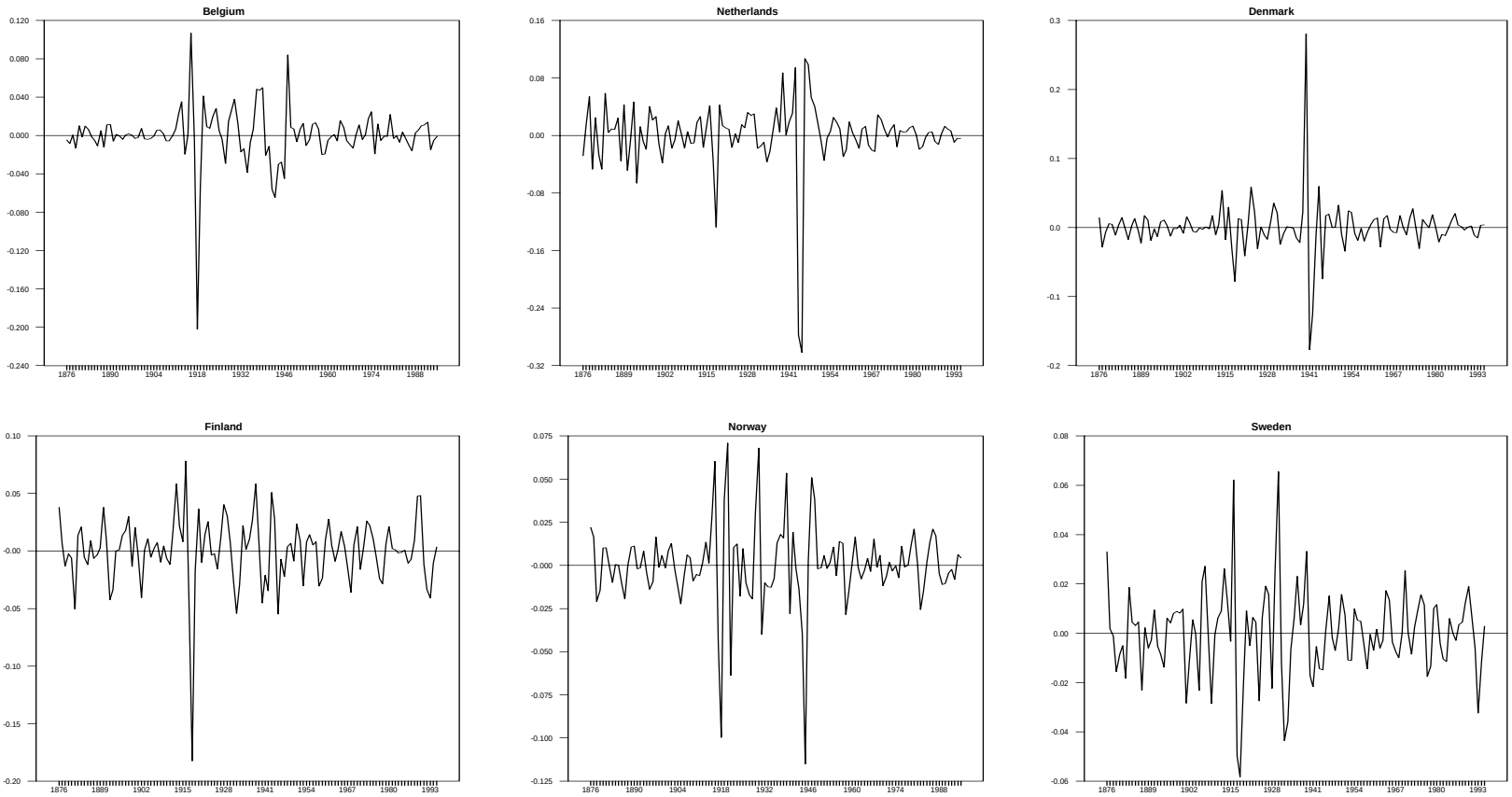

Belgium
Netherlands
Denmark
Finland
Norway
Sweden

Table 1: Average length of business cycles under different monetary regimes.

Period	US	UK	Germany	France	Canada	Italy	Japan
Gold standard	4.1 (9)	3.5 (10)	4.0 (10)	4.2 (9)	3.4 (11)	2.9 (12)	4.0 (6)
Interwar	6.3 (3)	6.0 (3)	5.2 (4)	6.5 (2)	4.5 (4)	3.2 (5)	4.0 (5)
Postwar	5.5 (8)	5.6 (8)	4.8 (9)	4.3 (9)	5.1 (9)	4.8 (8)	4.8 (8)
	Belgium	Netherlands	Denmark	Finland	Norway	Sweden	All countries
Gold standard	3.7 (10)	3.4 (11)	3.8 (10)	3.8 (8)	3.9 (8)	4.7 (7)	3.8
Interwar	8.3 (3)	5.5 (2)	4.2 (4)	6.3 (3)	4.8 (4)	5.0 (4)	5.4
Postwar	4.1 (9)	5.1 (7)	4.6 (8)	5.8 (8)	3.6 (11)	4.8 (8)	4.8

Note: Gold standard is the period 1873-1913, interwar is 1920-38, and postwar is 1948-95. The numbers in the table refers to the average length of estimated cycles peaks-to-peaks (or troughs-to-troughs) that fall in each regime.

Table 2: Volatility and skewness of bandpass filtered real GDP during different monetary regimes.

	1876-1995		**1876-1913**		**1920-38**		**1948-95**		**1948-72**		**1973-95**	
	stand.dev.	skewness	stand.dev.	skewness	stand.dev.	skewness	stand.dev.	skewness	stand.dev.	skewness	stand.dev.	skewness
US	0.035	-0.018	0.032	-0.145	0.053	-0.459	0.016	-0.435	0.016	-0.494	0.016	-0.378
UK	0.022	-0.205	0.020	-0.300	0.029	-0.700	0.014	0.628	0.011	-0.194	0.017	0.724
Germany	0.054	-1.530	0.024	0.491	0.077	-1.471	0.019	-0.057	0.019	-0.909	0.020	0.719
France	0.044	-1.581	0.024	-0.803	0.037	-0.380	0.010	0.201	0.011	0.379	0.010	-0.178
Canada	0.032	-0.437	0.031	-0.237	0.051	-0.588	0.015	-0.335	0.015	-0.212	0.015	-0.498
Italy	0.042	-5.092	0.020	-0.141	0.025	0.194	0.012	0.104	0.012	0.387	0.012	-0.132
Japan	0.050	-2.078	0.023	0.541	0.037	0.272	0.015	0.353	0.018	0.012	0.012	1.424
Belgium	0.029	-2.392	0.009	1.587	0.025	-0.208	0.011	0.043	0.010	-0.323	0.012	0.239
Netherlands	0.049	-3.440	0.030	-0.158	0.020	-0.137	0.017	0.361	0.022	0.212	0.010	-0.512
Denmark	0.038	2.208	0.011	-0.406	0.024	0.640	0.015	-0.149	0.016	-0.154	0.013	-0.187
Finland	0.030	-1.853	0.022	-0.075	0.027	-0.390	0.020	0.034	0.017	-0.669	0.022	0.350
Norway	0.036	-3.440	0.011	-0.099	0.032	0.470	0.012	0.322	0.013	0.554	0.012	-0.004
Sweden	0.018	0.151	0.015	-0.008	0.025	0.351	0.011	-0.213	0.010	0.797	0.012	-0.823

Table 3: Wald tests of the hypothesis that the variance of the cyclical component of real GDP is constant across the classical gold standard and the postwar period.

