Financial Integration and Business Cycle Synchronization*

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Abstract

We investigate the causal effect of financial integration on the degree of business cycle synchronization by utilizing a confidential database on banks' international bilateral exposure over the past three decades. Financial integration is associated with less synchronized output cycles, in line with most of the theories of output fluctuations. To establish causality, we construct a measure of "predicted integration" using exogenous variation in legislative-regulatory financial harmonization policies of the European Union and use this measure in an instrumental variables framework. Our results contrast with those of the previous empirical studies. We reconcile the different results by showing that the earlier estimates suffer from the standard identification problem.

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1 Introduction

In the midst of the biggest economic turmoil since the great depression, many argue that financial linkages has been a catalyst for the transmission of the 2007–2008 crisis from the U.S. to the rest of the world. However even before this crisis we did not have a good understanding of how financial integration works as a transmission mechanism. Although the standard models imply a negative relation between financial integration and the synchronization of output cycles, there are also models that predict a positive association. Unfortunately, the existing empirical literature does not help us to differentiate among these models.

Over the past decades cross-border financial integration has increased significantly (e.g. Lane and Milesi-Ferretti (2004, 2007)), while at the same time international business cycles have become more alike as shown in Figures 1 and 2.[1] Does this mean financial integration leads to more synchronized business cycles? A mechanical interpretation will certainly imply so. However the co-evolution of cross-country output correlations and cross-border financial linkages can result from a third factor, such as trade, which also has increased during this period of globalization. Alternatively, the researcher might observe that on average over time certain countries output move together and these countries also seem to be more financially integrated, leading to conclude a positive association between the two. Once again, these countries might have similar cultures or political ties that render them more integrated and make their output more correlated.

We account for this standard identification problem and show the causal negative effect of financial integration on international output co-movements. We achieve this objective by advancing on two fronts over the existing literature. First and foremost we utilize a unique, confidential, and so far unexploited database from the Bank of International Settlements (BIS) that reports bilateral cross-country bank assets and liabilities (stocks and flows) over the period 1978–2007 for twenty developed countries. The extensive time dimension of our data and our focus on a homogeneous group of advanced economies over a period of no major financial turmoil, allows us to account for most of the unobserved heterogeneity that may lead to spurious inference. We document that conditional on global shocks and country-pair time-invariant characteristics, which may affect both business cycle co-movement and financial integration, increasing financial integration is associated

[1] See among others, Kose, Otrok, and Prasad (2008), Otto, Voss, and Willard (2001), and Rose (2009), who argue that international business cycles became more alike. Heatcote and Perri (2003), on the other hand, document a decline in the U.S.-rest of the world output correlations after 1986, where "rest of the world" is defined as Europe, Japan, and Canada. Doyle and Faust (2005), employing a structural break analysis, find neither an increase nor a decrease in the co-movement of output for the G7 countries since 1980s.

with less synchronized, more divergent, output fluctuations.

Second, we construct a measure of "predicted integration", using exogenous variation in the transposition dates of the legislative harmonization policies in financial services of the EU and show that this predicted integration by financial laws causes less synchronized output cycles. There has been no paper to our knowledge that estimates bilateral time-varying instrumental-variable (IV) specifications for financial (or trade) integration. We estimate such models in an effort to account for reverse causation. Building on our parallel work on the effects of the European Union (EU) and the associated financial sector reforms on banking integration (Kalemli-Ozcan, Papaioannou, and Peydró (2009)), we use as an excludable instrument a bilateral time-varying index that measures the degree of legislative-regulatory harmonization policies in financial services among EU countries. This identification strategy is theoretically appealing as it links reforms in financial intermediation with outcomes in the same sector and in turn to output synchronization. The exogeneity assumption for instrument validity is plausible, because policy changes are unilateral (at the country-level), while the outcome we study (integration) is bilateral. The exclusivity assumption is also reasonable as harmonization policies in financial services should primarily affect business cycle patterns through financial integration. Our first stage shows a strong positive relationship between financial harmonization policies and banking integration between country-pairs. The second stage estimates reveal that the component of financial integration predicted by legislative harmonization policies in the financial sector makes business cycles less alike.

Our results are in support of the standard international business cycle theories that in the absence of major financial shocks, financial integration should magnify the effect of total-factor-productivity shocks and make output patterns diverge. In the canonical two-country general equilibrium model of Backus, Kehoe, and Kydland (1992) with complete financial markets, the country hit by a positive productivity shock experiences an increase in the marginal product of capital and labor, workers substitute leisure for labor, and the country receives capital on net—a mechanism that leads to negative output correlations between the two countries (see also Heathcote and Perri (2004a) for a multi-country model). Obstfeld (1994) formalizes another mechanism that also yields a negative effect of financial integration and business cycle synchronization. In his model financial integration shifts investment towards risky projects, enabling countries to specialize according to their comparative advantage, which in turn implies that output growth among financially integrated countries should be negatively correlated.[2] There might also be the case, where the negative

[2]Kalemli-Ozcan, Sørensen, and Yosha (2003) using regional-level data show that financial integration causes higher industrial specialization. Imbs (2004) and Kalemli-Ozcan, Sørensen, and Yosha (2001) using country-level data further

association between financial integration and business cycle synchronization is explained by reverse causality. Financial linkages among dissimilar economies might be higher, because international diversification benefits become larger when shocks (and thus returns) are less correlated across countries. For example, in the Heathcote and Perri (2004b) model less correlated cycles lead to an increase in the equilibrium level of financial integration, which in turn further reduces the correlation of the business cycles.

Alternatively, some models introduce financial frictions that may mitigate the effects of the standard TFP shocks (e.g. Calvo and Mendoza (2001); Perri and Quadrini (2009); Mendoza and Quadrini (2009), Devereux (2009)). Both demand and TFP shocks can be operative in these type of settings. Negative shocks to capital or frictions to financial intermediation arising from asymmetric information and moral hazard can generate contagion and thus make business cycles among integrated economies more similar. This is because in response to a negative financial shock foreign investors will withdraw capital from other markets. Corporate finance theories focusing specifically on banking integration yield an ambiguous sign on the correlation coefficient between integration and synchronization. Morgan, Rime, and Strahan (2004) extend the banking model of Holmstrom and Tirole (1997) to a multi-economy setting and show that the impact of banking integration on output co-movement depends on whether bank supply (financial) or bank demand/collateral (TFP) shocks dominate. On the one hand a negative productivity shock will lead to capital withdrawals and thus output differences among financially integrated economies will get amplified. On the other hand, if there is negative shock to bank capital in one country, then banks reduce their lending in other economies and inter-connected economies experience an increase in the co-movement of output. The net effect depends on which shock dominates.

The empirical literature fails to find a robust systematic relationship of either direction. Most of the studies adopt a cross-sectional approach mainly because of lack of data on financial linkages over a long period of time for country-pairs. These studies show a positive correlation between financial integration and GDP co-movement.[3] We argue that the existing empirical literature suffers from endogeneity problems and hence cannot provide well-identified estimates of financial integration

show that higher industrial specialization in turn leads to less synchronized cycles.

[3]Imbs (2006) uses bilateral data on financial holdings constructed by the IMF on a large cross-section of countries and shows a significant positive correlation between bilateral financial linkages and output synchronization. Similarly Otto, Voss and Willard (2001) find that OECD countries with strong FDI linkages have more similar cycles. Using cross-country data over the period 1960–1999, Kose, Prasad, and Terrones (2004) document that financially open countries without capital account restrictions have more synchronized business cycles with world output. The only study to our knowledge that documents a negative association between financial integration and synchronization is Garcia-Herrero and Ruiz (2008). These authors use capital account data for Spain and document a lower GDP synchronization of Spain with countries that Spain has strong financial linkages.

on output co-movement. To account for endogeneity, one has to account both for unobserved heterogeneity and also for reverse causation. Our main contribution in this paper is to explicitly deal with these simultaneity issues and identify one-way effect of financial integration on output co-movement.

