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Business Cycle Volatility and Globalization: A Survey

by

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Business Cycle Volatility and Globalization: A Survey[1]

Abstract

The globalization of capital and product markets has many implications for economic welfare. Countries can specialize in the production of goods for which they have comparative advantages, and capital is allocated more efficiently. However, one potentially adverse effect of globalization is the possibility that business cycle volatility might increase. Rapid and badly co-ordinated capital account liberalization has been blamed for enhancing the vulnerability of emerging markets to unstable international capital flows. At the same time, business cycle volatility in OECD countries seems to have been on a decline in the past decades.

Keywords: business cycle volatility, financial openness, new open economy macro models

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1 Motivation

The globalization of capital and product markets has many implications for economic welfare. Countries can specialize in the production of goods for which they have comparative advantages, and capital is allocated more efficiently. However, one potentially adverse effect of globalization is the possibility that business cycle volatility might increase. Rapid and badly co-ordinated capital account liberalization has been blamed for enhancing the vulnerability of emerging markets to unstable international capital flows. At the same time, business cycle volatility in OECD countries seems to have been on a decline in the past decades.

On a theoretical level, the effects of increased integration on business cycle volatility are in fact not clear. Consider the effects of increased integration of financial markets. On the one hand, increased financial integration allows consumers to cushion against adverse domestic shocks by lending and borrowing abroad. Hence, volatility of consumption would decline. On the other hand, financial integration increases the potential that domestic financial market distortions get magnified as foreign capital can come in. Volatility of output and investment would increase. Moreover, the effects of monetary and fiscal policies on output volatility depend on the degree of integration of financial markets (Sutherland 1996).

Likewise, increased integration of goods' markets could increase business cycle volatility as it allows countries to increasingly specialize their production patterns. This could make them more vulnerable to sector-specific shocks. If firms have market power and if goods market integration is incomplete, pricing-to-market may reduce the vulnerability of consumption to external shocks. As for financial market integration, the effects of goods' market integration for volatility depend on the type of shock and on the macroeconomic aggregate considered (Senay 1998).

Understanding the link between integration and business cycle volatility is not an end in itself. Rather, changes in business cycle volatility can have implications for economic growth. Again, the theoretical prediction on the link between output volatility and output growth is not clear (Ramey and Ramey 1995). On the one hand, countries could be able to choose between high-volatility, high-return technologies and low-volatility, low-return technologies. Greater volatil-

ity could then be the reflection of higher returns. On the other hand, greater volatility increases uncertainty and could thus repress investment and growth. In fact, empirical studies find it difficult to pin down the relationship between output volatility and growth. Ramey and Ramey (1995) and Kneller and Young (2001) find a negative link between volatility and growth.[2]

This paper reviews the theoretical and the empirical evidence on the links between globalization and real sector volatility. The focus is on work that addresses the implications of open markets for business cycle volatility. The paper falls into three main parts. In the following second part, stylized facts on globalization and on changes in business cycle volatility over time are summarized. Part three surveys the theoretical literature on the link between the openness of goods and financial markets, on the one hand, and business cycle volatility, on the other hand, and part four provides empirical evidence on this link. Part five concludes.

Throughout the paper, globalization is defined as the process of increasing flows of goods and capital across borders, a process which has been fostered both by technological change and by the deregulation of international markets. Business cycle volatility is measured as the standard deviation of a time series from its long-term trend.

2 Have Business Cycle Characteristics Changed Over Time?

This section summarizes stylized facts of changes in business cycles. I look at the volatility of business cycles and at correlations of business cycle, both across macro-economic aggregates and across countries. I complement this by evidence on the globalization and development of (financial) markets.

2.1 Volatility of Business Cycles

Notwithstanding the different concepts that can be applied to the measurement of business cycle volatility, volatility of most macroeconomic aggregates in OECD countries has declined over the past decades. This is one result of several studies using long-term, historic data for a cross-section of countries (Basu and

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2 For a review of the literature and for a recent empirical study see Doepke (2002). Kneller and Young (2001) find that higher volatility lowers economic growth.

Taylor 1999, Bergman et al. 1998, Dalsgaard et al. 2002).[3],[4] An additional stylized fact that emerges from these studies is that volatility of investment generally exceeds that of other time series (Basu and Taylor 1999, Backus et al. 1992).

Studies using historic data typically consider four regimes which differ with regard to the flexibility of exchange rates and the openness of countries to trade and capital flows (Table 1). The time of the Gold-Standard with mostly fixed exchange rates and the post-Bretton Woods era with mostly flexible exchange rates have been characterized by high degrees of capital mobility. In between the two world wars, capital mobility has been severely restricted, and these restrictions have generally been maintained during the Bretton Woods period of fixed exchange rates between the major currencies (Basu and Taylor 1999, Obstfeld and Taylor 2002).

Dividing the data into these time periods, Basu and Taylor (1999) look at business cycle characteristics of 15 OECD countries for the past 130 years. Generally, they find that the volatility of macroeconomic aggregates has increased in the period between the two world wars in comparison to the Gold Standard (Graph 1). During the Bretton-Woods period, volatility fell to the level observed during the Gold Standard, and, in the final period, volatility has fallen even further. For the past four decades at least, the fall in business cycle volatility in OECD countries has been driven mainly by a reduced volatility of investment and consumption (Dalsgaard et al. 2002).

The pattern of volatility in prices and exchange rates has differed from that of real economic aggregates (Basu and Tylor 1999). While prices and real exchange rates were generally less volatile during periods of fixed exchange rates, nominal exchange rate volatility has increased in periods of flexible exchange rates. Because of some degree of price stickiness, however, changes in nominal exchange rate volatility have not transmitted into one-to-one changes in real exchange rate volatility. Also, the volatility of short-term interest rates tends to have increased in recent decades (Stock and Watson 2002).

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3 These results survive even if adjustments are made for the fact that the collection of historic data might have induced a bias towards a higher measured volatility (Romer 1999).

4 Kouparitsas (1998) concludes that business cycle volatility in OECD countries has increased in the post-Bretton Woods period, but his dataset does not cover the 1990s.

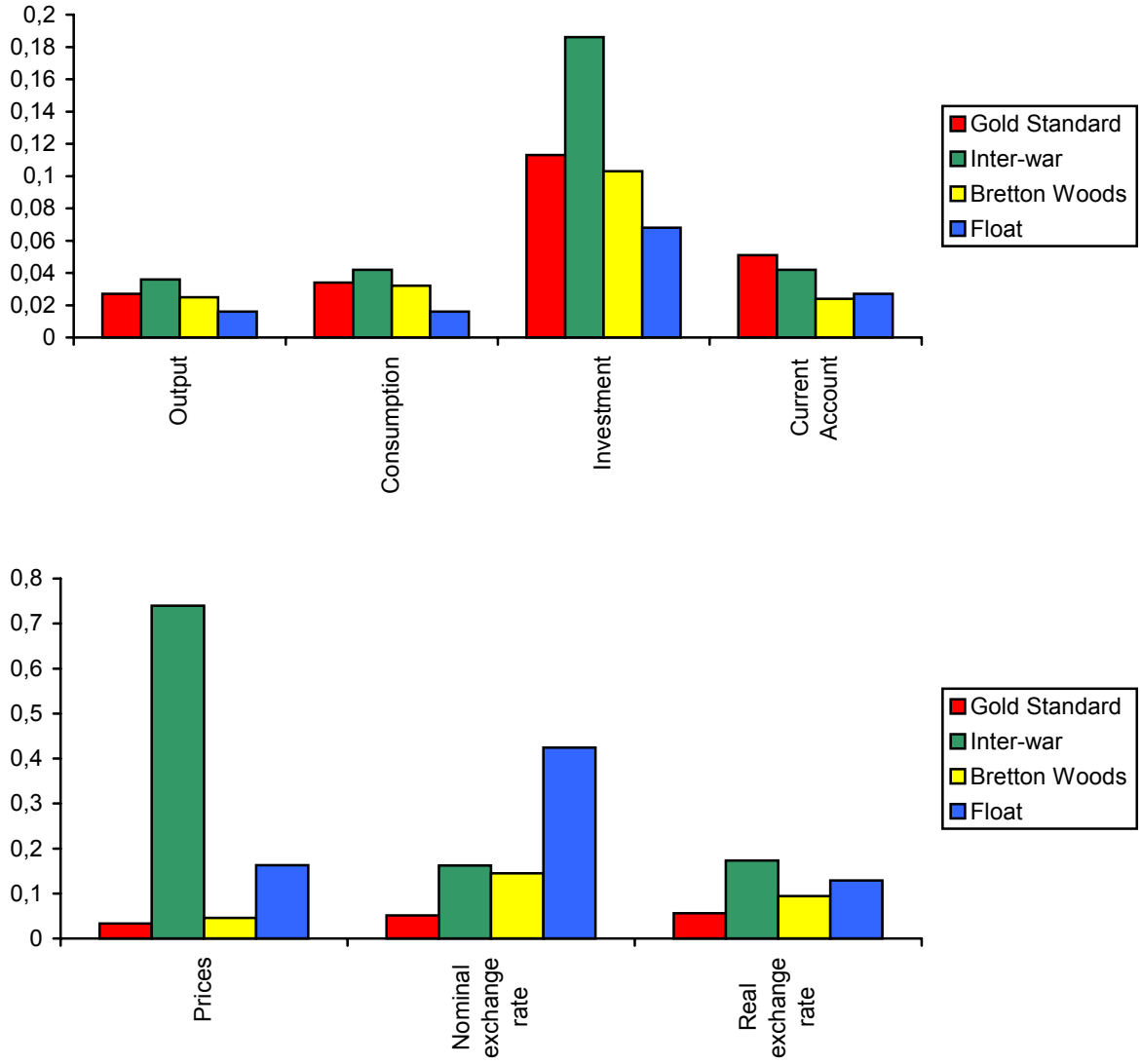
Table 1 — Globalization and Financial Markets in Historic Perspective