	US	UK	Germany	France	Canada	Italy	Japan
Wald test	14,749	2,384	1,773	6,397	10,036	11,417	5,734
p-value	0,000	0,122	0,183	0,011	0,002	0,001	0,017
	Belgium	Netherlands	Denmark	Finland	Norway	Sweden	All countries
Wald test	0,342	7,437	3,390	0,340	1,151	2,024	74,379
p-value	0,559	0,006	0,560	0,560	0,283	0,155	0,000

Note: All tests are based on SUR regressions of the variance of bandpass filtered GDP for each country on two dummy variables where the first dummy takes on the value 1 for the classical gold standard (1888-1913) period and 0 otherwise (1948-95), whereas the second dummy takes on the value 0 for the classical gold standard period and 1 otherwise. The Wald tests are χ^2 distributed with 1 degrees of freedom for the country tests and with 13 degrees of freedom for the joint test.

Table 4: Cross-correlations of bandpass filtered real GDP, expenditure components, money stock and prices.

		US				UK				Germany			
		(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
		Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1
Consumption	gold standard	0,748	-0,320	0,478	0,149	0,485	-0,288	0,715	-0,073	0,591	0,031	0,567	-0,029
	interwar	1,210	0,488	0,912	0,541	0,539	-0,302	0,309	0,580	0,564	0,248	0,744	0,898
	postwar	0,626	-0,218	0,553	0,127	1,106	0,450	0,742	0,120	0,687	0,187	0,656	0,415
	Bretton-Woods	0,735	-0,306	0,555	0,090	1,003	0,583	0,606	-0,293	0,818	-0,191	0,566	0,638
	post-Bretton Woods	0,443	0,030	0,598	0,163	1,150	0,390	0,796	0,345	0,577	0,488	0,759	0,215
Investment	gold standard	2,385	-0,091	0,817	-0,069	2,240	0,107	0,413	-0,065	5,476	0,073	0,821	-0,072
	interwar	3,578	0,503	0,918	0,460	2,310	-0,421	0,029	0,329	-	-	-	-
	postwar	2,979	-0,046	0,601	0,040	2,896	0,264	0,706	0,330	2,813	0,401	0,798	-0,078
	Bretton-Woods	2,975	-0,230	0,345	-0,332	2,592	0,091	0,529	0,104	3,368	0,363	0,953	0,028
	post-Bretton Woods	2,988	0,142	0,913	0,376	3,026	0,434	0,788	0,436	2,456	0,427	0,705	-0,170
Government	gold standard	1,872	0,063	-0,162	-0,078	7,072	0,033	0,142	0,323	5,286	-0,688	-0,617	-0,321
expenditures	interwar	1,648	0,113	0,187	-0,318	2,674	0,115	0,190	0,208	-	-	-	-
	postwar	3,577	0,062	0,064	0,331	2,992	-0,304	-0,535	-0,125	4,029	-0,261	0,034	0,444
	Bretton-Woods	4,610	0,159	0,221	0,575	4,024	-0,023	-0,251	-0,047	6,120	-0,333	-0,053	0,497
	post-Bretton Woods	1,468	-0,199	-0,525	-0,287	2,309	-0,538	-0,841	-0,291	1,534	-0,328	0,282	0,596
Government	gold standard	1,779	-0,241	0,294	0,404	3,378	-0,003	0,180	0,336	2,042	-0,059	-0,258	-0,010
revenues	interwar	2,690	0,423	0,605	0,456	2,444	-0,711	-0,398	0,218	1,616	0,351	0,856	0,535
	postwar	2,968	-0,432	0,367	0,754	2,443	-0,342	-0,511	0,040	3,439	-0,095	0,273	0,486
	Bretton-Woods	3,647	-0,398	0,428	0,828	2,875	-0,068	-0,427	-0,077	4,740	-0,086	0,249	0,542
	post-Bretton Woods	1,799	-0,532	0,279	0,702	2,219	-0,408	-0,583	0,064	1,302	-0,268	0,545	0,662
Export	gold standard	1,736	0,187	0,251	0,167	2,663	-0,164	0,254	0,222	2,049	-0,106	0,389	-0,030
	interwar	2,303	0,579	0,671	0,215	4,590	-0,198	0,281	0,352	1,280	-0,239	0,080	0,663
	postwar	4,156	-0,390	0,352	0,587	3,055	-0,206	0,294	0,330	3,245	-0,012	0,437	0,077
	Bretton-Woods	4,334	-0,278	0,450	0,638	4,321	-0,364	0,205	0,319	4,318	0,008	0,412	0,154
	post-Bretton Woods	3,778	-0,441	0,214	0,515	2,286	0,142	0,403	0,369	2,157	0,019	0,523	0,023
Import	gold standard	2,104	-0,228	0,438	0,238	1,556	-0,112	0,341	0,218	2,141	0,036	0,343	0,154
	interwar	2,680	0,557	0,877	0,152	3,436	-0,136	0,437	0,662	1,584	0,249	0,825	0,185
	postwar	3,605	0,025	0,657	0,188	4,800	-0,166	0,548	0,427	3,045	0,097	0,674	0,088
	Bretton-Woods	3,538	0,189	0,738	-0,101	6,441	-0,281	0,511	0,367	3,721	0,093	0,835	0,243
	post-Bretton Woods	3,645	-0,109	0,561	0,526	3,824	0,129	0,602	0,513	2,473	0,141	0,534	-0,041
Money stock	gold standard	0,798	0,043	0,658	-0,102	0,855	-0,040	0,374	0,595	1,693	0,096	-0,113	0,186
	interwar	1,134	0,373	0,840	0,633	1,134	-0,475	-0,343	-0,201	-	-	-	-
	postwar	1,214	0,269	0,266	-0,069	4,181	0,308	0,265	0,087	1,312	0,518	0,019	-0,245
	Bretton-Woods	1,320	0,041	0,311	-0,004	3,006	0,699	0,099	-0,341	1,722	0,468	-0,037	-0,588
	post-Bretton Woods	1,043	0,310	0,194	-0,227	4,580	0,239	0,310	0,228	0,931	0,664	0,078	0,130
Consumer	gold standard	0,375	-0,426	0,107	0,571	0,866	0,287	-0,096	0,221	0,748	0,050	-0,402	-0,166
prices	interwar	0,550	0,361	0,781	0,626	1,743	-0,600	-0,387	0,216	61,638	-0,105	-0,721	0,505
	postwar	0,970	-0,645	-0,391	0,226	1,436	-0,428	-0,645	-0,066	0,779	-0,460	-0,294	0,402
	Bretton-Woods	0,959	-0,586	-0,210	0,398	1,278	-0,357	-0,505	0,286	0,993	-0,538	-0,349	0,551
	post-Bretton Woods	0,983	-0,663	-0,610	0,100	1,487	-0,406	-0,729	-0,289	0,482	-0,330	-0,231	0,244

Table 4: Continued.