Specifically, our rich panel structure enables us to control for global shocks. This is essential since the cross-country output response to common shocks is going to be similar. Besides accounting for common shocks, the considerable time dimension of the data allows us to control for other global factors and policy convergence that have affected both financial integration and output synchronization. Financial globalization goes hand-in-hand with trade integration, where the latter can lead to increased output co-movement. Monetary policy has increasingly been coordinated at a global level which can also affect integration and synchronization. For example, Rose (2009) and Flood and Rose (2009) show that inflation targeting countries tend to have a higher degree of business cycle synchronization, while Rose and Engel (2002) present cross-sectional evidence of a higher degree of synchronization among countries that share a common currency. In the same vein, Inklaar, Jong-A-Pin, and de Haan (2008) find that fiscal policy convergence has also an effect on the synchronicity of output growth in the OECD economies.

In addition to global factors, it is also essential to control for time-invariant country-pair factors, such as distance, sociopolitical ties and differences in cultural norms. Most of the time these factors are not properly measured and unobserved. Recent research shows that informational frictions, cultural linkages and bilateral trust—to the extent that they can be measured—have strong effects on financial integration (e.g. Portes and Rey (2005); Guiso, Sapienza, and Zingales (2009); Ekinci, Kalemli-Ozcan and Sørensen (2008); Giannetti and Yafeh (2008); Mian (2006)). In addition by shaping preferences, trust and cultural norms might directly affect business cycle patterns (e.g. Stockman and Tesar (1995)). The inclusion of country-pair fixed-effects help us to account most of this type of unobserved heterogeneity.

Due to limited degrees of freedom most of the previous cross-sectional studies on the determinants of business cycle synchronization pool developed, emerging market and under-developed countries into the estimation (an exception is Inklaar, Jong-A-Pin, and de Haan (2008)). Yet there are major differences among these groups of countries. While emerging and under-developed countries are not as much financially integrated and experienced many major financial crises over the past three decades, until 2007–2008 industrial countries had witnessed an unparalleled period of stability without major financial shocks. Thus, although the BIS dataset includes data on developing and poor countries we limit our analysis to a group of relatively homogenous advanced

economies.[4]

Focusing on these twenty countries also allows us to have a control group that is similar to our treatment group when we construct our exogenous "predicted integration" measure to be used in the instrumental variables analysis. Our instrument of "predicted integration" is based on the variation in the timing of adoption of the EU-wide policies by the fifteen EU countries in our sample. In line with the evidence from the law and finance literature that focuses on country-level outcomes (e.g. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998); La Porta, Lopez-de-Silanes, and Shleifer (2008)), we show a strong positive relationship between implemented legislative harmonization policies in financial services and integration between country-pairs, conditional on the monetary unification. The instrumental variables analysis not only further accounts for endogeneity but also fixes the measurement error in our financial integration variable, leading to a causal positive estimate of integration on the synchronization of output fluctuations.

The paper is structured as follows. In the next section we present our data and the econometric methodology. Section 3 presents our OLS results on the effect of financial integration on business cycle synchronization. Section 4 presents the IV estimates that link financial legislation reforms with banking integration in the first-stage and banking integration with output synchronization in the second stage. Section 5 concludes.

2 Data and Methodology

Our data comes from the BIS International Locational Banking Statistics Database. This database reports asset and liability holdings of banks located in roughly forty (mainly industrial) countries ("the *reporting area*") in more than one hundred and fifty countries (the "*vis-a-vis area*") at a quarterly frequency since the end of 1977. Yet, half of these countries started reporting only recently (mostly after 2000) or are "off-shore" financial centers. Thus, our panel dataset consists of annual bilateral data from twenty rich economies over the period $1978-2007$.[5] These countries are: Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, Portugal, Sweden, and

[4] On the differential effect of international linkages on output comovement across developed and developing world, see for example Kraay and Ventura (2000, 2007) and Calderon, Chong, and Stein (2007).

[5] We prefer to use annual data given the noisy nature of quarterly data. Our panel has $1/2N*(N-1)*T$, i.e. $20*19*30 = 5700$ observations. There are, however, some missing observations (gaps), mainly in the initial years. Thus most of our models are estimated in a sample of $5,376$ observations. For robustness we also estimated the specifications in a balanced panel dropping the observations in the late 1970s. The results are similar to the ones reported below.

the United States.

The data is originally collected from domestic monetary authorities and includes all of banks' on-balance sheet exposure as well as some off-balance sheet items (mainly in the custodian business). The data is based on the location of banks and, therefore, also includes lending to subsidiaries and affiliates.[6] Thus it reflects more accurately the international exposure of countries than the consolidated statistics database of the BIS that nets out lending and investment to affiliate institutions. The data captures mainly international bank to bank debt, such as inter-banks loans and deposits, credit lines, and trade-related activities. The data also covers bank's investment in equity-like instruments as well as foreign corporate and government bonds.[7] Unfortunately the BIS dataset does not distinguish between inter-bank debt activities and portfolio investment. Thus we can not explore potential differential effects of various types of capital holdings and flows on business cycles synchronization. Going over the documentation (BIS (2003a,b); Wooldridge (2002)) it seems that during the initial years most flows reflect bank-to-bank transactions and credit lines, while FDI and equity flows have become more important after the mid-nineties. International bank M&A activity and direct lending to foreign residents have been limited overall (see Buch and De Long (2004) and Lane (2008)). Thus, the data mainly captures investment in debt related instruments and standard international banking activities. Besides stocks, the BIS also reports asset and liability flows in each period.[8]

2.1 Measures of Financial Integration and Synchronization

Measuring Integration

The BIS data is expressed originally in current USD. We convert the data into constant USD by deflating the series with the U.S. CPI. We construct measures of financial integration based on

[6]Our data includes the transactions through financial centers such as the U.K. and Switzerland. As long as business cycle patterns and dynamics of assets and liabilities systematically differ between financial centers versus the other countries, this will create measurement error that will attenuate our estimates.

[7]Assets include mainly deposits and balances placed with non-resident banks, including bank's own related offices abroad. They also include holdings of securities and participations (i.e. permanent holdings of financial interest in other undertakings) in non-resident entities. Data also include trade-related credit, arrears of interest and principal that have not been written down and holdings of banks own issues of international securities. They also cover portfolio and direct investment flows of financial interest in enterprises.

[8]Note that simply taking first differences of assets and liabilities could be misleading in constructing flows, since a devaluation either at the "*source*" or at the "*recipient*" country might cause an increase or decrease in total assets, even if no capital movements have taken place. Since reporting countries report to the BIS the currency in which the assets and liabilities are denominated, the BIS has constructed an estimate of the flows (see BIS 2003a).

both stock and gross flows. The first measure ($BANKINT1$) is the average value (over four observations for each pair) of (the logs of) real bilateral stocks in asset and liabilities normalized with the sum of the population of the two countries. Analogously, the second measure ($BANKINT2$) is the average of (the logs of) gross bilateral flows of assets and liabilities as a share of the population of the two countries).[9] We also experiment with other measures of integration, such as standardizing gross bilateral flows and stocks of banks assets and liabilities with GDP and/or with total stock of assets and liabilities. The results are similar to the ones reported here and hence we do not report them but they are available upon request.

Measuring Synchronization

We use three different measures of business cycle synchronization ($SYNCH_{i,j,t}$), by using real per capita GDP data from World Bank's World Development Indicator's Database (WB WDI).[10] First, we measure business cycle synchronization with the negative of divergence defined as the absolute value of real GDP p.c. growth differences between country i and j in year t.

$$SYNCH1_{i,,j,t} \equiv -\left|(\ln Y_{i,t} - \ln Y_{i,t-1}) - (\ln Y_{j,t} - \ln Y_{j,t-1})\right| \tag{1}$$

This index, which follows Giannone, Lenza, and Reichlin (2009), is simple and easy-to-grasp. In addition, it is not sensitive to various filtering methods that have been criticized on various grounds (e.g. Dellas and Canova (1992); Canova (1998, 1999)). In contrast to the correlation measures that cross-country studies mainly work with, the index does not reflect the volatility of output growth and, therefore, allows us to identify the impact of banking integration on the covariation of output growth. Doyle and Faust (2005) underline the importance of a synchronization measure that does not include volatility. Isolating the covariance part is desirable, because over the past two decades global volatility of output has fallen considerably in the industrial economies (e.g. Cecchetti, Flores-Lagunes, and Krause (2006)).

Second, we follow Morgan, Rime, and Strahan (2004) and construct $SYNCH2_{i,,j,t}$ as follows. First, we regress real p.c. GDP growth on country fixed-effects and year fixed-effects.