	1870–1914: Gold Standard	1919–1939	1945–1971: Bretton Woods	1972 – present
Trade integration	high degree of integration	international disintegration	relatively low degree of integration	increasing integration
Capital controls	low	widespread capital controls	high capital controls	capital controls gradually abolished
Capital flows	current account deficits 4-5%. International capital flows mainly from rich to poor countries, “ Gross and net foreign asset positions very close.			Increasing importance of portfolio capital flows. International capital flows mainly among developed countries. Foreign assets and liabilities similar; net flows are small.
Exchange rate regime	fixed		mostly fixed	flexible
Sources of shocks	Business cycle volatility influenced by shocks to the gold market, limited role of monetary and fiscal policy. Financial crises (banking panics) likewise causal for volatility.	Relative erratic macroeconomic policies in early years (1919-1921). More effective use of monetary policy in U.S. subsequently.	Rising fiscal deficits and debt-to-GDP ratios.	Oil crises in the 1970s had important impact on business cycles.
Financial market development	high	low	low	high

Sources: Basu and Taylor (1999), Bergman et al. (1998), Obstfeld and Taylor (2002), Rajan and Zingales (2001).

Graph 1 — Macroeconomic Volatility in Historical Perspective

This graph reports averages for OECD countries. Data have been de-trended using a bandpass filter. For details see Basu and Taylor (1999).



Source: Basu and Taylor (1999).

The level of business cycle volatility has not only changed over time, it also differs between countries. Developing countries tend to have a higher volatility of output than developed OECD countries (Easterly et al. 2000), one possible explanation being the more narrow production base and the greater dependence on primary commodity exports (Agénor 2001). Baxter (1995) offers an alternative interpretation.[5] She argues that investment should be more volatile in smaller countries because smaller countries face a flatter supply curve for capi-

5 See also Section 3.4.

tal, i.e. unlike in a large country, a positive productivity shock does not push up the international interest rate. Unfortunately, time series for emerging markets are too short to analyze whether business cycle volatility has witnessed a similar downward trend as in OECD countries.

In terms of time-series evidence from individual countries, the case of the U.S. has been studied most intensively.[6] These studies suggest that the determinants of business cycle volatility have changed over time (Blanchard and Simon 2001, Stock and Watson 1998, 2002). However, Stock and Watson (2002) cannot find evidence that there has been a decisive break-date in the reduction of volatility. Rather, this reduction seems to have been a gradual process with the relative calm periods of the 1960s and 1990s having been interrupted by the relatively volatile 1970s and 1980s.

Finally, with regard to the persistence of macroeconomic aggregates and thus the duration of cycles, consumption is the only aggregate for which persistence seems to have increased significantly in the floating rate period (Basu and Taylor 1999). Output persistence has been at a similar level in the floating rate and in the interwar period, and a similar conclusion holds for industrial production. Dalsgaard et al. (2002) also find hardly any evidence for changes in the duration of cycles.

2.2 Co-Movements of Business Cycles

Co-movements of business cycles across countries can have two main causes. First, countries may be hit by common shocks. Hence, irrespective of the degree of integration, they would experience similar cyclical characteristics. Second, transmission channels between countries may change. These transmission channels include trade in goods and services or trade in financial assets. Even if shocks are idiosyncratic, business cycles would thus move together, and these co-movements could increase as a result of globalization.

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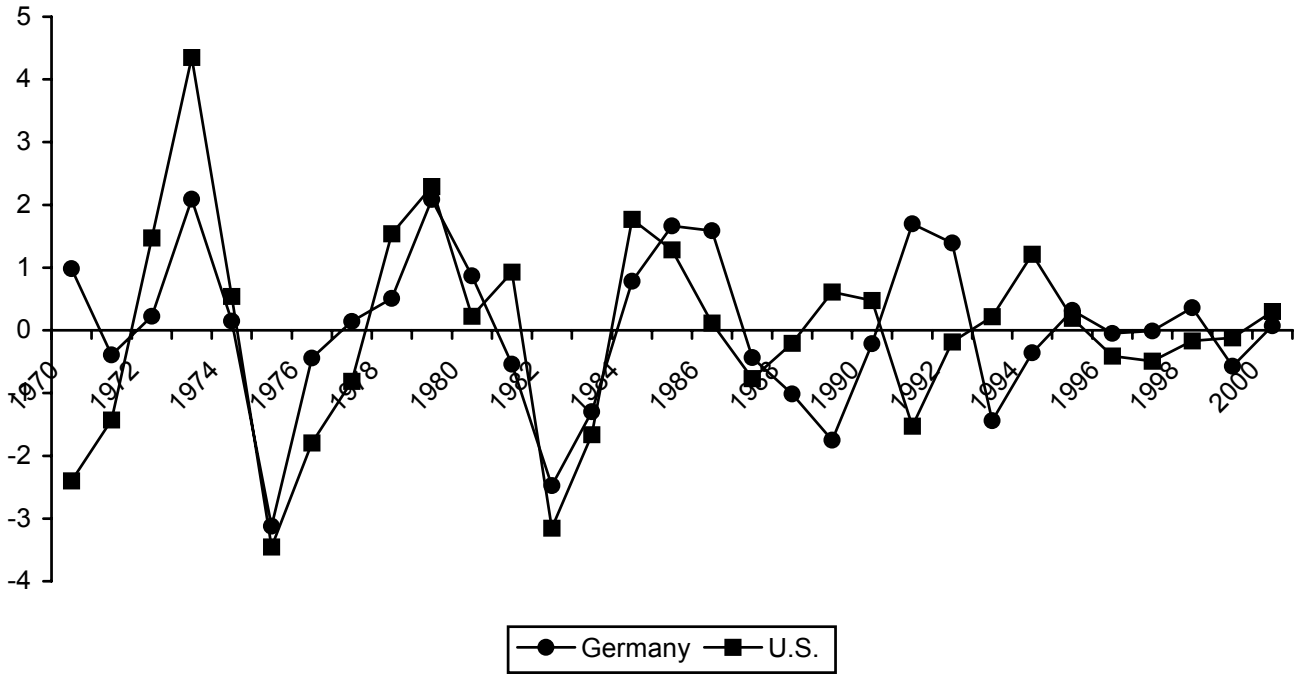
6 Simon (2001) looks at evidence from Australia.