		France				Canada				Italy			
		(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
		Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1
Consumption	gold standard	-	-	-	-	1,331	0,338	0,664	0,141	0,573	0,093	0,602	-0,092
	interwar	-	-	-	-	1,125	0,434	0,891	0,624	1,148	-0,004	0,389	-0,311
	postwar	0,972	0,025	0,461	0,134	0,838	-0,137	0,406	0,290	1,180	0,064	0,785	0,382
	Bretton-Woods	1,291	-0,505	0,232	0,342	0,890	-0,040	0,471	0,207	1,304	0,112	0,742	0,478
	post-Bretton Woods	0,730	0,532	0,726	-0,114	0,734	-0,184	0,306	0,377	1,040	0,037	0,847	0,426
Investment	gold standard	-	-	-	-	3,442	0,210	0,601	0,286	9,431	-0,197	0,661	-0,211
	interwar	-	-	-	-	3,580	0,242	0,874	0,741	7,272	-0,255	0,594	-0,106
	postwar	3,828	0,240	0,537	0,360	3,078	-0,143	0,561	0,502	4,038	0,248	0,871	0,565
	Bretton-Woods	3,661	0,039	0,060	0,412	3,231	-0,150	0,520	0,400	4,212	0,144	0,204	-0,003
	post-Bretton Woods	3,952	0,325	0,796	0,338	2,915	-0,075	0,615	0,608	4,038	0,248	0,871	0,565
Government	gold standard	3,510	-0,333	-0,373	-0,337	2,787	-0,405	-0,160	0,131	5,999	0,235	-0,094	-0,027
expenditures	interwar	2,981	-0,164	0,564	0,051	1,359	-0,275	0,108	0,021	8,268	0,106	-0,309	0,237
	postwar	6,020	0,005	0,042	0,336	2,932	0,134	0,114	0,126	4,498	-0,300	-0,656	-0,230
	Bretton-Woods	7,674	-0,037	0,091	0,418	3,611	0,332	0,281	0,082	7,684	-0,022	0,339	0,075
	post-Bretton Woods	1,825	-0,401	-0,203	0,139	1,827	-0,285	-0,273	0,191	4,498	-0,300	-0,656	-0,230
Government	gold standard	1,071	0,356	0,546	0,250	2,034	-0,080	0,294	0,215	5,329	0,146	0,039	-0,062
revenues	interwar	2,708	-0,137	0,646	0,197	1,453	0,632	0,661	0,110	1,468	0,228	-0,249	-0,072
	postwar	4,866	0,246	0,248	0,114	3,439	-0,055	0,433	0,152	3,403	-0,386	0,025	0,206
	Bretton-Woods	6,086	0,271	0,232	0,124	4,122	0,144	0,533	0,042	3,116	-0,289	0,233	0,251
	post-Bretton Woods	2,064	-0,153	0,459	0,158	2,412	-0,425	0,267	0,352	3,592	-0,394	-0,101	0,081
Export	gold standard	2,832	0,071	0,304	0,377	2,125	-0,326	-0,019	-0,219	2,324	0,087	-0,001	-0,084
	interwar	3,032	0,028	0,734	0,497	2,191	0,750	0,657	0,024	4,548	0,230	-0,063	0,011
	postwar	5,630	0,249	0,751	0,349	2,941	0,241	0,666	0,126	5,805	0,290	0,316	-0,259
	Bretton-Woods	6,414	0,448	0,834	0,386	2,436	0,249	0,627	0,112	5,824	0,154	0,312	-0,034
	post-Bretton Woods	4,236	-0,081	0,607	0,285	3,411	0,290	0,710	0,143	5,728	0,486	0,321	-0,326
Import	gold standard	3,595	0,450	0,243	-0,089	2,472	-0,092	0,529	0,132	2,578	0,494	0,014	-0,061
	interwar	2,665	0,181	0,727	0,224	2,415	0,579	0,912	0,354	6,229	0,280	0,064	-0,111
	postwar	5,590	-0,156	0,607	0,339	3,769	0,169	0,730	0,154	6,494	-0,137	0,587	0,149
	Bretton-Woods	5,229	-0,099	0,620	0,454	3,257	0,136	0,750	0,137	7,301	0,115	0,473	0,278
	post-Bretton Woods	6,101	-0,166	0,607	0,212	4,258	0,227	0,721	0,162	5,798	-0,289	0,698	0,074
Money stock	gold standard	1,134	0,000	-0,220	-0,129	1,056	0,539	0,323	-0,169	0,813	-0,103	-0,030	-0,170
	interwar	1,624	0,070	-0,104	0,093	0,551	0,836	0,808	0,368	1,137	-0,168	0,001	0,645
	postwar	2,090	0,242	0,363	0,257	1,551	-0,115	0,085	0,175	1,810	0,447	0,122	-0,217
	Bretton-Woods	2,028	0,177	0,485	0,403	1,407	0,402	-0,143	-0,084	1,694	0,420	0,183	-0,204
	post-Bretton Woods	2,191	0,317	0,199	0,092	1,647	-0,536	0,277	0,397	1,801	0,548	0,084	-0,213
Consumer	gold standard	0,501	0,186	-0,002	-0,488	0,839	0,502	-0,148	0,041	0,575	0,343	0,164	-0,168
prices	interwar	1,741	-0,276	0,322	0,257	0,524	0,329	0,783	0,674	1,609	-0,420	-0,011	0,409
	postwar	2,311	0,077	0,064	0,262	0,980	-0,319	-0,310	0,150	1,767	-0,557	-0,218	0,176
	Bretton-Woods	2,759	0,344	0,241	0,363	1,089	-0,015	-0,075	0,258	1,966	-0,468	-0,100	0,081
	post-Bretton Woods	1,421	-0,495	-0,448	0,072	0,842	-0,665	-0,675	-0,047	1,574	-0,605	-0,331	0,121

Table 4: Continued.

		Japan				Belgium				Netherlands			
		(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
		Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1
Consumption	gold standard	1,093	-0,021	0,479	-0,329	-	-	-	-	-	-	-	-
	interwar	0,647	0,118	0,853	-0,060	-	-	-	-	-	-	-	-
	postwar	0,917	0,011	0,571	0,419	-	-	-	-	-	-	-	-
	Bretton-Woods	0,864	-0,177	0,455	0,489	-	-	-	-	-	-	-	-
	post-Bretton Woods	1,018	0,258	0,780	0,175	-	-	-	-	-	-	-	-
Investment	gold standard	3,660	-0,099	-0,197	0,220	-	-	-	-	-	-	-	-
	interwar	5,047	0,042	0,285	0,089	-	-	-	-	-	-	-	-
	postwar	3,673	-0,046	0,447	0,433	5,152	0,062	0,592	-0,003	3,300	0,313	0,567	0,133
	Bretton-Woods	4,025	0,006	0,370	0,362	4,697	0,149	0,497	0,094	2,934	0,168	0,589	0,162
	post-Bretton Woods	2,803	0,114	0,706	0,620	5,494	0,069	0,655	-0,065	4,271	0,669	0,546	0,087
Government	gold standard	6,088	-0,151	-0,160	-0,088	10,063	-0,107	0,060	0,230	4,328	-0,519	-0,665	-0,106
expenditures	interwar	1,852	0,290	0,056	-0,166	5,409	-0,307	0,257	0,318	3,784	-0,374	-0,189	-0,184
	postwar	7,821	-0,126	-0,348	-0,031	4,141	-0,287	-0,077	0,183	3,107	-0,092	-0,135	-0,041
	Bretton-Woods	8,873	-0,146	-0,365	0,088	10,854	-0,106	0,135	0,071	2,580	0,108	0,024	-0,217
	post-Bretton Woods	4,851	-0,145	-0,324	-0,339	1,622	-0,185	-0,390	0,200	3,420	0,048	0,079	0,280
Government	gold standard	6,578	-0,141	-0,119	-0,067	2,495	0,087	0,310	0,220	0,811	-0,327	0,114	-0,209
revenues	interwar	1,582	0,449	0,269	-0,249	3,121	0,597	0,430	-0,121	3,112	0,280	0,501	0,492
	postwar	8,714	-0,122	-0,184	0,189	3,963	-0,258	0,203	0,293	3,014	-0,223	-0,116	-0,011
	Bretton-Woods	9,830	-0,111	-0,239	0,229	6,436	-0,256	0,396	0,403	4,131	0,217	0,280	-0,283
	post-Bretton Woods	5,588	-0,233	0,006	0,178	1,281	-0,269	-0,107	0,064	4,137	0,071	0,259	0,400
Export	gold standard	3,899	-0,094	0,301	-0,426	9,763	0,362	0,202	0,011	2,119	0,376	0,011	0,159
	interwar	2,768	-0,262	0,427	0,013	4,047	0,576	0,755	0,219	5,999	0,256	0,651	0,642
	postwar	7,007	0,101	-0,190	-0,323	5,214	0,102	0,691	0,057	2,976	-0,009	0,411	0,139
	Bretton-Woods	7,589	0,205	-0,245	-0,524	6,757	0,249	0,680	0,071	2,023	0,012	0,432	0,298
	post-Bretton Woods	5,121	-0,166	-0,009	0,367	3,696	-0,054	0,785	0,055	5,302	0,008	0,493	-0,055
Import	gold standard	3,999	0,195	-0,228	0,246	8,522	0,357	-0,073	0,266	2,118	0,612	0,000	0,142
	interwar	2,236	0,397	0,342	-0,472	4,539	0,642	0,862	0,273	6,160	0,114	0,595	0,664
	postwar	8,417	-0,002	0,062	0,033	4,401	0,039	0,738	0,148	3,595	-0,150	0,455	0,434
	Bretton-Woods	7,861	0,132	-0,031	-0,232	4,768	0,359	0,702	0,133	3,183	-0,234	0,425	0,616
	post-Bretton Woods	9,391	0,006	0,238	0,441	4,140	-0,144	0,774	0,157	4,933	0,083	0,569	0,005
Money stock	gold standard	4,939	-0,349	0,118	0,453	4,799	-0,068	0,471	0,354	1,440	0,105	-0,277	-0,094
	interwar	1,362	-0,121	0,020	0,059	3,000	0,463	0,393	-0,031	2,481	-0,265	0,113	0,493
	postwar	2,923	-0,039	0,244	0,275	1,841	0,097	-0,196	0,096	1,815	0,460	-0,076	-0,211
	Bretton-Woods	3,202	-0,246	0,207	0,334	1,796	-0,065	0,110	0,373	1,539	0,497	0,004	-0,239
	post-Bretton Woods	2,226	-0,068	0,362	-0,057	1,847	0,134	-0,458	-0,091	2,639	0,454	-0,262	-0,193
Consumer	gold standard	1,387	0,025	-0,261	0,238	5,694	-0,477	0,259	0,340	0,790	-0,400	0,140	-0,132
prices	interwar	1,052	-0,137	0,275	0,290	2,055	0,286	0,269	0,117	1,933	0,165	0,222	0,363
	postwar	2,975	-0,359	-0,432	0,114	1,319	-0,412	-0,159	0,084	0,906	-0,518	-0,242	0,106
	Bretton-Woods	3,428	-0,321	-0,431	0,194	1,359	-0,362	0,085	0,101	0,857	-0,595	-0,225	0,179
	post-Bretton Woods	1,650	-0,300	-0,525	0,146	1,249	-0,421	-0,408	0,046	1,058	-0,288	-0,289	-0,128