[9] We prefer using the average of the logs of both right hand side and left hand side variables instead of the log of the average (or the sum), since the aggregate GDP cannot, in general, be strictly log-normally distributed if each country's GDP is log-normally distributed. See Baldwin (2006) for a critique of using the log of the average of two countries GDP.

[10] Using PPP adjusted GDP p.c. yields almost identical results.

$$\ln Y_{i,t} - \ln Y_{i,t-1} = \gamma_i + \phi_t + v_{i,t} \; \forall \; i, j$$

The residuals ($v_{i,t}$ and $v_{j,t}$) reflect how much GDP growth p.c. differs in each country and year compared to average growth in this year (across countries) and the average growth of this country over the estimation period. The absolute value of these residuals ($FLUCT_{i,t}$) reflects GDP fluctuations with respect to the cross-country and the across-year mean growth.

$$FLUCT_{i,t} \equiv |v_{i,t}| \text{ and } FLUCT_{j,t} \equiv |v_{j,t}|$$

We then construct the business cycle synchronization proxy as the negative of the divergence of these residuals taking the absolute difference of residual GDP growth:

$$SYNCH2_{i,j,t} \equiv -|\nu_{i,t} - \nu_{j,t}| \tag{2}$$

Intuitively this index measures how similar GDP growth rates are between two countries in any given year, accounting for the average growth in each country and the average growth in each year.

Third, we follow previous cross-country studies and estimate $SYNCH3_{i,j,t}$ as the 5-year correlation of the cyclical component of output as measured with Baxter and King (1999) Band-Pass filter $(2, 8)$ (e.g. Imbs (2006); Baxter and Kouparitsas (2005)). In contrast to previous cross-sectional work, we have six 5-year observations rather than one observation per country-pair estimated over a longer period.

Measuring Trade and Specialization

Given the focus of the previous literature on international trade and industrial specialization patterns being the main determinants of fluctuations symmetry, we control for these variables in our estimation. Following the literature, we measure $TRADE_{i,j,t}$ with the log of bilateral real (deflated with the U.S. price deflator) exports and imports as a share of the two countries's GDP.

For specialization we follow Krugman (1991), Imbs (2006), and Kalemli-Ozcan, Sørensen, and Yosha (2003), among others, and measure specialization with the following index:

$$SPEC_{i,j,t} \equiv \sum_{n=1}^{N} \left| s_{i,t}^{n} - s_{j,t}^{n} \right|$$

where $s_{i,t}^{n}$ and $s_{j,t}^{n}$ denote the GDP share of manufacturing industry n in year t in country i and j respectively (data are retrieved from UNIDO). Thus, a higher number in $SPEC_{i,j,t}$ indicates that the two countries have less similar production structures in manufacturing.

Descriptive Statistics

Table 1 gives descriptive statistics for the main variables employed in the empirical analysis. The average divergence in bilateral real p.c. GDP growth rate is 1.76% ($SYNCH1$). Once we control for country and time fixed-effects ($SYNCH2$) in synchronization the differences are somewhat smaller (mean of 1.6%). Yet both proxy measures of synchronization exhibit significant variation both across country-pairs and over time (the standard deviation is 1.6% and 1.45% respectively).

Figures 1 and 2 give a graphical illustration of the evolution of banking integration and business cycle synchronization over the period we consider in our analysis. Cross-border banking activities have increased considerably over the past three decades. For example, real international bilateral bank holdings (per capita) have increased from an average value (across the 190 country-pairs of our sample) of roughly 70 dollars to almost 600 per person as of the end of 2007.[11] Figure 2 plots our synchronization measures over the last three decades. Growth divergence measures, $SYNCH1$ and $SYNCH2$ are plotted on the left y-axis and the correlation measure, $SYNCH3$, on the right y-axis. Although there is a considerable (and highly desirable from a panel estimation viewpoint) degree of short-term variability, output synchronization has been steadily increasing according to all measures since the mid-1980s. For example the average correlation of the cyclical component of GDP ($SYNCH3$) was around $0.1 - 0.3$ in the 1980s. In the 1990s the correlation increased on average to 0.4, while in the 2000s the correlation reached 0.6.[12]

[11] These numbers are an order of magnitude smaller than the total bilateral equity holdings reported for example in 2007 vintage of the IMF CPIS dataset. Yet in the 1980s and the early 1990s banking activities were a relatively larger component of total capital flows. Our instrumental variable estimates will account for any measurement error in financial integration, as long as bank holdings/flows and other holdings/flows are correlated (previous works document a strong positive correlation between various types of capital flows (e.g. Bekaert and Harvey (2000); Lane and Milesi-Ferretti (2008)) .

[12] For completeness in the Supplementary Appendix we tabulate country-specific figures with the evolution of the three proxy measures of synchronization for each of the twenty countries we consider in the analysis.

2.2 Econometric Specification

We estimate variants of the following specification:

$$SYNCH_{i,j,t} = \alpha_{i,j} + \alpha_t + \beta BANKINT_{i,j,t-1} + \mathbf{X}'_{i,j,t-1}\delta + \varepsilon_{i,j,t} \quad (3)$$

($SYNCH_{i,j,t}$) is one of our three synchronization indices that measures the co-movement of output between countries i and j in year t. $BANKINT_{i,j,t-1}$ is one of our two measures of cross-border banking integration between countries i and j in the previous year $(t-1)$.[13] The specification also includes year (α_t) and country pair fixed-effects ($\alpha_{i,j}$). The year fixed-effects account for the effect of global shocks and other common factors that affect both business cycle patterns and banking integration. The country-pair effects account for hard-to-measure factors such as cultural ties, informational frictions, political coordination and other time-invariant unobservable factors, all of which have been shown to have an effect on both financial integration and business cycle patterns.

3 Ordinary Least Squares Estimation

3.1 Cross-Sectional Estimates

Table 2 presents both cross-sectional and panel fixed-effects estimates on the effect of banking integration on GDP synchronization. For comparability with previous studies, we start our analysis in Panel A by estimating cross-sectional models that pool the time series observations across all country pairs. The "between" estimator removes the time dimension by averaging the dependent and the explanatory variable across each country-pair.

Columns (1)-(4) report cross-sectional estimates using synchronization in real per capita GDP growth rates ($SYNCH1$ and $SYNCH2$) as the dependent variable, for both integration measures. The cross-sectional coefficient on the two banking integration measures is positive and significant at standard confidence levels; a result that is in line with the previous empirical literature. This suggests that across the 190 pairs of industrial countries there is higher covariation of GDP growth among economies with stronger financial ties.

The specifications in columns (5)-(8) report estimates using the cyclical component of real per

[13] We have also estimated this specification using contemporaneous values of financial/banking integration finding similar results.

capita GDP ($SYNCH3$) estimated over a 5-year period as the dependent variable. These models are estimated in six non-overlaping 5-year periods.[14] While using this index of synchronization allows direct comparability with previous cross-sectional studies (e.g. Imbs (2006); Baxter and Kouparitsas (2006)), we lose many observations as due to averaging we do not fully utilize the time dimension. In columns (6) and (8) we also examine whether our results reflect differences on trade intensity or industrial specialization. A priori it looks important to account for differences in bilateral trade when working with long-term data as trade in goods and financial services tend to move in tandem (see Rose and Spiegel (2004) and Aviat and Coeurdacier (2007) among others) and previous studies show that trade has a significantly positive effect on business cycle synchronization (see Rose (2009) for a review). Likewise accounting for specialization patterns is key as theoretical and empirical studies argue that financial integration affects the specialization patterns (e.g. Obstfeld (1994); Kalemli-Ozcan, Sørensen, and Yosha (2001)). In line with previous studies (e.g. Frankel and Rose (1998); Imbs (2006)) trade also enters with a positive estimate, suggesting that countries that trade more have more similar output patterns. Also similar to the previous studies (e.g. Kalemli-Ozcan, Sørensen, Yosha (2003), and Imbs (2004)), our regressions further show that countries with dissimilar production structures have less synchronized cycles.[15] Most importantly for our focus, while trade intensity and differences in industrial specialization enter with significant coefficients, the estimate on $BANKINT$ continues to be at least two standard errors above zero in both permutations.[16]

3.2 Panel Fixed-Effect Estimates

In Table 2, Panel B we report otherwise identical to Panel A specifications, but we add country-pair fixed-effects and period fixed-effects in the empirical model, as shown in equation (3). This allows us to examine whether "within" pairs of countries and conditional on global trends, a higher degree of international banking activities is associated with less or more similar GDP fluctuations.[17] As we have argued above, accounting for country-pair fixed-effects is necessary as time-invariant country-pair characteristics related to geographical or cultural distance and trust can determine

[14] The results are similar if we estimate the specifications in rolling-windows of 5-years

[15] We also augmented the empirical model with trade and specialization one at a time, obtaining similar results.