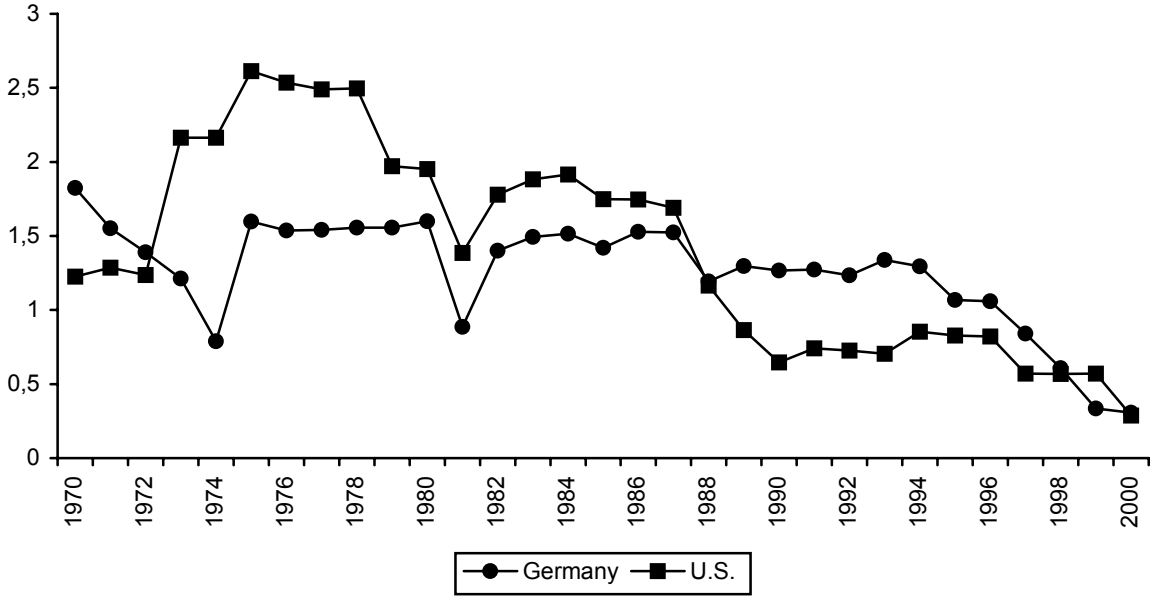
Graph 2 — Volatility of the Business Cycle in Germany and the U.S., 1970-2000

The Graph shows (a) the cyclical component of real GDP, using bandpass filtered data and (b) the volatility of the output gap, computed as a five-year moving average.

a) Output-Gap



b) Standard Deviation of the Output-Gap



Co-movement of business cycles across countries, in turn, could have an impact on measuring the impact of globalization on the volatility of cycles. This is because changes in the volatility of cycles in one country may be attributed to greater openness if correlations of cycles between countries increase over time. The decline in business cycle volatility in the U.S., for instance, has been widely documented. If business cycle correlations between Germany and the U.S. had increased, the fall in volatility in Germany could be due to the greater co-movement of cycles and not due to a direct impact of openness on volatility in Germany (Graph 2).[7],[8]

Yet, evidence presented in Basu and Taylor (1999) does not show a clear pattern of increased co-movement with the U.S. in the post-Bretton-Woods period for a cross-section of OECD countries. While a small increase in correlations is, on average, reported for consumption, the co-movement of industrial production and of the current account has hardly changed, and the co-movement of prices across OECD countries has even declined. Heathcote and Perri (2001), in contrast, find greater co-movement of shocks between the U.S. and Europe.

Differences in the cross-country correlations of macroeconomic aggregates have also been reported by Backus, Kehoe, and Kydland (1992, 1995) who find relatively large co-movements across countries and output correlations that tend to exceed consumption correlations. Theoretical work, in contrast, would predict higher consumption correlations and lower output correlations, a finding which Backus et al. label the ‘quantity anomaly’.

The IMF (2001) concludes in a recent study that, although transmission channels have intensified due to globalization, that there is no global cycle, and that country-specific shocks such as German unification and the bursting of the Japanese asset price bubble have interrupted integration trends. Also, the lack of bilateral data complicates an analysis of transmission channels over time. Therefore, it is difficult to analyze whether increased correlations are the result of tighter transmission channels or of more frequent common shocks.

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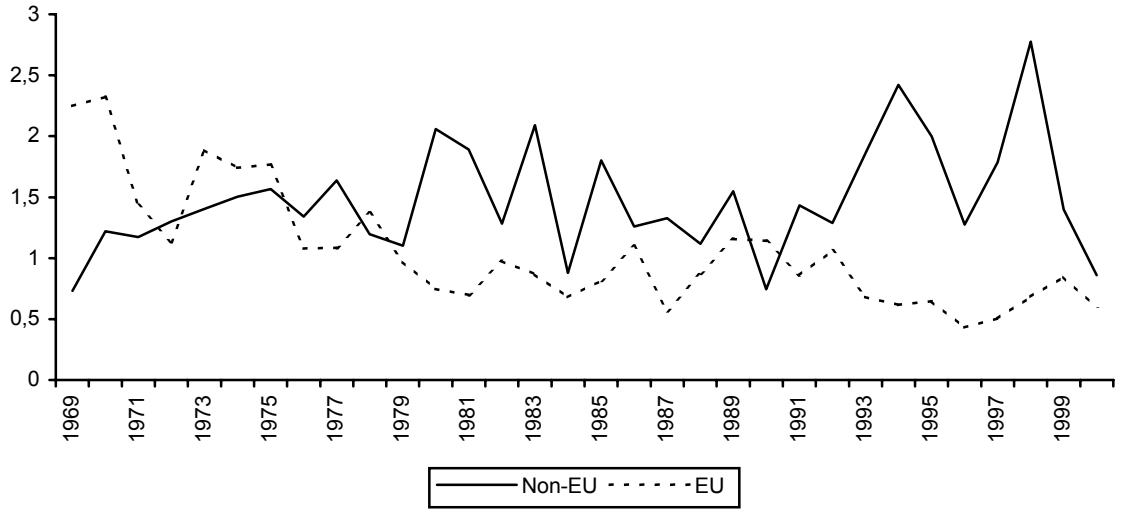
7 A similar problem arises if the co-movement of cycles of different macroeconomic aggregates changes. To see this, assume that the correlation between consumption and output increases and that, at the same time, the volatility of consumption declines due to increased financial integration. Hence, one could attribute the decline in the volatility of output directly to globalization while it is in fact due to the link between openness and consumption.

8 For Germany, the Sachverständigenrat (2001) has analyzed the link between business cycles in Germany and in the United States. One result of the analysis is that the link in fact seems to have become stronger over time. Increased foreign trade activities and international capital flows are offered as an explanation.

Generally, it is an open debate whether the decline in macroeconomic volatility across OECD countries is due to an increased synchronization of cycles (Bergman et al. 1998) or due to other structural changes that have affected these economies simultaneously (Dalsgaard et al. 2002). Bergman et al. (1998) find that correlations across OECD countries have tended to increase over time, and the authors interpret this as evidence for increased integration of the world economy. Increased co-movements of cycles seems to be particularly strong in Europe (Bergman et al. 1998, Dalsgaard et al. 2002). Graph 3 plots the standard deviations of the output gaps[9] in OECD countries. This graph confirms that the increased synchronization of business cycles seems to be a European rather than an OECD-wide phenomenon.[10] Hence, the decline in output volatility that many OECD countries have experienced does not seem to have been driven by a substantially greater co-movement of business cycles across countries.

Graph 3 — Standard Deviation of Output Gaps in OECD Countries

This graph plots the standard deviation of output gaps in OECD countries. The EU sample includes Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Portugal, Spain, Sweden, the U.K. The non-EU sample includes Australia, Canada, Japan, Mexico, New Zealand, Norway, South Korea, Switzerland, and the U.S.