Table 4: Continued.

		Denmark				Finland				Norway				Sweden			
		(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
		Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1	Vol.ratio	j=-1	j=0	j=+1
Consumption	gold standard	-	-	-	-	-	-	-	-	1,224	-0,342	0,050	0,566	1,353	-0,081	0,599	0,069
	interwar	-	-	-	-	-	-	-	-	0,570	-0,111	0,150	0,873	1,275	-0,084	0,712	0,468
	postwar	-	-	-	-	-	-	-	-	2,716	-0,032	0,233	0,239	0,994	0,124	0,511	0,242
	Bretton-Woods	-	-	-	-	-	-	-	-	3,227	0,027	0,162	0,046	1,005	0,253	0,497	-0,073
	post-Bretton Woods	-	-	-	-	-	-	-	-	2,214	-0,106	0,326	0,473	0,985	0,031	0,523	0,448
Investment	gold standard	4,165	-0,326	0,045	0,333	3,103	0,076	0,390	0,271	4,486	0,300	0,537	0,194	5,349	-0,032	0,588	0,161
	interwar	5,009	0,062	0,798	0,137	3,460	0,538	0,750	0,375	-	-	-	-	3,468	0,384	0,883	0,098
	postwar	4,589	0,018	0,872	-0,032	3,722	0,149	0,824	0,529	5,351	-0,181	0,090	0,179	4,818	0,154	0,573	0,377
	Bretton-Woods	3,980	-0,086	0,875	-0,228	3,230	-0,205	0,717	0,386	4,908	-0,107	0,099	0,111	4,359	-0,003	0,236	0,230
	post-Bretton Woods	5,470	0,127	0,893	0,142	4,004	0,341	0,886	0,606	5,673	-0,246	0,082	0,227	5,125	0,249	0,785	0,482
Government	gold standard	11,204	-0,045	-0,065	0,142	5,192	-0,354	-0,011	0,240	6,498	0,018	0,296	0,125	1,815	-0,368	-0,182	-0,046
expenditures	interwar	1,887	0,111	-0,238	0,152	4,690	-0,118	0,098	0,331	1,751	0,030	0,178	0,192	6,963	0,279	-0,095	-0,127
	postwar	2,878	0,026	-0,387	-0,001	2,443	-0,251	0,044	0,068	3,954	-0,010	0,003	-0,001	3,498	-0,160	-0,519	-0,223
	Bretton-Woods	3,295	0,026	-0,322	0,208	3,485	-0,203	0,256	-0,035	5,536	0,205	0,073	-0,028	4,719	0,013	-0,560	-0,404
	post-Bretton Woods	1,972	-0,020	-0,613	-0,442	1,379	-0,492	-0,290	0,257	1,532	-0,485	-0,219	0,057	2,172	-0,497	-0,555	-0,032
Government	gold standard	4,174	-0,147	-0,002	0,152	2,402	-0,265	-0,182	0,132	6,747	-0,136	0,310	0,321	3,412	0,125	0,532	0,045
revenues	interwar	2,172	-0,112	0,517	-0,297	3,829	0,048	0,626	0,608	2,382	-0,181	0,332	0,208	7,523	0,294	-0,006	-0,003
	postwar	2,948	-0,043	-0,019	0,270	2,348	-0,028	0,367	0,181	4,489	-0,118	0,115	0,113	4,546	-0,292	-0,246	0,194
	Bretton-Woods	3,481	-0,096	-0,184	0,223	3,207	-0,064	0,310	-0,099	5,871	-0,023	0,108	0,045	5,813	-0,228	-0,620	-0,096
	post-Bretton Woods	1,683	0,023	0,553	0,447	1,559	0,009	0,495	0,539	2,735	-0,267	0,145	0,270	3,322	-0,406	0,209	0,544
Export	gold standard	3,514	0,013	0,464	0,025	4,090	0,436	0,568	0,001	4,899	0,230	0,108	-0,486	3,724	0,262	0,455	0,037
	interwar	3,672	0,170	0,430	0,065	5,988	0,261	0,574	0,241	3,573	0,295	0,675	-0,425	5,384	0,316	0,472	-0,022
	postwar	2,276	-0,219	0,138	0,217	4,539	0,207	0,424	-0,182	6,483	0,035	0,278	-0,152	5,835	0,121	0,456	0,131
	Bretton-Woods	2,180	-0,153	0,225	0,309	6,419	0,051	0,542	-0,169	7,158	-0,114	0,429	0,020	7,014	-0,293	0,408	0,444
	post-Bretton Woods	2,423	-0,317	0,002	0,057	2,743	0,517	0,341	-0,243	5,874	0,171	0,131	-0,327	4,795	0,581	0,526	-0,182
Import	gold standard	4,689	-0,162	-0,034	0,113	3,209	0,301	0,600	0,200	4,309	0,336	0,345	-0,046	3,032	0,291	0,592	-0,003
	interwar	3,961	0,107	0,577	0,086	5,155	0,396	0,752	0,360	3,423	0,241	0,539	0,471	6,546	0,063	0,273	0,269
	postwar	3,601	-0,406	0,478	0,254	4,793	0,091	0,642	0,161	4,397	-0,028	0,364	0,250	6,881	0,065	0,437	0,213
	Bretton-Woods	3,632	-0,436	0,468	0,341	6,433	-0,085	0,711	0,143	4,138	-0,070	0,295	0,111	8,115	-0,330	0,362	0,447
	post-Bretton Woods	3,549	-0,224	0,499	0,077	3,358	0,378	0,632	0,204	4,587	-0,032	0,414	0,355	5,796	0,475	0,529	-0,040
Money stock	gold standard	2,538	-0,076	0,234	0,091	1,926	0,149	0,273	0,399	1,819	0,112	0,298	0,460	1,476	-0,406	-0,070	0,254
	interwar	0,994	0,539	0,637	-0,065	1,423	-0,004	0,293	0,532	0,648	-0,486	0,022	0,633	1,359	-0,134	0,145	0,292
	postwar	2,098	0,398	-0,037	-0,229	4,399	0,270	0,283	-0,017	2,212	0,062	0,256	0,119	5,948	0,179	-0,115	-0,273
	Bretton-Woods	1,213	0,509	-0,079	-0,319	6,584	0,128	0,217	-0,233	2,535	0,141	0,144	-0,071	8,370	0,215	-0,281	-0,409
	post-Bretton Woods	3,018	0,607	-0,010	-0,190	1,904	0,407	0,583	0,593	1,794	0,063	0,398	0,340	2,949	0,259	0,186	0,025
Consumer	gold standard	2,112	-0,150	-0,161	0,207	1,527	-0,296	-0,429	0,158	1,969	0,261	0,236	0,484	1,465	-0,160	0,248	0,264
prices	interwar	1,921	0,170	0,033	0,122	1,144	0,270	0,044	0,399	1,373	-0,072	0,173	-0,104	1,900	0,165	0,113	0,039
	postwar	1,031	-0,286	-0,614	-0,071	1,647	-0,199	-0,132	0,047	1,528	-0,257	-0,346	-0,022	1,615	-0,527	-0,410	0,276
	Bretton-Woods	1,089	-0,226	-0,618	-0,035	2,449	0,003	-0,100	-0,137	1,848	-0,081	-0,158	0,038	2,033	-0,552	-0,530	0,269
	post-Bretton Woods	0,840	-0,223	-0,658	-0,044	0,787	-0,607	-0,253	0,387	1,191	-0,515	-0,609	-0,084	1,201	-0,540	-0,298	0,298