[16] When we control for trade intensity and differences in industrial specialization we lose roughly 20% of our sample due to data unavailability on the industrial statistics needed to construct $SPEC$. Specifically we lose all observations in the late 1970s as the UNIDO dataset that we use to construct $SPEC$ starts reporting data after 1980.

[17] Due to serial correlation standard errors in the "within" models are clustered at the country-pair level (Bertrand, Duflo, and Mullainathan (2004)). This method allows for arbitrary heteroskedasticity and autocorrelation across each country pair.

business cycle co-movement and financial integration simultaneously. Likewise, time fixed-effects in columns (5)-(8) directly capture many features of globalization, such as policy convergence, that might affect both output synchronization and financial integration.

The "within" estimates in Panel B stand in sharp contrast to the analogous cross-sectional coefficients in Panel A. In all model perturbations the estimate on banking integration is statistically significant at standard confidence levels, but with the opposite sign to the cross-sectional specifications. The panel fixed-effect specifications imply that a higher level of international banking integration is associated with less -rather than more- alike output fluctuations. This result is present with both banking integration measures and all three synchronization indicators. Moreover as specifications (6) and (8) illustrate this result is not driven by changes on goods' trade and the industrial structure.[18] As a result, while in the cross-section there is a positive association between output co-movement and financial integration, as financial linkages become stronger over time output growth tends to diverge. The striking difference between the cross-sectional and the panel estimates suggests that omitted variable bias arising from both common global shocks and hard-to-account-for country-pair characteristics was plaguing estimates in previous cross-country studies.

These results are also economically significant. As the banking integration measures are expressed in logs (as a share of the two countries' population) and the dependent variable is in percentage units, the coefficients measure the effect of a percentage increase in banking integration on output growth co-movement. For example, the estimates in models (1) and (3) of Panel B imply that a 10 percent increase in bilateral bank holdings is associated with $1.6\% - 1.9\%$ fall in GDP growth co-movement (roughly a one standard deviation).

In Table 3 we estimate autoregressive specifications, controlling for persistence in business cycle synchronization.[19] We find that GDP fluctuations are not particularly persistent (the first autoregressive coefficient is around 0.20). Yet one might be worried that our previous results are driven by inertia in output synchronization patterns. Autoregressive models are also useful to quantify the short and the long-run effect of banking integration on business cycle synchronization.[20]

[18] Note that given the limited time-variation in trade and specialization differences, these variables now become insignificant correlates of business cycle synchronization.

[19] For brevity, from this table onwards, we report estimates only with $SYNCH2$ on the LHS. Results with other synchronization measures are very similar and available upon request.

[20] Although the joint presence of the country-pair fixed effects and the lagged dependent variable yields biased estimates, this bias becomes negligible as the time dimension becomes large. Recent Monte Carlo studies show that the bias sharply decays when the time horizon exceeds 20 periods. For example, in the context of growth regressions, Judson and Owen (1999) estimate that the bias on the lagged dependent variable is around 1 to 2 percent of the

The coefficient on $BANKINT$ in columns (1) and (2) that measures the annual (short-run) effect of banking integration on GDP synchronization is negative and significant at the 1% level. The long-run effect of banking integration is somewhat larger (around $0.075 - 0.09$) due to the positive serial correlation in the dependent variable. The long-run coefficient implies that a 10 percent increase in bilateral bank holdings or gross transactions is associated with an almost 1 percent fall in GDP growth co-movement.

In columns (3) and (4) we include lagged log level of GDP of countries i and j to account for the possibility that our estimates are driven by countries receiving a lot of foreign bank capital, while converging to a steady state. Including the lagged log level of GDP also allows us to account for the cyclical properties of international synchronization.[21] The log level of GDP p.c. in countries i and j enters with a positive and significant coefficient, but does not alter our main result.[22] The coefficient on banking integration continues to be negative and at lest three standard errors below zero, indicating that increasing bilateral financial linkages within country-pairs are followed by a lower level of output co-movement.

3.3 Sensitivity Analysis

We performed various sensitivity checks to investigate the stability of our OLS estimates that reveal a striking difference between the cross-sectional and over time correlation between output synchronization and banking integration. First, we checked whether our results are driven by influential observations. The change in the sign of the coefficient on banking integration is not due to any particular country-year observations (see the partial correlation plots in the Supplementary Appendix). Second, we estimated a weighted least square (WLS) (by population and/or GDP p.c.) regression in order to guard against the influence of small country pairs, obtaining similar results.[23] Third, we repeat estimation dropping Luxemburg and/or Switzerland. This helps us check whether our estimates are driven by small countries with large banking systems. The estimates are not shown for brevity but are similar to the ones reported here and available upon request. Forth, we

true coefficient value when T is greater than 20 and less than 1 percent when the time horizon exceeds 30. More importantly, the bias on the independent variables (in our case banking integration) becomes less than 1 percent.

[21] We thank Fabrizio Perri and Gian-Maria Milesi-Ferretti for suggesting to control for GDP differences to account for output convergence and the counter-cyclical nature of business cycle synchronization.

[22] The result is similar if we replace the log level of GDP in the two countries with GDP growth in countries i and j.

[23] For example we obtain the following coefficients and standard errors for the benchmark specifications in Table 2, columns (1) and (2). For the within regression, the estimate (s.e.) is -0.187 (0.039) and for the between regression, the estimate (s.e.) is 0.069 (0.021).

experiment with alternative proxy measures of trade intensity and production similarities, finding similar results (also not shown). Fifth, we used unstandardized measures of banking integration as the dependent variable and controlled directly for population and/or GDP. Again the results are similar.

4 Instrumental Variables Estimation

Our results so far show a strong negative effect of banking integration on business cycle synchronization in a panel of countries. Although this result is robust to controlling most of the unobserved heterogeneity and survive stability tests, one, however, could still argue that our coefficients do not capture the one way effect of financial integration on synchronization.

A first concern emerges from potential omitted variables. Most of the robust correlates of business cycle synchronization identified in the Baxter and Kouparitsas (2005) study are time-invariant and hence our country-pair fixed-effects will account for these factors. Inclusion of common global effects also mitigates concerns that our estimates suffer from omitted variable bias. Nevertheless we can not completely rule out that an omitted time-varying country-pair factor may affect both output synchronization and banking integration.

Second, there is the possibility of reverse causation. This type of endogeneity may arise if banking integration is the outcome rather than the cause of business cycle divergence (as in the Haethcote and Perri (2004) model). To partly account for this possibility, in our panel estimates we have used lagged values of banking integration (and the other controls). Yet, clearly using lagged values is far from ideal.

Third, there are worries that the estimates may be plagued by measurement error. While the BIS statistics capture all cross-border banking activities and thus classical error-in-variables is negligible, our data does not include other types of international investment (such as portfolio investment by non-banks or FDI). How does this affect the OLS results? Since the various forms of financial integration are positively correlated (Lane and Milesi-Ferretti (2004, 2007)) the estimates of Tables 2-3 will not be systematically biased. Yet, many theoretical models suggest that the impact of integration through ownership and equity might have stronger effects on risk sharing and output divergence compared to financial integration through debt instruments (e.g. Morgan, Rime, and Strahan (2004); Holmstrom and Tirole (1997)). If this is indeed the case and banking activities are positively correlated with equity investment by non-banks (as clearly shown by Lane

and Milesi-Ferretti (2004, 2007)), then our estimates in Tables 2 and 3 might suffer from attenuation bias and thus we under-estimate the (negative) effect of financial integration on synchronization. Attenuation might also arise because the bilateral locational statistics miss a significant portion of bilateral investment and lending activities since most of the international capital flows occur through financial centers (see Kubelec and Sa (2009)).

To account for these issues one needs exogenous variation in bilateral banking integration. While no study to our knowledge has estimated bilateral panel instrumental variable (IV) models on the effects of financial or trade integration, we propose a novel identification scheme that allows us to identify the one-way effect of financial integration on output synchronization.