Recent studies also suggest that cross-country correlations of business cycles are driven by cultural and geographic factors and might thus be fairly persistent. Otto et al. (2001) look at the factors determining correlations of business cycles

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9 The output gap is computed as the deviation of output from its long-term trend, using bandpass-filtered data. Theoretical New Keynesian models define the output gap as the deviation of output from its equilibrium level in the absence of nominal rigidities.

10 This conclusion also holds if emerging market countries such as Mexico, South Korea, and Turkey are excluded from the non-EU sample.

across countries. Their descriptive statistics show, first of all, no significant changes in the correlation of GDP growth rates among OECD countries between the 1960s and 1970s, on the one hand, and the 1980s and the 1990s, on the other hand. Generally, the intensity of bilateral trade in goods seems to have a positive effect on output correlations. Likewise, cultural similarity and institutional factors such as good accounting standards, similar legal systems, a common language, and the receptiveness to new technologies have a significant impact on growth correlations. More traditional transmission channels such as the similarity of monetary policy, the integration of long-term bond markets, or a common industry structure, however, do not seem to affect correlations.

Work by Clark and van Wincoop (2001) supports the role of trade linkages in explaining business cycle correlations but also point to the importance of natural barriers to integration. They compare the correlations of business cycles across U.S. states to correlations across European countries. They find that correlations in the U.S. are higher, and that these differences are related mainly to 'border effects' and, as a related issue, to the lower levels of trade among European countries. Since the 'border effect' does not seem to have deminished over time and since co-movements in the U.S. do not seem to be policy-induced, the authors question that the adoption of a Single Currency in Europe is likely to increase business cycle correlations. In a similar vein, these considerations imply that a rapid increase in correlations between the U.S. and Europe due to globalization is unlikely.

2.3 Financial Market Integration and Development

Overall, there is no strong support for the hypothesis that a decline in output volatility in the U.S., together with increased correlations between other OECD countries and the U.S. have been the main driving forces of changing business cycle volatility. This suggests that there might be other common developments that have shaped volatility patterns. One main development that has affected all OECD countries in the past decades has been the increase in the international integration of goods and financial markets. Since this could be a potential candidate for explaining changes in business cycle volatility across countries, this section briefly reviews the empirical evidence on globalization and financial market developments.

Generally, financial market integration has followed a $\cup$-shaped pattern (Bordo et al. 1998, Obstfeld and Taylor 2002) that looks like the mirror image of

the inverse ∪-shaped pattern of real sector volatility. The Gold Standard is typically considered as a period during which legal capital account restrictions have been minor. When comparing the degree of capital mobility today to that prevailing during the Gold Standard, most tests on financial integration come to the same conclusion: capital mobility may be higher today than it used to be a couple of decades ago, but not necessarily higher than at the turn of the last century. Similarly, the integration of stock markets, as measured through return correlations, has followed a ∪-shaped pattern (Goetzmann et al. 2001).

Financial integration has been paralleled by increased goods' market integration (Graph 4). Baldwin and Martin (1999) summarize stylized facts on the degree of globalization of the world economy. They distinguish two waves of globalization (1870-1914 and 1960-present), arguing that these globalization episodes shares many similarities but also differences. Similarities mainly relate to the level of trade and capital flows. Yet, the recent wave of globalization differs in the sense that technological change has been more important. Also, both trade and capital flows now tend to be more concentrated in developed countries whereas there were more substantial flows between developed and developing countries during earlier integration episodes.[11]

In addition to the increasing integration of financial markets, financial systems have become more developed (Graph 5). The number of companies traded on stocks markets and the volume of stock market capitalization over GDP have risen. In parallel, the importance of the banking system relative to GDP has increased in many countries. Interestingly, financial development has taken a similar ∪-shaped pattern as the integration of financial markets (Rajan and Zingales 2001).

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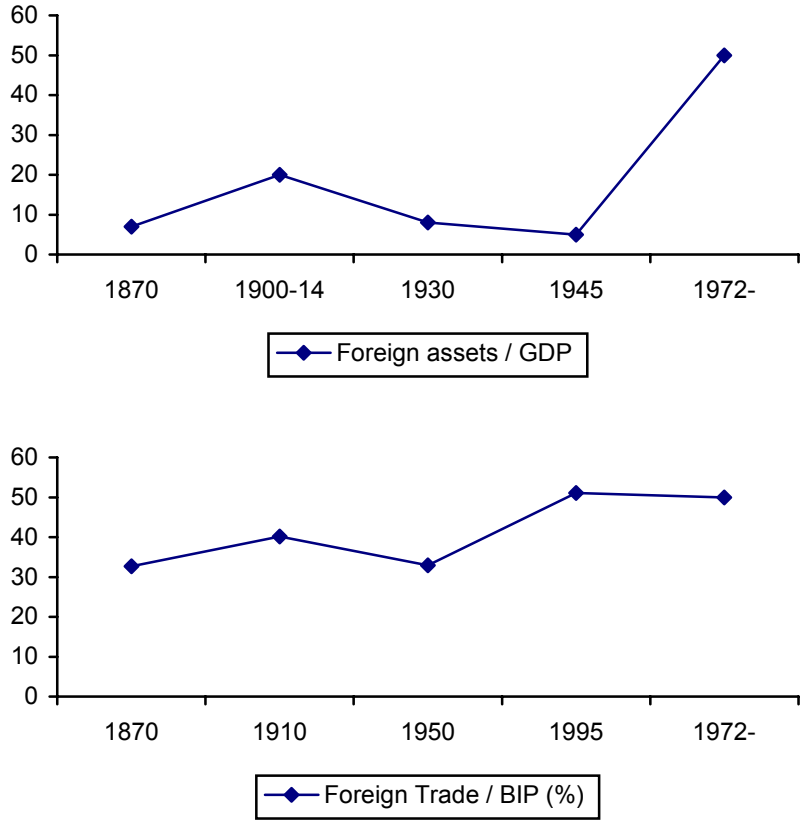
11 Similarly, migration between rich and poor countries is relatively small now while it used to be important during the early globalization wave.

Graph 4 — Financial and Goods Market Integration



Source: Obstfeld/Taylor(2002), Baldwin/Martin (1999)

When studying the link between financial openness, financial development, and, eventually, business cycle volatility, the issue of causality arises. Greater financial development could, for instance, induce governments to open up the financial account of the balance of payments because domestic financial intermediaries are in a better position to compete against foreign entrants. However, the reversed causality is conceivable as well since greater exposure to foreign competition might induce the need to reform the domestic financial system.[12] Also, while most theoretical models stress causality running from financial openness towards business cycle volatility (see Section 3.2), the reversed causality is possible as well. Countries experiencing large idiosyncratic shocks have greater incentives to open up for foreign capital in order to be able to diversify country-specific shocks.

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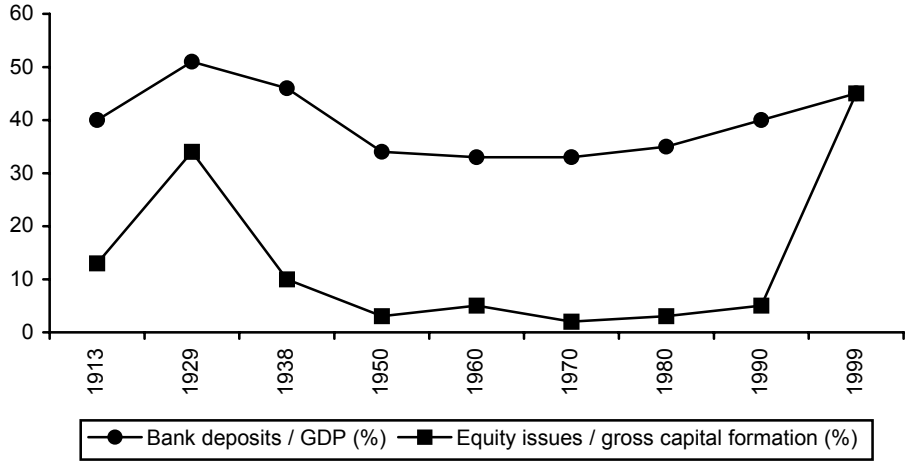
12 For empirical evidence that supports this direction of causality see Kaminsky and Schmukler (2001).