Note: Marked correlations denote statistically significance at the 5 percent level using Newey-West optimal bandwidth standard errors.

Table 5: Predictive regressions.

		US		UK		Germany		Francer		Canada		Italy		Japan	
		R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)
Consumption	gold standard	0,039	0,144	0,064	0,087	0,066	0,021	-	-	0,119	0,009	0,294	0,162	0,095	0,140
	interwar	0,196	0,106	0,199	0,089	0,005	0,401	-	-	0,248	0,274	0,055	0,124	0,015	0,049
	postwar	0,249	0,085	0,097	0,020	0,102	0,047	-0,025	0,078	0,100	0,027	0,067	0,141	0,234	0,116
	Bretton-Woods	0,295	0,226	0,117	0,231	0,109	0,179	0,195	0,045	0,122	0,031	0,035	0,244	0,292	0,148
	post-Bretton Woods	0,070	0,002	0,092	0,023	0,349	0,008	0,204	0,063	0,100	0,127	0,175	0,080	0,006	0,077
Investment	gold standard	0,004	0,050	0,071	0,082	0,149	0,023	-	-	0,046	0,077	0,073	0,025	0,119	0,104
	interwar	0,179	0,202	0,121	0,151	-	-	-	-	0,257	0,282	0,144	0,088	0,037	0,005
	postwar	0,153	0,141	0,016	0,110	0,000	0,010	0,050	0,043	0,068	0,011	-0,071	-0,362	0,218	0,177
	Bretton-Woods	0,191	0,377	0,094	0,267	-0,022	0,037	0,040	0,341	0,054	0,095	0,058	0,000	0,223	0,237
	post-Bretton Woods	0,027	0,087	0,054	0,006	0,069	0,031	0,080	0,049	0,098	0,070	0,159	0,180	0,031	0,063
Government	gold standard	0,131	0,017	0,120	0,038	0,462	0,039	0,093	0,003	0,137	0,311	0,042	0,024	0,063	0,076
expenditures	interwar	0,002	0,173	0,121	0,067	-	-	0,297	0,145	0,065	0,071	0,021	0,040	0,014	0,001
	postwar	0,037	0,186	0,001	0,195	0,009	0,164	0,115	0,113	0,124	0,014	0,385	0,687	0,126	0,028
	Bretton-Woods	0,014	0,363	0,083	0,125	0,008	0,233	0,154	0,191	0,318	0,002	0,037	0,239	0,237	0,076
	post-Bretton Woods	0,064	0,141	0,155	0,218	0,030	0,098	0,085	0,288	0,097	0,032	0,075	0,584	0,057	0,256
Government	gold standard	0,064	0,184	0,101	0,170	0,014	0,002	0,251	0,059	0,233	0,094	0,030	0,024	0,081	0,015
revenues	interwar	0,060	0,254	0,338	0,004	0,447	0,355	0,063	0,093	0,098	0,050	0,026	0,309	0,058	0,035
	postwar	0,337	0,108	0,009	0,131	0,280	0,232	0,046	0,114	0,048	0,000	0,186	0,053	0,092	0,063
	Bretton-Woods	0,499	0,092	0,023	0,111	0,556	0,345	0,061	0,129	0,041	0,027	0,241	0,082	0,155	0,095
	post-Bretton Woods	0,216	0,349	0,032	0,082	0,070	0,381	0,068	0,046	0,243	0,098	0,159	0,088	0,039	0,037
Export	gold standard	0,115	0,044	0,039	0,049	0,017	0,023	0,141	0,279	0,126	0,167	0,049	0,010	0,060	0,075
	interwar	0,138	0,014	0,042	0,099	0,242	0,314	0,097	0,075	0,197	0,016	0,062	0,417	0,017	0,267
	postwar	0,320	0,195	0,066	0,183	0,099	0,198	0,005	0,048	0,022	0,022	0,073	0,052	0,227	0,048
	Bretton-Woods	0,346	0,334	0,213	0,077	0,157	0,294	0,014	0,032	0,077	0,044	0,100	0,047	0,277	0,030
	post-Bretton Woods	0,188	0,040	0,044	0,301	0,144	0,110	0,119	0,107	0,003	0,114	0,216	0,051	0,022	0,078
Import	gold standard	0,010	0,055	0,012	0,021	0,076	0,026	0,197	0,015	0,376	0,106	0,260	0,001	0,158	0,076
	interwar	0,112	0,329	0,035	0,451	0,360	0,127	0,157	0,018	0,037	0,058	0,057	0,437	0,156	0,581
	postwar	0,091	0,046	0,068	0,217	0,036	0,043	0,262	0,265	0,008	0,036	0,100	0,039	0,209	0,133
	Bretton-Woods	0,135	0,032	0,139	0,133	0,151	0,106	0,303	0,364	0,013	0,114	0,047	0,085	0,240	0,462
	post-Bretton Woods	0,030	0,358	0,040	0,364	0,110	0,067	0,218	0,182	0,012	0,001	0,317	0,030	0,014	0,068
M	gold standard	0,062	0,213	0,223	0,168	0,041	0,082	0,029	0,018	0,240	0,070	0,085	0,177	0,072	0,050
	interwar	0,177	0,046	0,192	0,137	-	-	0,160	0,035	0,398	0,030	0,062	0,439	0,059	0,002
	postwar	0,151	0,023	0,078	0,003	0,153	0,017	0,030	0,006	0,054	0,053	0,201	0,041	0,203	0,021
	Bretton-Woods	0,282	0,156	0,210	0,201	0,058	0,202	0,001	0,124	0,208	0,106	0,179	0,037	0,355	0,034
	post-Bretton Woods	0,092	0,010	0,052	0,040	0,454	0,114	0,097	0,236	0,433	0,086	0,205	0,018	0,168	0,015
Consumer	gold standard	0,072	0,214	0,069	0,170	0,044	0,024	0,023	0,300	0,197	0,060	0,223	0,057	0,061	0,085
prices	interwar	0,039	0,140	0,171	0,368	0,033	0,134	0,038	0,018	0,031	0,159	0,106	0,061	0,032	0,068
	postwar	0,320	0,028	0,060	0,092	0,188	0,282	0,107	0,122	0,034	0,026	0,288	0,034	0,282	0,161
	Bretton-Woods	0,277	0,140	0,132	0,036	0,297	0,520	0,228	0,209	0,012	0,062	0,204	0,035	0,323	0,204
	post-Bretton Woods	0,270	0,045	0,067	0,120	0,054	0,064	0,231	0,065	0,339	0,083	0,430	0,059	0,090	0,129