4.1 Financial Sector Legislative-Regulatory Harmonization

We construct a policy instrument for banking integration, that is "predicted integration," using data on financial sector harmonization policies across EU15 countries, which are part of our twenty country sample. To construct the instrument we use information from the EU Commission on the implementation of the Directives of the Financial Services Action Plan (FSAP), a major policy initiative launched in 1998 that aimed to remove regulatory and legislative barriers across European countries in financial services (specifically in capital markets, banking, and insurance). Besides other technical recommendations and communications, the FSAP included 29 major pieces of legislation, 27 Directives and 2 Regulations.[24] In contrast to Regulations that become immediately part of the legal order of all EU member countries, EU Directives are legal acts that do not become immediately enforceable across the EU. Instead, member countries are given time to adopt, modify and eventually transpose the Directives into domestic law. The time of the transposition takes many years, as EU member states delay the adaptation either due to bureaucratic inefficiencies or to protect domestic firms and interest groups.

As with other pieces of EU-initiated legislation, there is a great deal of heterogeniety on the speed with which European countries adopted the FSAP Directives. For example only four EU countries (Denmark, France, Finland and the UK) transposed the "Directive on the Supervision of Credit Institutions, Insurance Undertakings and Investment Firms in a Financial Conglomerate" within the first two years since its circulation (in November of 2002) by the EU Commission. It took four

[24]Until the official completion date at the end of 2003 the EU Commission had passed 21 of these measures.The remaining 6 Directives of the FSAP passed in the period $2004-2007$. To explore the sensitivity of our estimates we also used an alternative index of bilateral harmonization policies using data only on the initial 21 Directives. The results are similar (not reported for brevity).

years for Greece and five years for the Netherlands and Sweden to transpose this important financial legislation into national law, while one country (Portugal) had not transposed the Directive till the end of our sample period (end of 2007).[25] The sharp differences on the timing of transposition across member states allow us to construct a bilateral time-varying instrument that reflects legislative-regulatory harmonization reforms in financial services. We construct this "predicted integration" that is a legislative-regulatory harmonization policy measure as follows: First, using data from the EU Commission and each of the EU15 member countries, we define 27 indicator variables ($LEX_{i,,j,t}$, one for each Directive) that equal one if at any given year both countries in each country-pair cell have transposed the Directive into national law and zero otherwise. Second, we create the country-time varying legislative harmonization measure ranging by summing the values of these 27 indicator variables ($LEX_{i,,j,t}$). Since the variable is highly skewed in the regressions we use the log value, i.e., $HARMON_{i,j,t} \equiv \ln\left(\sum_{k=1}^{K=27} LEX_{i,,j,t}\right)$.[26]

4.2 Identification

We posit the following first-stage relationship between legislative-regulatory harmonization policies in financial services ($HARMON$) and cross-border financial integration ($BANKINT$):

$$BANKINT_{i,j,t} = \alpha_i + \delta_t + \gamma HARMON_{i,j,t} + Z'_{i,j,t}\Psi + \nu_{i,j,t} \tag{4}$$

Identification requires that the index of legislative harmonization policies in financial services ($HARMON$) serves as the "excludable" instrument: a) It is significantly correlated with banking integration (i.e. there is a strong first-stage relationship); and b) Conditional on other factors (captured in vector Z') it affects business cycle synchronization only through banking integration (i.e. $COV(HARMON_{i,j,t}, \varepsilon_{i,j,t})|Z'_{i,j,t}, \alpha_i, \delta_t = 0$ where $\varepsilon_{i,j,t}$ is the error term in the second stage).

The key "exclusivity" assumption is plausible because legislative policy reforms in financial services should affect the patterns of business cycle co-movement primarily by altering cross-border financial activities. Our identification scheme is theoretically appealing as it links policy changes

[25] See Kalemli-Ozcan, Papaioannou, and Peydro (2009) for details on the adoption process and a complete codebook of the transposition of each Directive by each EU15 member country.

[26] Imbs (2006) and Kalemli-Ozcan, Sorensen and Yosha (2001) employ a similar bilateral instrumentation strategy using, however, cross-sectional data. Specifically these studies use the sum of the La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998) measures of investor protection of the two countries as an instrument for bilateral financial integration. Yet in contrast to these studies our instrument is truly bilateral as it reflects that both countries have transposed into the domestic legal order each of the 27 Directives of the FSAP.

in a particular aspect of law (financial intermediation) with outcomes in exactly the same industry (financial integration). Thus conditional on other bilateral characteristics it seems quite reasonable that harmonization policies in financial services affect output synchronization through altering the dynamics of bilateral financial ties.

Our identification builds on insights of the law and finance literature that argues that differences in the legal protection of shareholders and creditors have first-order effects on the development of deep and efficient financial markets and intermediaries (see La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998); La Porta, Lopez-de-Silanes, and Shleifer (2008)). Our identification set-up is, however, more restrictive (and thus stronger) since we link reforms in legal practices that aim to make the functioning of the financial system more alike with bilateral changes in financial patterns.

While the timing of the transposition of the Directives of the Financial Services Action Plan into the domestic law may be related to hard-to-account-for domestic (unilateral) political and economic conditions, the outcomes we study -financial integration in the first-stage and output synchronization in the second-stage are bilateral. This makes the instrument validity quite plausible, because in the first-stage we study whether financial integration between two countries increases when both economies of each country-pair have harmonized their legislation on financial services by transposing exactly the same Directive.

4.3 First-Stage: Legislative-Regulatory Harmonization in Financial Services and Banking Integration

Table 4, Panel B reports the first stage estimates. The coefficient on $HARMON$ in column (1) is positive and highly significant. This suggests that countries that quickly incorporated into domestic law the EU-wide regulatory-legislative harmonization policies became more financially integrated through international banking activities.[27] The estimate retains significance when we control for lagged log level of GDP in the two countries (in column (2)) and/or when we control for inertia in output synchronization (in columns (3)-(4)). The first-stage fit is quite strong. In all model permutations the first-stage F-score is significantly larger than 10, the rule-of-thumb value that alerts for weak instrument problems (Staiger and Stock (1997); Stock, Wright, and Yogo (2001)).[28]

[27]The first stage estimates differ in the case of dynamic panel estimation since we have slightly different samples.

[28]The Stock and Yogo (2003) critical value for weak identifictaion (at the 10% level) is around 16.5. As the F-score of the excluded instrument is always larger than 22, this further reassures that the 2SLS estimates do not suffer from the "weak instrument" problems.

In columns (5)-(8) we control for the bilateral flexibility of the exchange rate regime. This is important as there is the possibility that harmonization policies among EU countries might reflect monetary unification in Europe that occured at the same time as the launch of the FSAP. To do so we exploit the recent update of the de-facto exchange rate regime classification of Reinhart and Rogoff (2004) by Ilzetzki, Reinhart, and Rogoff (2008), and use in the regressions a bilateral time-varying index that measures the flexibility of the exchange rate. The Reinhart and Rogoff "coarse" regime classification ranges from 1 to 5 where lower values suggest a more rigid regime. For example, euro area countries get a score of 1 after 1999 and a score of 2 in the 1990s (when they were participating in the European Exchange Rate Mechanism). Using this dataset we construct the bilateral index by taking the sum of the log classification of countries i and j in the beginning of each year t ($ERCSUM = \ln(ER_{i,t}) + \ln(ER_{j,t})$). In all permutations $ERCSUM$ enters the first stage with a significant negative estimate. This suggests that cross-border banking activities increased significantly when countries adopt more rigid exchange rate arrangements, such as joining the euro. This result is in line with the evidence of the so-called fear-of-floating literature that argues that countries adopt strict de facto exchange rate arrangements in an effort to attract foreign investment (e.g. Gelos and Wei (2005) show evidence for a group of emerging economies, while Kalemli-Ozcan, Papaioannou, and Peydro (2009) present similar evidence for advanced economies).

Most importantly controlling for the nature of the exchange rate regime has no major effect on the first-stage fit between the excludable instrument of harmonization policies and banking integration. The estimate of $HARMON$ is at least 4 standard errors larger than zero in all specifications. As we show below (in Table 5) the strong first-stage relationship between harmonization policies in financial services and banking integration retains significance when we control for numerous other correlates of banking integration.