Graph 5 — Financial Market Development



Source: Rajan and Zingales (2001).

With regard to factors driving financial openness, Obstfeld and Taylor (2002) argue that economic policy choices have been important. They stress the importance of the classical macroeconomic trilemma in explaining the choice of the exchange rate regime, monetary policy, and capital account regimes. Their central argument is that capital mobility has tended to increase in times when there was a relatively wide-spread consensus in favor of subordinating monetary policy to an exchange rate regime (Gold Standard) or for a monetary policy regime geared towards domestic objectives at the expense of exchange rate stability (recent float). Their line of reasoning suggests a causal relationship running from changes in the economic policy stance to financial openness. Restrictions that were imposed on the international movement of goods and capital in the 1920s and 1930s, in turn, seem to have caused greater macro-economic volatility because the ability to spread risk was restricted (Basu and Taylor 1999). According to this view, causality would run from regulatory change to financial openness and then to business cycle volatility. The crucial question is, of course, whether the closing-down of international markets can be considered as exogenous to these processes or whether international disintegration was a result of the adverse shocks hitting the world economy in the 1920s.

The issue of causality between financial development and openness has been addressed by Rajan and Zingales (2001). They argue that, historically, changes in openness with regard to finance and trade seem to have affected the degree of financial development. Their argument runs as follows. Suppose that an exogenous shock such as the Great Depression hits an economy. As a short-run remedy, this may induce policy-makers to erect barriers both with regard to trade

and capital flows. Behind this curtain, the domestic financial system can be more tightly regulated. Hence: *The waning and waxing of financial markets over time can be broadly attributed to the world shutting down (when it went off the Gold Standard) and then re-opening up (after the breakdown of Bretton Woods) to cross-border capital flows.* (Rajan and Zingales 2001, p. 34). Their empirical results support the idea that openness reduces incumbents' incentives and/or ability to restrict entry.

At the risk of oversimplifying, this section has shown that

- Business cycle volatility in OECD countries has tended to decline in recent decades.
- Exchange rate volatility has increased after the fall of the Bretton Woods system. Volatility of interest rates has increased.
- In Europe, cross-country correlations of business cycles have increased over time. No clear trend is visible for the OECD as a whole though.
- Financial and goods markets have become more integrated.
- Financial development has increased.

3 Business Cycle Volatility in Open Economies — Theoretical Explanations

This section reviews the theoretical literature on the impact of globalization on the volatility of business cycles. Three groups of models are distinguished. First, the arguments of traditional neo-classical and Keynesian models of open economies are reviewed. Second, the implications of the so-called new-Keynesian open economy macro-models in the tradition of Obstfeld and Rogoff (1995, 1996) are summarized. Third, models that stress the importance of financial market distortions for business cycle volatility are discussed.

3.1 Traditional Models

In a neo-classical world without financial market frictions, savings and investment decisions are independent from each other. Investment decisions are made to equalize rates of return across countries. Households use their savings to

smoothen consumption over time.[13] The absence of frictions has two implications for the impact of financial openness on the correlations and the volatility of macroeconomic aggregates: First, the volatility of consumption *relative to output* should decline as the degree of capital mobility increases. Second, the volatility of investment should increase as the degree of capital mobility increases.

However, the clear predictions of the neo-classical model break down if more realistic assumptions are made. Using an intertemporal equilibrium model for a small open economy, Mendoza (1994) shows that structural characteristics of countries may affect the impact of openness on volatility. The model differs from a standard neo-classical model in that countries may vary in their degree of risk aversion, in that the supply of labor might be more or less flexible, and in that productivity shocks may differ in their size or persistence.

In Mendoza (1994), three different assumptions are made concerning the capital account regime. In a first scenario, capital is considered perfectly mobile and agents can accumulate net foreign assets according to their optimization conditions. In a second scenario of limited capital mobility, net foreign assets are restricted between some lower and upper limits but these limits are not necessarily binding. Within these boundaries, net foreign assets evolve according to the free capital mobility condition. Third, it is assumed that a regime of strict capital controls prevails in which the limits are always binding.

Mendoza uses the model to simulate the impact of productivity or terms of trade shocks on different macroeconomic aggregates under different assumptions on capital mobility. The key point of his analysis is that, unless the strict separation of savings and investment is assumed, there is no direct link between output volatility and the degree of openness. Consumption (investment) volatility, however, always declines (increases) as financial markets become more integrated.

Razin and Rose (1994) use a neo-classical framework to analyze the link between openness and volatility by distinguish the effects of idiosyncratic from global shocks in integrated markets. Results are derived for a small open economy which experiences productivity shocks. Increased capital mobility has the greatest impact on the volatility of investment if shocks are permanent and country-specific. Transitory shocks, in contrast, have a small impact on the present value of future profits and thus a small impact on investment decisions. Global

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13 Note that consumption smoothing refers to the transfer of a unit of the consumption good from one date to another while risk-pooling implies the transfer of consumption from one state of nature to the other (Baxter 1995).

shocks raise both the interest rate and the marginal productivity of capital, and the net effect is ambiguous. A country-specific shock, in contrast, would not affect the world interest rate. With regard to consumption, increased capital mobility allows for a better smoothing of consumption, and volatility goes down. This is shown for the case of transitory, country-specific shocks.

The work by Razin and Rose (1994) also suggests that increased integration of goods markets should – in the presence of idiosyncratic shocks – increase output volatility because the specialization of production increases. Empirical evidence on this prediction of standard trade theory is scarce however. First, there is very little empirical work that directly tests the implications of theoretical models of international comparative advantages (Harrigan 2001). One main problem for empirical research is that one needs to find a situation in which autarky prices applied in order to compute the effects of integration. Second, there are other theories of international trade featuring, for instance, monopolistic competition, that have predictions on the pattern of international specialization which do not imply necessarily specialization into different industries. If trade is mainly in the form of two-way, intra-industry trade, countries may be hit by similar shocks, and business cycle co-movements might actually increase as trade links intensify.

While the neo-classical model focuses on the effects of productivity shocks for volatility, the Mundell-Fleming model has traditionally been used to study the effects of policy shocks. Generally, the effects of monetary and fiscal shocks on business cycle volatility depend on the exchange rate regime and on the degree of capital mobility. Under flexible exchange rates and full capital mobility, an increase in money supply lowers interest rates, triggers capital exports and a devaluation of the domestic currency. The resulting increase in demand has a positive effect on output. In the long-run, adjustments of nominal prices would counteract this effect. In this setting, fiscal policy has only modest output effects because of the appreciation of the domestic currency that it induces and the resulting negative demand effect. Conversely, under fixed exchange rates and capital mobility, monetary policy is ineffective since the fall in interest rates following an expansionary monetary impulse triggers a loss in foreign currency reserves. The reverse holds true for fiscal policy.

Incomplete mobility of capital would leave the main qualitative results unchanged while it would enhance the effectiveness of monetary (fiscal) policy under fixed (flexible) exchange rates. In this model, the impact of openness on

the volatility of consumption is qualitatively the same as for output since consumption is a function of output.

3.2 Financial Openness and Volatility: The 'New Open Economy Macroeconomics' Perspective

New open-economy macroeconomic models have become a popular way of analyzing international policy issues (Obstfeld and Rogoff 1995, 1996). One major advantage of these models is that they explicitly model the micro-foundations of open economy macro-models. The baseline model differs from the traditional Mundell-Fleming in a couple of regards:

All agents act under perfect foresight. Households derive their optimal consumption path, asset holdings, and labor supply. Hence, although there is no capital in the baseline model, output is not exogenous but rather depends on the leisure-labor-decision of households. Firms, which are owned by households, use labor inputs to produce differentiated goods which affords them with monopoly power. In the short-run, prices are fixed, and output is demand-determined. In the long-run, prices adjust though.