Table 5: Continued

		Belgium		Netherlands		Denmark		Finland		Norway		Sweden	
		R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)	R^2(y.x)	R^2(x.y)
Consumption	gold standard	-	-	-	-	-	-	-	-	0,051	0,307	0,224	0,049
	interwar	-	-	-	-	-	-	-	-	0,129	0,605	0,102	0,057
	postwar	-	-	-	-	-	-	-	-	0,026	0,104	0,012	0,029
	Bretton-Woods	-	-	-	-	-	-	-	-	0,034	0,055	0,014	0,035
	post-Bretton Woods	-	-	-	-	-	-	-	-	0,008	0,177	0,023	0,125
Investment	gold standard	-	-	-	-	0,061	0,012	0,137	0,131	0,118	0,026	0,087	0,134
	interwar	-	-	-	-	-0,051	0,021	0,120	0,131	-	-	0,129	0,088
	postwar	0,020	0,026	-0,011	0,049	0,037	0,081	0,000	0,045	0,074	0,024	0,014	0,192
	Bretton-Woods	0,028	0,097	-0,045	0,127	0,022	0,097	0,012	0,013	0,256	0,011	0,126	0,196
	post-Bretton Woods	0,071	0,060	0,348	0,080	0,138	0,138	0,019	0,146	0,030	0,044	0,050	0,098
Government	gold standard	0,016	0,081	0,144	0,033	0,057	0,032	0,146	0,021	0,062	0,113	0,168	0,022
expenditures	interwar	0,098	0,214	0,087	0,021	0,086	0,056	0,089	0,194	0,071	0,317	0,088	0,052
	postwar	0,071	0,017	0,001	0,083	0,154	0,029	0,074	0,142	0,001	0,005	0,049	0,115
	Bretton-Woods	0,049	0,647	0,065	0,083	0,146	0,133	0,087	0,109	0,082	0,009	0,015	0,167
	post-Bretton Woods	0,028	0,160	0,162	0,121	0,216	0,129	0,034	0,417	0,093	0,047	0,189	0,172
Government	gold standard	0,048	0,038	0,225	0,264	0,086	0,015	0,026	0,027	0,047	0,192	0,014	0,030
revenues	interwar	0,463	0,380	0,010	0,403	0,025	0,056	0,120	0,151	0,006	0,170	0,095	0,028
	postwar	0,070	0,071	0,019	0,006	0,225	0,163	0,046	0,010	0,015	0,038	0,013	0,140
	Bretton-Woods	0,194	0,439	0,082	0,143	0,221	0,194	0,074	0,056	0,028	0,044	0,028	0,169
	post-Bretton Woods	0,134	0,099	0,208	0,155	0,207	0,113	0,019	0,126	0,090	0,029	0,087	0,105
Export	gold standard	0,157	0,001	0,274	0,042	0,088	0,006	0,188	0,022	0,020	0,169	0,064	0,114
	interwar	0,280	0,270	0,014	0,186	0,151	0,031	0,082	0,023	0,094	0,122	0,128	0,053
	postwar	0,137	0,021	0,107	0,006	0,009	0,055	0,005	0,095	0,018	0,045	0,006	0,071
	Bretton-Woods	0,248	0,085	0,211	0,010	0,012	0,077	0,009	0,041	0,037	0,057	0,038	0,031
	post-Bretton Woods	0,051	0,001	0,070	0,041	0,085	0,049	0,010	0,417	0,021	0,159	0,050	0,353
Import	gold standard	0,182	0,184	0,296	0,113	0,018	0,002	0,088	0,054	0,078	0,016	0,085	0,052
	interwar	0,340	0,257	0,042	0,191	0,098	0,025	0,001	0,046	0,382	0,119	0,020	0,026
	postwar	0,098	0,033	0,165	0,055	0,140	0,058	0,023	0,024	0,011	0,071	0,005	0,085
	Bretton-Woods	0,316	0,137	0,261	0,104	0,071	0,071	0,016	0,009	0,002	0,038	0,017	0,019
	post-Bretton Woods	0,117	0,018	0,043	0,027	0,245	0,028	0,015	0,092	0,010	0,143	0,027	0,323
M	gold standard	0,087	0,157	0,000	0,011	0,005	0,006	0,091	0,064	0,122	0,244	0,302	0,011
	interwar	0,145	0,002	0,164	0,337	0,175	0,059	0,093	0,262	0,277	0,356	0,054	0,039
	postwar	0,044	0,036	0,329	0,026	0,101	0,094	0,020	0,036	0,017	0,097	0,009	0,096
	Bretton-Woods	0,163	0,201	0,313	0,024	0,101	0,156	0,033	0,082	0,066	0,090	0,009	0,099
	post-Bretton Woods	0,107	0,044	0,488	0,191	0,156	0,081	0,026	0,060	0,043	0,267	0,023	0,013
Consumer	gold standard	0,195	0,077	0,135	0,208	0,005	0,147	0,165	0,132	0,161	0,222	0,163	0,002
prices	interwar	0,043	0,027	0,003	0,518	0,183	0,035	0,225	0,180	0,079	0,050	0,005	0,006
	postwar	0,222	0,072	0,232	0,023	0,243	0,032	0,054	0,095	0,089	0,003	0,064	0,061
	Bretton-Woods	0,321	0,101	0,285	0,051	0,249	0,031	0,062	0,113	0,070	0,015	0,110	0,052
	post-Bretton Woods	0,289	0,027	0,080	0,004	0,301	0,025	0,049	0,033	0,125	0,005	0,194	0,112

Note: The first column shows the difference between R^2 from regressions of y (the business cycle) on two lags of x (the candidate series) and y, and R^2 from regressions of y on two lags of y whereas the second column shows the relative R^2 when y and x are reversed.

Table 6: Economic behavior during recessions. Average deviation from trend of real GDP and its components in recessions.

	# of recessions	Y	C	I	G	R	X	M	M2
US	22	-3.8	-1.9	-7.1	-2.9	-3.8	-3.5	-6.4	-2.2
UK	22	-2.6	-0.4	-1.1	-2.3	-0.8	-2.7	-4.3	-0.3
Germany	25	-4.9	-0.5	-7.7	3.1	0.1	-2.4	-6.0	-0.4
France	24	-3.4	-0.2	-1.0	-1.4	-3.3	-5.7	-12.0	-0.1
Canada	24	-3.5	-2.8	-4.1	-0.8	-2.7	-4.9	-5.7	-0.9
Italy	27	-3.2	-1.8	-8.9	1.1	-0.9	-1.3	-2.7	-0.4
Japan	23	-3.7	-1.2	-0.5	2.5	0.8	-0.2	2.1	-0.7
Belgium	23	-2.3	—	-5.8	-1.3	-0.8	-3.3	-3.0	-1.0
Netherlands	23	-4.2	—	-2.8	1.2	-7.4	-4.9	-5.9	-1.2
Denmark	27	-2.8	—	-5.3	2.3	-1.9	-3.5	-6.9	0.4
Finland	24	-2.9	—	-1.8	0.4	-5.1	-16.8	-15.4	-1.9
Norway	27	-2.2	0.2	-3.6	-1.3	-0.8	-7.2	-3.4	0.3
Sweden	23	-1.8	-1.4	-5.0	5.8	1.5	-4.7	-4.4	1,0

Table 7: Effects of bandpass filtered economic aggregates on real GDP during recessions. Pooled panel data regression.

C	I	G	T	X	M	M2	R^2	Durbin Watson
0.282	0.072	0.022	-0.033	0.075	-0.003	0.009	0.803	1.871
(3.473)	(4.871)	(1.224)	(-1.203)	(3.288)	(-0.146)	(0.388)		

Note: The regression coefficients are OLS estimates and the standard errors in their t-statistics shown below each coefficient are corrected for heteroscedasticity. The number of observations is 174. The regression also includes country dummies. The corresponding parameters are all statistically different from zero at conventional significance levels and not reported to save place.