4.4 Reduced-Form: Legislative-Regulatory Harmonization in Financial Services and Output Synchronization

Before presenting the second-stage estimates, we examine the "reduced-form" relationship between output synchronization and legislative-regulatory harmonization policies in financial services, in Panel C of Table 4. The reduced-form regression in column (1) yields a negative and highly significant estimate on $HARMON_{i,j,t-1}$. This suggests that conditional on time-invariant country-pair factors and global trends, harmonization policies in financial services have lead to a lower degree of output growth synchronization. The estimate on $HARMON$ retains economic and statistical

significance when we control for inertia in synchronization and differences in the level of output (columns (2)-(4)), and quite importantly when we augment the specifications with the bilateral index of the flexibility of the exchange rate regime (columns (5)-(8)).

In our set-up the reduced-form estimates are particularly interesting because the harmonization index can be thought as a structural measure of financial integration. So far the literature on international financial integration has relied either on quantity (e.g. capital flows) or price-based measures (e.g. correlation of equity returns; see Adam *et al.* (2004) for a general discussion). In contrast to these outcome measures the legislative-regulatory harmonization index reflects structural features of the system that governs financial intermediation. The reduced-form estimates thus show that conditional on common global trends and country pair fixed-factors, convergence policies in financial services have been followed by a fall in the synchronization of output patterns. Since legislative transposition policies are unilateral, and harmonization and output synchronization are bilateral outcomes, the reduced-form specifications are unlikely to be driven by endogeneity.

4.5 2SLS Estimates

We now turn our attention to the the second-stage estimates that identify the one-way effect of financial integration on business cycle synchronization. Panel A of Table 4 reports the results. In all permutations the 2SLS coefficient of banking integration is negative and significant at the 99% confidence level. This suggests that increases in bilateral banking activities driven by legislative-regulatory harmonization policies in financial services lead to more divergent output patterns. The average standardized "beta" coefficient on banking integration in Panel A of Table 4 is 0.5, implying that a one standard deviation increase in bilateral banking activities is followed by an output growth divergence of around $0.7\% - 0.8\%$ (i.e. half of standard deviation in $SYNCH2$; see Table 1)

The 2SLS estimates are larger in absolute value than the analogous OLS coefficients (in Tables 2 and 3). This suggests that the OLS estimates were contaminated by measurement error. Specifically there are two main sources of attenuation in these estimates. First, bilateral banking activities are just one part of financial integration; and if anything most theoretical works suggest that the impact of other forms of financial integration, mostly portfolio equity investment and FDI, should have a larger impact on cross-border risk sharing and output co-movement than integration that takes the form of debt and direct lending. Since the instrument is broader than banking, covering reforms in all segments of financial intermediation (specifically in capital markets, insurance industry, and banking) the larger second stage coefficients should come at no surprise. This is exactly because now

the second stage coefficients reflect the impact of all aspects of cross-border financial integration. Second, attenuated OLS estimates arise because a sizable portion of international investment and lending is redirected through financial centers (e.g. Kubelec and Sa (2008); Lane and Milesi-Ferretti (2007)) and thus standard measures of bilateral integration miss indirect linkages. Since our legislative-regulatory harmonization index is truly bilateral it helps in the 2SLS estimation to account for measurement error arising from hard-to-account-for indirect transactions through financial centers.

4.6 Sensitivity Analysis

The key exclusivity assumption in our identification strategy is that (conditional on other factors) legislative-regulatory harmonization reforms in financial services affect output co-movement only through financial integration. Naturally the impact of such reforms on synchronization (i.e. the "reduced-form") should primarily and mainly come from changes in financial integration (i.e. the "first-stage");[29] yet one may argue that harmonization policies in financial services might affect other bilateral outcomes (such as trade in goods), which in turn also affect output synchronization.

Thus we have estimated many 2SLS specifications with additional covariates in an effort to control as fully as possible for potentially other indirect effects of legislative harmonization policies in financial services on business cycle co-movement. Table 5 reports second-stage estimates of static and dynamic specifications with other control variables. The first-stage relationship between legislative-regulatory harmonization policies and cross-border banking integration continues to be strong (F-statistics around $16-17$), even though we control for many other relevant factors. The second-stage coefficient on banking integration is negative and significant at least at the 5% level in all permutations. The estimates in Table 5 imply that conditional on country-pair fixed-factors, common time effects, goods trade ($TRADE$), different patterns on industrial specialization ($SPEC$), and output convergence (GDP), the component of banking integration explained by harmonization policies in financial services, i.e., the predicted integration causes a lower degree of bilateral output synchronization.

We further have estimated all the IV specifications using only the EU15 countries instead of our sample of twenty developed countries. Although having a sample where some countries did not

[29]The causal effect of banking integration on output synchronization is simply the ratio of the "reduced-form" coefficient of legislative-regulatory harmonization policies on output co-movement to the "first-stage" coefficient of $HARMON$ on banking integration.

adopt any reforms and hence act as a control group is appealing, it is also important to know if our results are robust to excluding these countries. We obtain very similar results when we use the sample of EU15 and hence we do not report them.

5 Conclusion

The recent credit crunch in the U.S. and the global transmission of the crisis have raised the interest of the policy makers on how financial globalization affects the propagation of country-specific shocks. Theoretical studies and empirical literature have produced conflicting results on the effect of financial integration on output synchronization. As we show in this paper, this is because identifying the one way effect of financial integration on cross-border output patterns entails addressing many challenges.

First, it is important to focus on a sample and period where there were no major financial shocks. Theory makes different predictions on the role of financial integration in the propagation of productivity compared to financial shocks. Second empirical work needs to account for global factors, as according to the theory financial integration magnifies idiosyncratic, country-specific shocks. Common sources of fluctuations have similar effects on output dynamics. Third, one also has to control for the other factors that affect both business cycle co-movement and financial integration. Fourth, one has to account for endogeneity arising from reverse causation; international capital asset pricing models suggest that it is differences on output fluctuations and returns that make financial integration rise, rather than the other way around.

In this paper we try to address all these challenging issues, exploiting a unique dataset of bilateral cross-country observations on banks' international assets and liabilities over the past thirty years for twenty developed countries to examine the link between financial integration and business cycle synchronization. We limit our attention to the pre-crisis period 1978–2007 in the group of advanced economies, to avoid mixing productivity with financial shocks. The rich panel structure allows us to control for unobserved and hard-to-account-for country-pair specific factors, such as geography, information asymmetries, and cultural similarities. In addition, we control for global shocks, arising from increased coordination of monetary policy, the expansion of trade, and other features of globalization. Both country-pair factors and global trends affect financial integration and output synchronization simultaneously, and hence failing to control for these yields a biased estimate from the cross-sectional estimation.

To further account for time-varying omitted variables and reverse causality we also estimate bilateral panel instrumental variable specifications that link legislative harmonization policies in financial services with banking integration and output synchronization. This identification strategy is theoretically appealing as it links reforms in financial intermediation with outcomes in the same sector and in turn to output synchronization. Our first stage shows a strong positive relationship between financial harmonization policies and banking integration between country-pairs. The second stage estimates reveal that the component of financial integration predicted by legislative harmonization policies in the financial sector makes business cycles less alike. This is the result we also show in the OLS panel estimation.

As a result, both the OLS and the IV panel estimates offer support to theories predicting that in response to closer financial linkages output cycles become less synchronized. Our empirical approach and results suggest that policy suggestions based on simple time-series or cross-sectional correlations can be quite misleading. As data will start becoming available, future research should analyze the effect of financial globalization on the propagation of the recent financial crisis.