The baseline model furthermore assumes that purchasing power parity and the law of one price hold: although prices may diverge from marginal costs, there are no restrictions to arbitrage across markets. Also, there are no frictions on international financial markets: agents can hold foreign and domestic bonds at no costs. Changes in net wealth of households have an impact on the labor-leisure-choice and thus affect output also in the long-run. Money markets are fully segmented, and only domestic (foreign) agents hold domestic (foreign) money.

In contrast to the predictions of the Mundell-Fleming model, fiscal policy is effective under flexible exchange rates and full capital mobility. This result is driven by changes in the relative levels of consumption at home and abroad. These changes are driven by the consumption smoothing properties of the model and trigger a devaluation of the domestic currency and an expansion of domestic output. However, whereas the implications of the Obstfeld-Rogoff framework for the impact of fiscal shocks on the *level* of output differ, implications for the *volatility* of output are similar: volatility declines as financial markets become more open.

Consumption smoothing also implies that predictions for the volatility of consumption differ from those for output since, in the Obstfeld-Rogoff model, more

open financial markets always induce greater consumption smoothing and thus a decline in volatility.

The baseline new open macro-model has been extended in several respects.[14] Some of the recent contributions to this literature have also introduced incomplete integration of markets. Sutherland (1996) introduces costs of trading international bonds, which drive a wedge between domestic and foreign interest rates.[15] The model is used to analyze the effects of asymmetric shocks on volatility.[16]

3.2.1 Financial Market Integration

Links between financial integration and volatility can be analyzed by studying the effects of monetary and fiscal shocks on output and consumption.

A rise in money supply has a real balance effect since prices are sticky. International financial markets provide households with the opportunity to smoothen consumption. Consequently, consumption at home increases instantaneously to its new steady state level, and domestic households accumulate foreign assets. With perfectly integrated international bond markets, domestic and foreign bonds are perfect substitutes. The international interest rate differential is zero, implying that the nominal exchange rate depreciates instantaneously to its new steady state value.

Nominal price stickiness implies a real devaluation, and the consumption-switching effect leads to a rise in domestic output. Domestic consumption demand is further stimulated by the decline in the domestic real interest rate. Demand-determined output at home increases. Developments abroad are a mirror-image of these processes.

In the long-run, as output prices have adjusted, output declines. However, since domestic households have accumulated more wealth, they lower their labor inputs and consume less. This wealth effect can explain why output does not fully return to its old steady-state level but remains slightly below this level.

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14 For surveys see Lane (2001) and Sarno (2001).

15 In Sutherland (1996) or Senay (1998), the trading frictions between national financial markets depend upon the volume of cross-border capital movements per period of time (i.e. capital flows). Recently, this assumption has been relaxed by Benigno (2001). In his two-country model, intermediation costs are an increasing function of the real holdings of net foreign assets (i.e. capital stocks).

16 While uncorrelated shocks would have essentially the same qualitative implications on the link between openness and volatility, perfectly correlated global shocks would imply that openness and volatility are unrelated.

Under imperfect capital mobility, domestic and foreign interest rates can diverge, and the domestic interest rate falls. This has two effects on the behavior of households. First, they increase consumption and this enforces the real balance effect. Hence, the increase in consumption is larger than under perfect capital mobility. Second, households accumulate foreign assets but by less than under full capital mobility because the accumulation of foreign assets is costly. Combining these effects, the nominal exchange rate still depreciates but by less than under full capital mobility.

Overall, the immediate real depreciation of the domestic currency is thus larger in the model with perfectly integrated capital markets than in the model with imperfectly integrated markets (Table 2). Hence, output volatility is lower in the model with imperfectly integrated financial markets.

Generally, the development of the current account in these models closely tracks the development of consumption since consumers use changes in their foreign assets position to smoothen consumption. In the case of an increases in the money stock, net foreign assets are build up which allows consumers to distribute higher consumption levels across time. This increase in net foreign assets corresponds to a current account surplus. The surplus shrinks over time as consumption gradually declines to the long-run steady state level.

Table 2 — Business Cycle Volatility and Financial Integration

Capital Mobility	Consumption	Nominal Exchange Rate	Real Exchange Rate	Domestic interest Rate	Output	Foreign Assets
			Monetary Policy			
Complete	↑	↑↑	↑↑	0	↑↑	↑
Incomplete	↑↑	↑	↑	↓	↑	↑↑
			Fiscal Policy			
Complete	↓	↑	↑	0	↑	↓
Incomplete	↓↓	↑↑	↑↑	↑	↑↑	↓↓

Source: Adopted from Sutherland (1996).

In the presence of fiscal shocks, i.e. of an increase in government spending financed by an increase in taxes, financial integration stabilizes all variables.

Under perfect capital mobility, an increase in government expenditure lowers consumption and the demand for foreign assets. The decline in domestic relative to foreign consumption induces a depreciation of the domestic currency with qualitatively the same implications for the real exchange rate and output as a monetary shock. However, the change in the exchange rate is driven entirely by the change in relative consumption levels.

Under imperfect capital mobility, domestic interest rates increase, thus causing an even larger decline in domestic consumption and a lower accumulation of foreign assets. The result is a larger depreciation of the domestic currency.

Because the exchange rate depreciates by more than in the model with integrated financial markets, the change in output is larger because of the larger expenditure switching effect. The change in consumption is larger as well because of the impact of changes in interest rates on the savings-consumption decision. In the long-run, the decline in wealth of households induces an increase in labor supply to keep up consumption.

3.2.2 Goods Market Integration

Senay (1998) combines the assumption of incomplete integration of financial markets with pricing-to-market behavior and thus imperfect integration of goods markets (Table 3).[17] She shows that the implications of integration in one market for the propagation of shocks are largely independent of the extent of integration in the other market (Table 3).

The main mechanism behind this result is that pricing-to-market shields consumers from movements of exchange rates. The expenditure-switching effect underlying the dynamics of the Sutherland model is mitigated. Pricing-to-market also implies that the purchasing-power-parity does not hold anymore and that real interest rates can diverge.

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17 Tille (2000) also analyzes the interaction between financial and goods market integration. In his model, countries differ with regard to the volatility of monetary policy shocks. In this case, financial integration is not universally beneficial. Rather, countries with more volatile shocks will experience welfare gains from integration while those with relatively moderate shocks will loose.

Table 3 — Interaction Between Financial and Goods Market Integration

	Monetary shock		Fiscal shock	
	Consumption	Output	Consumption	Output
	Financial market integration			
Goods market integration				
Imperfect	–	+	–	–
Perfect	–	–	–	–
	Goods market integration			
Financial integration				
Imperfect	–	+	+	+
Perfect	–	+	+	+

Source: Adopted from Senay (1998).

The change in output volatility as financial markets integrate following a monetary shock depends on the degree of goods market integration. With pricing-to-market, the expenditure-switching effect of nominal exchange rate changes is switched off. Hence, the effect of domestic consumption dominates he domestic output effect. Also, with pricing-to-market, the financial flows resulting from monetary shocks are small, and the degree of financial market integration becomes relatively unimportant.

To summarize, the implications of the models by Sutherland (1996) and Senay (1998) are that financial integration leads to lower short-run volatility due to demand shocks. The effects of monetary shocks, in contrast, differ. Under financial integration, monetary shocks cause larger volatility of the nominal exchange rate and of output but lower volatility of interest rates and consumption. The integration of goods markets tends to increase volatility because the expenditure-switching effect of real exchange rate changes is at work. The exception is the impact of monetary shocks on the volatility of consumption. In this case, the depreciation of the real exchange rate dampens the increase in consumption working through the real balance effect.

3.3 Financial Development and Volatility

One key insight of the international finance literature in recent years has been that financial market imperfections that take the form of asymmetries in information can help to explain the structure of international capital flows (Brennan and Aranda 1999, Neumann 1999, Razin et al. 1998). Also, there is an increasing body of empirical evidence showing the importance of information costs in explaining the behavior of participants in international financial market (Choe et al. 1999 and 2001, Frankel and Schmukler 1996, Kim and Wei 1999).