Table 8: International contemporaneous output links, bandpass filtered real GDP.

		UK	Germany	France	Canada	Italy	Japan	Belgium	Netherlands	Denmark	Finland	Norway	Sweden
US	prewar	0.151	-0.140	0.063	0.510	0.340	-0.278	0.318	0.109	0.140	-0.090	0.134	0.051
	nterwar	0.644	0.003	0.412	0.839	0.295	-0.191	0.312	0.396	0.499	0.360	0.425	0.584
	postwar	0.473	0.276	0.143	0.721	0.124	0.377	0.190	-0.138	0.156	0.136	0.177	-0.037
	Bretton Woods	0.138	0.329	-0.064	0.645	-0.205	0.331	0.090	-0.412	-0.141	0.010	0.065	-0.181
	post-Bretton Woods	0.744	0.224	0.427	0.812	0.487	0.465	0.285	0.533	0.586	0.249	0.321	0.098
UK	prewar		-0.201	0.245	0.039	0.165	0.333	0.170	0.345	0.146	-0.015	-0.100	0.020
	nterwar		0.140	0.273	0.681	0.331	0.584	-0.020	0.059	0.241	0.247	0.276	0.301
	postwar		0.223	0.468	0.299	0.251	0.163	0.279	0.272	0.498	0.466	0.085	0.385
	Bretton Woods		0.494	0.381	-0.090	-0.058	-0.076	0.274	0.357	0.416	0.377	0.136	0.550
	post-Bretton Woods		0.057	0.590	0.587	0.470	0.431	0.280	0.300	0.628	0.516	0.057	0.298
Germany	prewar			0.259	-0.016	0.108	-0.114	0.424	0.117	0.088	0.326	-0.066	0.368
	nterwar			0.152	0.148	-0.009	0.478	0.063	0.442	-0.568	0.293	-0.023	0.278
	postwar			0.350	0.087	0.266	0.470	0.523	0.397	0.320	0.124	0.233	0.237
	Bretton Woods			0.319	0.192	-0.016	0.408	0.500	0.352	0.257	0.607	0.196	0.527
	post-Bretton Woods			0.389	-0.017	0.536	0.587	0.552	0.594	0.407	-0.249	0.274	-0.005
France	prewar				0.257	0.366	-0.085	0.450	0.260	-0.160	0.153	0.095	0.091
	nterwar				0.380	0.214	0.290	0.610	0.373	0.399	0.512	0.639	0.282
	postwar				0.111	0.435	0.154	0.589	0.454	0.275	0.520	-0.025	0.434
	Bretton Woods				-0.042	0.144	-0.091	0.443	0.426	0.212	0.509	0.119	0.505
	post-Bretton Woods				0.327	0.785	0.604	0.777	0.582	0.375	0.559	-0.228	0.374
Canada	prewar					0.126	-0.280	0.316	0.004	-0.149	-0.043	0.259	0.125
	nterwar					0.380	-0.028	0.301	0.452	0.415	0.547	0.505	0.592
	postwar					0.109	0.151	0.206	-0.035	0.015	0.176	0.104	0.105
	Bretton Woods					-0.264	0.076	0.128	-0.242	-0.227	-0.191	-0.094	-0.216
	post-Bretton Woods					0.516	0.280	0.274	0.496	0.361	0.494	0.354	0.405
Italy	prewar						-0.175	0.105	-0.078	0.458	0.330	0.071	0.043
	nterwar						-0.229	0.162	0.039	0.072	0.260	0.236	-0.002
	postwar						0.441	0.504	0.485	0.220	0.317	0.292	0.308
	Bretton Woods						0.408	0.141	0.418	0.044	0.084	0.338	0.101
	post-Bretton Woods						0.515	0.836	0.749	0.450	0.506	0.241	0.485
Japan	prewar							-0.154	-0.158	0.074	-0.089	-0.344	-0.073
	nterwar							0.419	0.338	-0.386	0.356	-0.133	-0.130
	postwar							0.482	0.208	0.083	0.288	0.186	0.055
	Bretton Woods							0.479	0.137	-0.067	0.343	0.382	-0.014
	post-Bretton Woods							0.528	0.465	0.375	0.255	-0.146	0.149
Belgium	prewar								0.247	0.099	0.414	0.142	0.229
	nterwar								0.602	0.228	0.502	0.524	0.338
	postwar								0.506	0.109	0.551	0.192	0.443
	Bretton Woods								0.511	-0.044	0.747	0.379	0.471
	post-Bretton Woods								0.682	0.294	0.412	0.010	0.425
Netherlands	prewar									-0.282	0.051	-0.114	0.248
	nterwar									-0.097	0.391	0.364	0.425
	postwar									0.430	0.322	0.437	0.369
	Bretton Woods									0.420	0.442	0.460	0.432
	post-Bretton Woods									0.511	0.235	0.451	0.371
Denmark	prewar										0.356	-0.191	0.140
	nterwar										0.128	0.401	0.317
	postwar										0.120	0.348	0.259
	Bretton Woods										0.122	0.231	0.351
	post-Bretton Woods										0.126	0.523	0.168
Finland	prewar											0.121	0.460
	nterwar											0.459	0.427
	postwar											0.105	0.652
	Bretton Woods											0.362	0.492
	post-Bretton Woods											-0.124	0.761
Norway	prewar												0.294
	nterwar												0.603
	postwar												0.087
	Bretton Woods												-0.033
	post-Bretton Woods												0.205

Note: Marked correlations denote statistically significance at the 5 percent level using Newey-West optimal bandwidth standard errors.

Table 9: International contemporaneous price level linkages, bandpass filtered price levels.