6 Data Appendix

Synchronization Index 1 [$SYNCH1$]: The measure is defined as minus one times the divergence of (logarithmic) real p.c. GDP growth between each pair of countries in each year. $SYNCH1_{i,,j,t} \equiv -[(\ln Y_{i,t} - \ln Y_{i,t-1}) - (\ln Y_{j,t} - \ln Y_{j,t-1})]$. For output ($Y$) we use World Bank's real per capita GDP at constant prices series. This index follows Giannone, Lenza and Reichlin (2008). *Source: World Bank's World Development Indicators Database (2008).*

Synchronization Index 2 [$SYNCH2$]: The measure follows Morgan, Rime, and Strahan (2004) and is constructed in two steps. First, we regress (logarithmic) real p.c. GDP growth separately for each country on country fixed-effects and year fixed-effects, i.e. $\ln Y_{i,t} - \ln Y_{i,t-1} = \gamma_i + \phi_t + v_{i,t} \; \forall \; i, j$. Second, we construct the business cycle synchronization index as the negative of the divergence of the residuals for each country-pair, i.e. $SYNCH2_{i,j,t} \equiv -|\nu_{i,t} - \nu_{j,t}|$. *Source: World Bank's World Development Indicators Database (2008).*

Synchronization Index 3 [$SYNCH3$]: The measure is the correlation of the cyclical component of (logarithmic) real per capita GDP as measured with Baxter and King (1999) Band-Pass filter (2,8). We estimate the correlation using five-years of data. The index follows Baxter and Kouparitsas (2004) and Imbs (2006). *Source: World Bank's World Development Indicators Database (2008).*

Banking Integration 1 [$BANKINT1$]: Banking integration index based on bilateral cross-border holdings (stocks) of banks. Data on bank's cross-border bilateral stocks of assets and liabilities come from the confidential version of BIS's Locational Banking Statistics. For each country-pair and year there are up to four observations. *i*) asset holdings (stocks) of banks located in country i in all sectors of the economy in country j; *ii*) asset holdings (stocks) of banks located in country j in all sectors of the economy in country i; *iii*) liabilities (stocks) of banks located in country i to country j. *iv*) liabilities (stocks) of banks located in country j to country i. The data is originally expressed in current US dollars. First, we deflate the four series with the US deflator. Second, we standardize the series by dividing asset and liabilities with the sum of the two countries population in each year (using data from World Bank's World Development Indicators Database). Third, we take the average of the log value of real bilateral assets and liabilities in each year. For further details, see Section 2.1. *Source: Bank of International Settlements, Locational Banking Statistics (2008).*

Banking Integration 2 [$BANKINT2$]: Banking integration index based on bilateral cross-

border gross flows of banks. Data on bank's cross-border bilateral gross flows of assets and liabilities come from the BIS Locational Banking Statistics. For each country-pair and year there are up to four observations. *i*) asset flows of banks located in country i in all sectors of the economy in country j; *ii*) asset flows of banks located in country j in all sectors of the economy in country i; *iii*) liability flows of banks located in country i to country j. *iv*) liability flows of banks located in country j to country i. The data is originally expressed in current US dollars. First we deflate the four series with the US deflator. Second we take the absolute value of (net) flows. Third, we standardize the series, by dividing asset and liability flows with the sum of the two countries population in each year (using data from World Bank's World Development Indicators Database). Fourth, we take the average of the log value of real bilateral gross flows in assets and liabilities in each year. For details see Section 2.1. *Source: Bank of International Settlements, Locational Banking Statistics (2008). Source: Bank of International Settlements, Locational Banking Statistics (2008); for details on the BIS dataset see Wooldridge (2003) and BIS (2008).*

Trade Integration [$TRADE$]: Index of bilateral trade intensity. The measure is the log of bilateral real (deflated with the US price deflator) exports and imports as a share of two countries's GDP. This measure follows Calderon, Chong, and Stein (2007). *Source: IMF's Direction of Trade Database (2008).*

Specialization [$SPEC$]: Index of industrial specialization, based on dissimilarities in production. The measure is the sum of the absolute differences in the share of industrial production for nine manufacturing sectors as a share of the total manufacturing production in each pair of countries in each year, i.e. $SPEC_{i,j,t} \equiv \sum_{n=1}^{N} \left| s_{i,t}^{n} - s_{j,t}^{n} \right|$. The index follows Krugman (1991), Imbs (2006), and Kalemli-Ozcan, Sørensen, and Yosha (2003). *Source: United Nations Industrial Statistics Database (2008).*

Legislative Harmonization in Financial Services [$HARM$]**:** Index of regulatory-legislative harmonization in financial services based on the transposition of the Directives of the Financial Services Action Plan (FSAP). The FSAP was a major policy initiative at the EU-level, launched in 1998 that included 27 EU-wide legislative acts (the Directives). Until the official completion of the plan in the end of 2003, the EU legislative bodies (the Commission and the Council) had initiated 21 of these laws. However, Directives do not become immediately enforceable across the EU. EU member states have considerable discretion in the transposition (adoption) of these acts. We construct the bilateral harmonization index in three steps. First, for each country we define 21 indicator variables that equal one starting at the year of the transposition of each Directive into national law and zero otherwise. Second, we create a country-time varying legislation measure

ranging from 0 to 21 by summing the values of the 21 indicator variables for each country ($LEX_{i,t}$). Third, we take the sum of the log value of the legislation measure for each country in each year (i.e. $HARM_{i,j,t} \equiv \ln(LEX_{i,t}) + \ln(LEX_{j,t})$). The remaining six Directives of the FSAP were passed in the period $2004 - 2007$. We thus also construct an alternative index, based on the transposition of all the 27 Directives of the FSAP. *Source: Kalemli-Ozcan, Papaioannou, and Peydró (2009), based on data from the EU Commission.*

Exchange Rate Flexibility [$ERSUM$]**:** Bilateral index of the flexibility of the exchange rate, based on "fine" regime classification of Reinhart and Rogoff (2004). The country-specific index ranges from 1 to 14 where lower values suggest a more rigid regime. We construct the bilateral index by taking the sum of the log classification of countries i and j in the beginning (January) of each year t ($ERSUM = \ln(ER_{i,t}) + \ln(ER_{j,t})$). *Source: Ilzetzki, Reinhart, and Rogoff (2008) and Reinhart and Rogoff (2004).*

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Table 1: Descriptive Statistics

	Obs.	*mean*	*st. dev.*	*min*	*p25*	*p50*	*p75*	*max*
SYNCH1	5376	-1.76	1.60	-13.95	-2.44	-1.31	-0.62	0.00
SYNCH2	5376	-1.61	1.45	-12.55	-2.19	-1.23	-0.55	0.00
BANKINT1	5376	195.54	507.25	0.00	9.52	41.95	155.70	9110.02
BANKINT2	5376	63.99	151.05	0.04	4.87	18.37	62.62	4065.77
HARMON	5376	1.46	4.91	0	0	0	0	27
ERC	5376	4.17	1.57	2	3	4	5	10
TRADE	5376	0.01	0.02	0	0.00	0.00	0.01	0.29
SPEC	2739	1.88	1.18	0.24	1.10	1.61	2.32	15.33

The table reports summary statistics of the main variables used in the empirical analysis. *SYNCH1* is the negative value of the absolute difference in real p.c. GDP growth between country i and country j in year t. *SYNCH2* is the negative of the absolute difference of residual real p.c. GDP growth between country i and country j in year t. *BANKINTI1* denotes the average of bilateral stocks of assets and liabilities of countries i and j normalized by the sum of the two countries' population in year t. In the empirical specifications we use the log of this measure (*BANKINT1*). *BANKINT2* denotes the average bilateral gross flows of assets and liabilities of countries i and j normalized by the sum of the two countries' population in year t. In the empirical specifications we use the log of this measure *(BANKINT2).*

HARMON is a bilateral index of legislative and harmonization policies in financial services in the context of the Financial Services Action Plan (FSAP), initiated by the EU Commission in 1998 to integrate financial services in Europe. The value for each country-pair ranges from 0 to 27, with higher values suggesting a higher degree of harmonization. For details on the construction of all variables see Section 2.2 and the Data Appendix.

ERCSUM denotes the sum of the values of the Reinhart and Rogoff (2004) coarse exchange rate classification of countries i and j in the beginning of each year t. For each country the Reinhart and Rogoff (coarse) grid ranges from 1 to 5 with higher values indicating a more flexible currency arrangement.

TRADE denotes real bilateral imports and exports as a share of the two countries' GDP (data come from IMF's Direction of Trade Database). *SPEC* is an index of specialization that reflects the dis-similarities in industrial production in manufacturing between the two countries in each year (data come UNIDO).