These insights have potentially important implications for the link between financial markets and business cycle volatility. This is because imperfectly informed agents might be prone to herding and because international capital flows might magnify distortions in domestic financial markets. Yet, while there are recent papers arguing that, due to financial market imperfections, globalization might increase the volatility of financial markets (Chari and Kehoe 1997, Calvo and Mendoza 1999, Bacchetta and van Wincoop 1998), these papers do not derive implications for macro-economic volatility. This aspect has been stressed in recent papers that analyze the impact of financial market frictions for output volatility.

Using a closed-economy setting, Bernanke, Gertler, and Gilchrist (2000), Bernanke and Gertler (1999), and Bacchetta and Caminal (2000) analyze the impact of asymmetric information on financial markets for output volatility. One central element of these models is the so-called 'financial accelerator'.[18] The idea behind this 'financial accelerator' is that, due to asymmetries in information, the net worth of firms influences the costs of external finance firms have to pay.[19] If net worth is pro-cyclical, the external finance premium would be counter-cyclical, thus potentially enhancing business cycle fluctuations.

In an international framework, links between financial market imperfections and macro-economic volatility have been studied by Aghion, Bacchetta, and Banerjee (1999). In their model, domestic financial market frictions imply that the financing costs of firms are a function of their net worth. Apart from capital, firms use a fixed factor in their production. A positive shock thus stimulates production through the net worth effect but may eventually also raise the relative

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18 Domestic financial market frictions in the form of a 'financial accelerator' have been build into new open economy macro-models as well (Faia 2001, Cespedes et al. 2001).

19 Generally, this branch of the literature departs from the Modigliani-Miller assumption on the irrelevance of the financial structure for the real economy.

price of the fixed factor. This real appreciation of the domestic currency lowers the net worth. Through the interplay between wealth and price effects, the model generates business cycle fluctuations.

The model distinguishes international bank lenders and foreign direct investors. While lenders are imperfectly informed about foreign investment opportunities, foreign direct investors are not. Hence, foreign direct investment is less destabilizing in this model than bank lending. Moreover, financial opening has the potential to magnify domestic shocks, and the relationship between openness and volatility is non-linear.

3.4 Economic Development and Volatility

Kouparitsas (1996) analyzes the implications of increased trade and capital flows in a framework that distinguishes developed from developing countries. In his real business cycle model, trade between the North and the South is asymmetric. Although both the North and the South trade in primary goods and in manufactured products, the importance of these items differs for the two regions. The North mainly imports primary products from the South and uses these in the production of manufactured goods which are exported to the South. Production of manufactured goods has a low elasticity of substitution between inputs in the short-run.

In the absence of financial markets, business cycles in the South are highly correlated with economic activity in the North. The terms of trade and the income of the South improve following a positive productivity shock in the North. This stimulates consumption in the South and the demand for manufactured goods imported from the North. The implications of this framework are that output and expenditures in the North and the South are strongly correlated, and that the terms of trade of the South are highly volatile.

Financial market integration allows agents to better pool risks. Hence, wealth is less dependent on fluctuations in domestic activity and is increasingly correlated with foreign activity. The volatility of consumption is likely to decline following financial integration, and the correlation between domestic and foreign consumption should increase.

However, the magnitude of these effects differ for the North and the South. Due to its size, the North experiences relatively small effects of increased integration of financial markets. In the smaller South, business cycle volatility significantly declines following financial integration.

For empirical work, this model holds the implications that business cycle volatility should be higher for smaller and/or less-developed countries but that greater integration of financial markets should lower volatility in these countries. Work by Crucini (1997) yields a similar conclusion. He shows that, ceteris paribus, the volatility of macroeconomic aggregates is larger in smaller countries, irrespective of their state of development. His theoretical model allows for no other source of heterogeneity of countries. The intuition behind this result is that changes in the relative productivity of smaller countries will trigger capital inflows that are relatively large (small) for the small (large) economy. Hence, the resulting changes in output and investment are likewise large (small).

4 Business Cycle Volatility in Open Economies — Empirical Evidence

The empirical literature on the sources of business cycle fluctuations in open economies falls into two main groups. A first set of papers uses a narrative approach to discuss mainly the implications of economic policy on volatility. A second group of papers has used more systematic empirical, regression-based techniques to explore the openness of markets as a determinant of volatility both across time and across countries.

4.1 The Role of Economic Policy

Prima facie, the relatively similar patterns of business cycle volatility in the period of the Gold Standard and in recent decades raises the issue whether the causes of business cycle fluctuations have also remained similar. This conclusion might be supported by the observation that, in terms of financial sector openness and financial sector development, the two episodes also look relatively similar. Yet, this interpretation neglects the substantially changed role macroeconomic policy has played in the two decades

Romer (1999) argues that governments seem to have improved their ability to cushion exogenous shocks but that some business cycle fluctuations are also due to activist government policy. However, empirical evidence presented by Dalsgaard et al. (2002) would partly contradict this line of reasoning. To measure the impact of fiscal policy on business cycles, the authors distinguish automatic stabilizers and discretionary fiscal changes. They find that the combined effects from these two policies seem to have contributed to dampening the cycle

in most OECD countries. Also, Bergman et al. (1998) cite improved macroeconomic management as one cause of reduced business cycle volatility.

For the U.S., the role of monetary policy for the reduction in output volatility has been analyzed in more detail by Stock and Watson (2002). They find evidence that the inflation and output coefficients in Taylor-type monetary policy rules for short-term interest rates have increased. This should lead to a greater volatility in interest rates, as is in fact found in the data. In their own work, Stock and Watson (2002) find a negative coefficient for the real interest rate which has tended to increase in absolute terms over time. Overall, they conclude that *the majority in the reduction in variability in output is attributed to the reduced variability in shocks, and not to changes in the monetary policy coefficients. More precisely, these results suggest that 14% of the decrease in variance in output is associated with changes in the monetary policy coefficients* (Stock and Watson 2002: p. 19).

4.2 Other Explanations

Sectors differ with regard to the volatility of output. The services sector, for instance, is typically considered more stable than other sectors, and structural change favoring services might therefore explain the reduction in volatility across countries (Bergman et al. 1998). However, for the case of the United States, Stock and Watson (2002) dismiss this interpretation. Although they find that the services sector has been less volatile than other sectors, this does not explain much of the decline in volatility across all macroeconomic aggregates. Also, Blanchard and Simon (2001) argue that the decline in volatility that could be observed recently in the U.S. and in some other OECD countries cannot be attributed to the 'New Economy' but is rather part of a longer term trend which started in the 1960s and has been interrupted in the 1970s and early 1980s.

As an alternative explanation, Stock and Watson (2002) look into changes in the volatility of different shocks, comparing the period before 1984 to subsequent years. They find that the variability of monetary shocks, of government spending and tax shocks, of productivity shocks, and of commodity price shocks other than oil have declined. Oil price shocks have remained virtually unchanged. These results suggest that the decline in volatility is mainly due to an improved external environment.

Anecdotal evidence presented in Dalsgaard et al. (2002) supports a positive correlation between increased importance of international trade and a decline in

business cycle fluctuations. Bergman et al. (1998) argue that lower real sector volatility might be due to a greater international diversification of countries (and thus reduced exposure to common shocks).

4.3 The Impact of the Financial System

While earlier work on the determinants of business cycle volatility has focused on the impact of monetary, fiscal, and productivity shocks, the recent literature has shifted attention to the role of the financial system.

Stylized facts suggest that openness and volatility are linked. Basu and Taylor (1999, p. 22) argue that "It seems likely that an open capital market should lead to more volatile investment, thanks to an inflow and outflow of capital, and less volatile consumption, because of greater possibilities to smoothen consumption. By definition, it will also lead to a more volatile current account".

Establishing the link between openness and volatility more systematically has been more difficult though (see also Table 4). In fact, most studies fail to find evidence that this link actually exists. Easterly et al. (2000) find that trade and financial openness have different implications for the volatility of output: while greater openness for trade seems to *increase* volatility, the magnitude and the volatility of private capital flows do not seem to have a statistically significant impact on business cycle volatility. Similarly, Razin and Rose (1994) are unable to find a link between the volatility of consumption, investment, or output and proxies of financial openness.