		UK	Germany	France	Canada	Italy	Japan	Belgium	Netherlands	Denmark	Finland	Norway	Sweden
US	prewar	0.396	0.097	-0.265	0.451	0.405	0.339	0.013	-0.121	0.020	0.1148	0.113	0.157
	nterwar	0.649	-0.148	0.323	0.950	0.428	0.161	0.403	0.443	0.190	0.335	0.211	0.460
	postwar	0.657	0.554	0.578	0.752	0.607	0.422	0.489	0.313	0.444	0.413	0.242	0.521
	Bretton Woods	0.664	0.668	0.650	0.819	0.624	0.500	0.761	0.289	0.275	0.441	0.246	0.584
	post-Bretton Woods	0.663	0.443	0.690	0.695	0.588	0.516	0.252	0.359	0.712	0.426	0.243	0.470
UK	prewar		0.591	0.172	0.621	0.077	0.221	0.383	0.421	0.240	0.489	0.557	0.480
	nterwar		-0.696	0.355	0.646	0.543	0.515	0.384	0.625	0.359	0.525	0.609	0.918
	postwar		0.454	0.392	0.599	0.690	0.236	0.625	0.455	0.459	0.519	0.408	0.623
	Bretton Woods		0.747	0.455	0.654	0.728	0.202	0.756	0.382	0.575	0.418	0.535	0.778
	post-Bretton Woods		0.284	0.608	0.609	0.716	0.550	0.572	0.629	0.453	0.785	0.407	0.620
Germany	prewar			0.275	0.283	0.231	0.105	0.551	0.403	0.509	0.508	0.580	0.607
	nterwar			-0.159	-0.108	-0.197	-0.323	-0.171	-0.412	-0.424	-0.056	-0.708	-0.766
	postwar			0.495	0.541	0.652	0.393	0.682	0.375	0.419	0.299	0.274	0.634
	Bretton Woods			0.514	0.596	0.772	0.425	0.786	0.211	0.387	0.253	0.269	0.768
	post-Bretton Woods			0.576	0.437	0.459	0.429	0.542	0.752	0.401	0.398	0.195	0.306
France	prewar				-0.068	0.064	-0.402	0.400	0.172	0.256	0.152	0.316	0.113
	nterwar				0.404	0.607	0.089	0.626	0.382	-0.361	0.115	-0.026	0.152
	postwar				0.643	0.536	0.569	0.461	0.270	0.239	0.408	0.107	0.348
	Bretton Woods				0.661	0.449	0.564	0.428	0.186	0.121	0.335	0.025	0.300
	post-Bretton Woods				0.789	0.931	0.604	0.750	0.657	0.819	0.751	0.533	0.590
Canada	prewar					0.002	0.248	0.265	0.110	0.115	0.236	0.273	0.144
	nterwar					0.448	0.210	0.500	0.492	0.139	0.371	0.129	0.456
	postwar					0.693	0.319	0.671	0.571	0.621	0.658	0.450	0.588
	Bretton Woods					0.682	0.320	0.831	0.625	0.561	0.690	0.349	0.584
	post-Bretton Woods					0.694	0.479	0.491	0.484	0.745	0.636	0.670	0.588
Italy	prewar						0.296	0.179	0.046	0.273	0.152	0.261	0.236
	nterwar						0.207	0.153	0.131	-0.175	0.224	0.333	0.362
	postwar						0.393	0.798	0.517	0.603	0.563	0.425	0.639
	Bretton Woods						0.381	0.829	0.418	0.523	0.442	0.377	0.618
	post-Bretton Woods						0.634	0.762	0.696	0.758	0.824	0.531	0.674
Japan	prewar							-0.105	-0.241	-0.169	-0.136	0.161	0.014
	nterwar							0.199	0.708	0.607	0.807	0.425	0.442
	postwar							0.294	0.032	-0.046	0.145	-0.414	0.009
	Bretton Woods							0.238	-0.077	-0.167	0.040	-0.538	-0.079
	post-Bretton Woods							0.660	0.591	0.603	0.719	0.247	0.414
Belgium	prewar								0.252	0.417	0.265	0.508	0.315
	nterwar								0.468	-0.120	0.349	-0.184	0.276
	postwar								0.661	0.488	0.677	0.468	0.637
	Bretton Woods								0.595	0.502	0.627	0.504	0.761
	post-Bretton Woods								0.804	0.453	0.843	0.428	0.482
Netherlands	prewar									0.513	0.622	0.253	0.406
	nterwar									0.428	0.624	0.335	0.611
	postwar									0.403	0.685	0.414	0.420
	Bretton Woods									0.386	0.666	0.410	0.370
	post-Bretton Woods									0.394	0.731	0.386	0.509
Denmark	prewar										0.578	0.591	0.635
	nterwar										0.458	0.734	0.338
	postwar										0.526	0.540	0.550
	Bretton Woods										0.506	0.527	0.587
	post-Bretton Woods										0.579	0.526	0.434
Finland	prewar											0.475	0.714
	nterwar											0.259	0.432
	postwar											0.404	0.442
	Bretton Woods											0.340	0.359
	post-Bretton Woods											0.596	0.641
Norway	prewar												0.747
	nterwar												0.591
	postwar												0.628
	Bretton Woods												0.734
	post-Bretton Woods												0.334

Note: Marked correlations denote statistically significance at the 5 percent level using Newey-West optimal bandwidth standard errors.

Figure 1: US business cycle. The NBER chronology vs band-pass filtered data. Shaded areas indicate troughs given by the NBER.

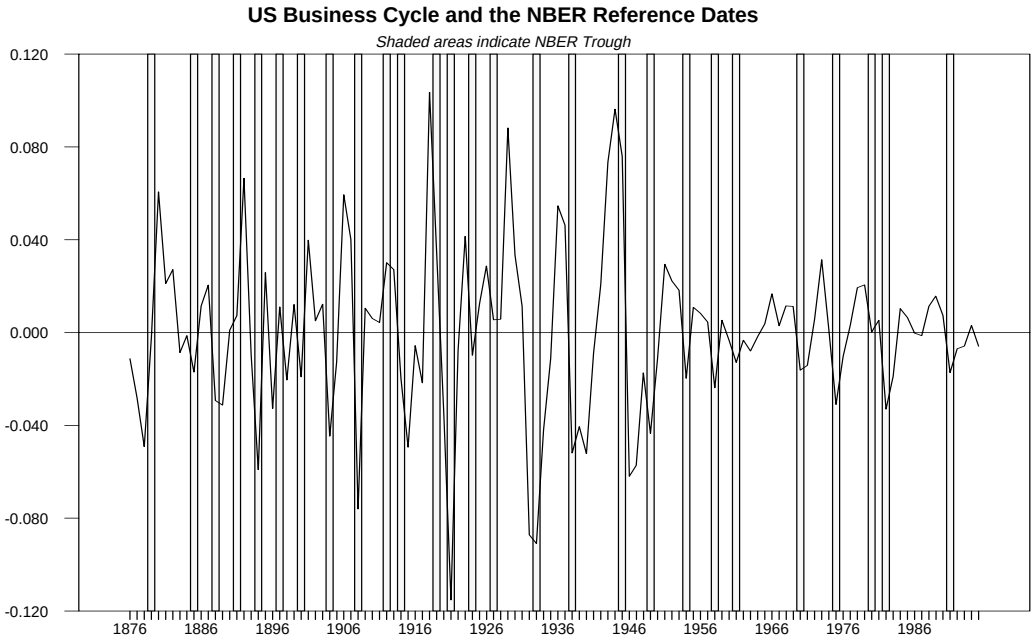
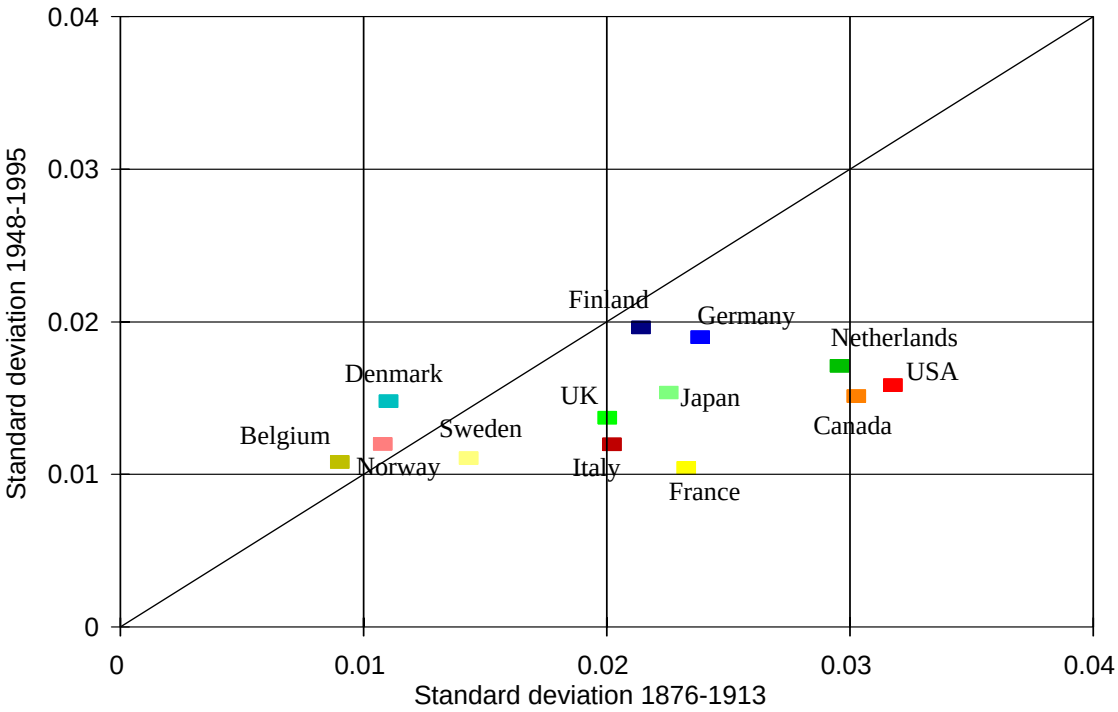



Figure 2: Standard deviation of cyclical components during the classical gold standard (1876-1913) and the post-World War II-period (1948-95).