One reason for the missing link between openness and volatility could be that this relationship has changed. Buch et al. (2002) use a panel dataset for OECD countries for the past 40 years but find no consistent link between openness and business cycle volatility for the entire period. Estimates for individual decades show that the sources of business cycle fluctuations seem to have changed over time. The evidence that monetary and fiscal shocks have been the sources of business cycle fluctuations in the 1980s and 1990s is relatively strong while there is no consistent pattern in the 1970s.

Table 4 — Previous Empirical Results

Authors	Methodology	Results
Razin and Rose (1994)	OLS and IV regressions 138 countries 1950-1988 dependent variable: standard deviations of de-trended consumption, investment, and output data	Distinguish between transitory and persistent and common versus idiosyncratic shocks. Different measures for the openness of the current and the capital account of the balance of payments have no impact on volatility. Inability to distinguish idiosyncratic from common shocks as a possible explanation.
Ceccetti and Krause (2001)	OLS regressions 23 OECD countries 2 periods (1982-89, 1990-97) dependent variable: macroeconomic performance as a weighted sum of output and inflation variability	Reductions in inflation and in output volatility are due to reduced state-ownership of banks and the introduction of explicit deposit insurance systems.
Denizer, Iyigun, and Owen (2000)	Quasi-panel, OLS regression 70 countries annual data 1956-1998 (divided into 4 time periods) dependent variable: standard deviation of real per capita income, investment, or income growth	Countries with more developed financial systems experience smaller fluctuations in real per capita output, consumption, and investment growth.
Easterly, Islam, and Stiglitz (2000)	Panel OLS regression 60-74 countries 2 periods (1960-78, 1979-97) dependent variable: growth volatility (standard deviation of the per capita growth rate)	Developing country dummy, trade share over GDP, and standard deviation of M1 growth have a positive impact on volatility. Non-linear effect of the ratio of private sector credit over GDP: level enters with a negative, squared term with a positive coefficient. Magnitude of private capital flows has no significant impact. Trade openness enhances economic growth and higher growth reduces volatility. However, trade openness also contributes to volatility in per capita GDP growth. Wage rigidities are not important in explaining volatility.
Karras and Song (1996)	Cross-Country regression 21 OECD countries dependent variable: growth volatility (standard deviation of the growth rate)	Volatility of money supply represents the monetarist interpretation of the cycle, volatility of investment demand and government spending is attributed to Keynesian explanations of business cycles. Variation of total factor productivity as a measure of supply side shocks to represent the real business cycle school. Business cycles are shown to be a combination of monetary, spending, and real shocks.

Evidence for a link between the structure of financial markets and output volatility seems to be more robust. Easterly et al. (2000) find a more sophisti-

cated, i.e. ‘deeper’ financial system to be associated with lower macroeconomic volatility, and this relationship seems to be non-linear. Cecchetti and Krause (2001) attribute the empirically observed decline in inflation and output volatility to financial deregulation, i.e. to a reduction of state-ownership in banking and the introduction of explicit deposit insurance systems. This result would be consistent with Romer (1999) who argues that the introduction of deposit insurance in the U.S. had helped to increase confidence and has lowered the risk of financial crises. She argues that financial crises have been widespread before the Great Depression but almost non-existent after the war.

Denizer et al. (2000) model the volatility of the change in per capita income, investment, and consumption as a function of a set of variables representing financial development and a set of control variables. The latter variables include the growth rate of the respective time series as well as variables representing the course of important political decisions, and the degree of (trade) openness of the country. The main result of this exercise is that business cycle volatility depends indeed in part on the magnitude and the structure of the financial sector of the economy. Likewise, da Silva (2001) finds that business cycles are less volatile in countries with developed financial systems.

Table 5 provides estimation results for a cross-section of up to 77 developing and OECD countries which partly supports the findings of the earlier literature. The Table shows that the volatility of interest rates and of real government spending increase business cycle volatility. Also, volatility tends to be higher in less developed countries but this effect is not always significant. While the link between financial openness and development, on the one hand, and business cycle volatility, on the other hand, has not been very robust, an increased volume and concentration of trade seems to increase business cycle volatility.

Table 5 — Determinants of Business Cycle Volatility

The dependent variable is the standard deviation of real GDP growth in the 1990s. The volatility of government consumption is the standard deviation of the growth in real government consumption. The volatility of interest rates is the coefficient of variation of nominal lending rates. Capital controls = dummy set equal to one if country has capital controls on cross-border financial credits, i.e. greater openness implies a decline in the variable. *** (**, *) = significant at the 1 (5, 10) percent level. Robust t-statistics in brackets.

	(1) Baseline	(2) Including capital controls	(3) Including trade	(4) Including financial market development
Constant	4.50** (2.14)	4.58* (1.85)	3.55* (1.80)	6.45*** (3.16)
Volatility of lending rates	1.91** (2.15)	1.88** (2.09)	1.78* (1.95)	1.91** (2.11)
Volatility of government spending	0.16** (1.94)	0.16* (1.79)	0.17*** (2.84)	0.06 (0.97)
log (GDP per capita)	–0.28 (–1.42)	–0.29 (–1.24)	–0.28 (–1.48)	–0.47** (–2.34)
Capital controls		0.09 (0.12)		
Stock market capitalization * capital controls				0.01** (2.01)
Trade / GDP			0.01* (1.64)	
Trade concentration			0.03** (2.00)	
R^2	0.29	0.28	0.41	0.21
N	77	74	73	70

5 Summary

In the past decades, business cycle volatility has declined, and this trend has been relatively uniform across all macroeconomic aggregates. Financial market and exchange rate volatility, in contrast, have tended to increase. These trends are evident in longer-term data for OECD countries. In developed countries and emerging markets, business cycle volatility is typically higher than in OECD countries, but the data are usually too short to track developments over time. Moreover, financial markets have become more developed and more open. This paper has reviewed different empirical and theoretical models aimed at explaining these patterns in the data.

Generally, the finding that exchange rate volatility has increased in parallel to increasing financial integration would be consistent with predictions of theoretical models (Fleming 1962, Mundell 1963, Sutherland 1996). However, the general decline in business cycle volatility is more difficult to square with these models. Rather, the link between openness and volatility would be expected to depend on the type of shock and the type of macroeconomic aggregate considered.

The observation that the volatility of *all* macroeconomic aggregates (output, consumption, investment) has declined in parallel warrants an alternative explanation. Of reason could simply be ‘good luck’, i.e. more favorable shocks that have occurred in the 1990s. Evidence presented in Stock and Watson (2002) for the U.S. in fact supports that the variability of shocks has declined since the 1980s. However, if one looks at more structural arguments why business cycle volatility might have declined, there are two potential candidates.

The first candidate is the enhanced development of financial markets. In more developed markets, consumption volatility would decline due to better consumption smoothing possibilities. Also, output and investment volatility could be expected to decline because of the more limited role played by financial frictions. Empirical studies on the link between globalization, financial market development, and business cycle volatility do indeed find greater evidence for a dampening impact of financial development on volatility.

The second candidate explaining the general decline in business cycle volatility is the greater effectiveness of macro-economic policies. Monetary policy, in particular, has become more effective after the abolition of capital controls and

the adoption of more flexible exchange rate systems. Stock and Watson (2002) in fact show that greater effectiveness of monetary policy can help to explain the reduction in output volatility. Since they analyze the case of the U.S. and thus of a fairly large, closed economy, their concern is not much on external developments and the impact of globalization. Indirectly, however, the greater effectiveness of monetary policy that recent studies find could be traced to the increased openness of countries and the greater flexibility of exchange rate regimes.

Additional empirical evidence is needed though to test these hypotheses. This requires, most importantly, that time series evidence for a larger number of countries is used to identify unexpected and expected (monetary) policy shocks. Moreover, empirical research should aim at a better understanding of the factors determining the volatility of different macroeconomic aggregates.

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