Table 2: Banking Integration and Business Cycle Synchronization
Cross-Sectional and Panel Fixed-Effects Specifications

	Annual Data				5-year averaged data			
	BANKINT1		*BANKINT2*		*BANKINT1*		*BANKINT2*	
	SYNCH1	*SYNCH2*	*SYNCH1*	*SYNCH2*	*SYNCH3*	*SYNCH3*	*SYNCH3*	*SYNCH3*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Cross-Sectional ("Between") Estimates								
Banking Integrat	0.0655	0.0776	0.0655	0.0867	0.0314	0.0247	0.0432	0.0382
(*BANKINT*)	(0.022)	(0.0169)	(0.0293)	(0.0228)	(0.008)	(0.010)	(0.010)	(0.012)
	2.96	*4.58*	*2.23*	*3.80*	*3.98*	*2.55*	*4.19*	*3.11*
Trade						5.0151		4.7380
(*TRADE*)						(1.208)		(1.191)
						4.15		*3.98*
Specialization						-0.0424		-0.0455
(*SPEC*)						(0.019)		(0.019)
						-2.22		*-2.36*
R-squared (betw	0.044	0.100	0.026	0.071	0.078	0.253	0.085	0.274
Panel B: Panel Estimates ("Within") with Country-Pair and Year/Period Fixed-Effects								
Banking Integrat	-0.1864	-0.0677	-0.1574	-0.0818	-0.0537	-0.1125	-0.0392	-0.1035
(*BANKINT*)	(0.0387)	(0.0285)	(0.0400)	(0.0317)	(0.020)	(0.029)	(0.023)	(0.032)
	-4.82	*-2.38*	*-3.94*	*-2.58*	*-2.68*	*-3.91*	*-1.70*	*-3.20*
Trade						-1.3548		-1.3286
(*TRADE*)						(1.405)		(1.463)
						-0.96		*-0.91*
Specialization						-0.0240		-0.0151
(*SPEC*)						(0.029)		(0.029)
						-0.83		*-0.53*
R-squared (withi	0.131	0.131	0.128	0.132	0.226	0.253	0.222	0.274
Observations	5,376	5,376	5,376	5,376	1,118	820	1,116	818
Country-pairs	190	190	190	190	190	190	190	190

Table 2 - Notes

Panel A reports cross-sectional (between) coefficients. Panel B reports panel fixed-effect (within) coefficients that include a vector of country-pair fixed-effects and a vector of year/period fixed-effects. In the panel models in Panel B standard errors are adjusted for country-pair level heteroskedasticity and autocorrelation. In specifications (1) and (3) the dependent variable is minus one times the absolute difference in real p.c. GDP growth between country *i* and country *j* in year *t (SYNCH1)*. In specifications (2) and (4) the dependent variable is minus one times the absolute difference of residual real p.c. GDP growth between country *i* and country *j* in year *t (SYNCH2)*. These models are based on annual observations that cover the period 1978-2007. In columns (5)-(8) the dependent variable is the correlation of the cyclical component of real p.c. GDP between country i and j in each of the 6 five-year periods that cover the period 1978-2007 (SYNCH3; estimated with the Baxter and King Band-Pass filter (2,8)).
BANKINT1 denotes the one year lagged value of the average of the logs of bilateral stocks of assets and liabilities normalized by the sum of the two countries' population in year *t*. *BANKINT2* denotes the one year lagged value of the average of the logs of bilateral gross flows of assets and liabilities normalized by the sum of the two countries' population in year *t*. In columns (5)-(8) the banking integration measures *(BANKINT1* and *BANKINT2)* are averages in each of the six non-overlaping 5-year periods. *TRADE* denotes the log of real bilateral imports and exports as a share of the two countries' GDP. *SPEC* is an index of specialization that reflects the dis-similarities in industrial production (in manufacturing) between the two countries in each period. TRADE and SPEC variables are averaged over each of the six 5-year periods. The Data Appendix and Section 3.1. gives details on the construction and the sources of all variables. The Table also gives the number of country-pairs, the number of observations, the between R-squared (for the cross-sectional models) and the within R-squared (for the panel fixed-effect specifications).

Table 3: Banking Integration and Business Cycle Synchronization
Dynamic Panel Fixed-Effects Specifications

Banking Integration Measure:	*BANKINT1*	*BANKINT2*	*BANKINT1*	*BANKINT2*
	(1)	(2)	(3)	(4)
Lag (1) Banking Integration	-0.0631	-0.0743	-0.0985	-0.0968
(*BANKINT*)	(0.0276)	(0.0303)	(0.0294)	(0.0294)
	-2.29	*-2.47*	*-3.35*	*-3.29*
Lag (1) Synchronization	0.1977	0.1968	0.1956	0.1951
(*SYNCH2*)	(0.0190)	(0.0189)	(0.0192)	(0.0190)
	10.39	*10.46*	*10.17*	*10.26*
Lag (2) Synchronization	-0.0316	-0.0324	-0.0342	-0.0344
(*SYNCH2*)	(0.0129)	(0.0128)	(0.0129)	(0.0128)
	-2.46	*-2.54*	*-2.65*	*-2.68*
Lag Log GDP in country *i*			0.4706	0.3995
			(0.2430)	(0.2347)
			1.94	*1.70*
Lag Log GDP in country *j*			0.5941	0.4806
			(0.2010)	(0.1895)
			2.96	*2.54*
Long-run effect - Banking Integration	-0.0757	-0.0889	-0.1175	-0.1153
F-score	5.35	6.05	11.49	10.74
p-value	*0.021*	*0.014*	*0.001*	*0.001*
Year FE	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes
R-squared (within)	0.167	0.168	0.169	0.169
Observations	5,029	5,024	5,029	5,024
Country-pairs	190	190	190	190

The Table reports dynamic panel fixed-effect coefficients. All models include a vector of country-pair fixed-effects and a vector of year fixed-effects. Standard errors are adjusted for country-pair level heteroskedasticity and autocorrelation and corresponding t-statistics are reported below the estimates. In all specifications the dependent variable is minus one times the absolute difference of residual real p.c. GDP growth between country *i* and country *j* in year *t (SYNCH2)*. All specifications include two lags of the dependent variable. In the last two specifications we control for the lagged log level of per capita GDP in country *i* and country *j*.

BANKINT1 denotes the one year lagged value of the average of the logs of bilateral stocks of assets and liabilities

normalized by the sum of the two countries' population in year t. *BANKINT2* denotes the one year lagged value of the average of the logs of bilateral gross flows in assets and liabilities normalized by the sum of the two countries' population in year t. The Data Appendix and Section 3.1. gives details on the construction and the sources of all variables. The Table also gives the long-run coefficient of banking integration and the corresponding F-score and p-value.

Table 4: Legislative and Regulatory Harmonization in Financial Services, Banking Integration and Business Cycle Synchronization: Instrumental Variables Specifications

	Static		Dynamic		Static		Dynamic	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: 2SLS Estimates: Dependent Variable is Business Cycle Synchronization								
Banking Integration	-0.4044	-0.4672	-0.4060	-0.4764	-0.5417	-0.6674	-0.5428	-0.6720
(*BANKINT2*)	(0.1365)	(0.1340)	(0.1239)	(0.1227)	(0.1800)	(0.1920)	(0.1775)	(0.1924)
	-2.96	*-3.49*	*-3.28*	*-3.88*	*-3.01*	*-3.48*	*-3.06*	*-3.49*
Exchange Rate Regime					-0.1746	-0.2328	-0.1760	-0.2285
(*ERCSUM*)					(0.0726)	(0.0822)	(0.0840)	(0.0926)
					-2.41	*-2.83*	*-2.10*	*-2.47*
Panel B: 1st Stage Estimates: Dependent Variable is Banking Integration								
Financial Sector	0.3146	0.2879	0.3038	0.2743	0.2597	0.2236	0.2312	0.1983
Harmonization	(0.0523)	(0.0458)	(0.0509)	(0.0445)	(0.0498)	(0.0430)	(0.0479)	(0.0417)
(*HARMON*)	*6.02*	*6.28*	*5.97*	*6.16*	*5.22*	*5.20*	*4.82*	*4.76*
Exchange Rate Regime	__				-0.2221	-0.2596	-0.3074	-0.3237
(*ERCSUM*)					(0.0589)	(0.0587)	(0.0625)	(0.0602)
					-3.77	*-4.42*	*-4.92*	*-5.38*
F-score	36.24	39.47	35.64	37.97	27.22	27.08	23.27	22.64
p-value	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Panel C: Reduced Form Estimates: Dependent Variable is Business Cycle Synchronization								
Financial Sector	-0.1246	-0.1322	-0.1236	-0.1311	-0.1380	-0.1474	-0.1244	-0.1326
Harmonization	(0.0355)	(0.0341)	(0.0292)	(0.0279)	(0.0374)	(0.0362)	(0.0308)	(0.0297)
(*HARMON*)	*-3.51*	*-3.87*	*-4.23*	*-4.71*	*-3.69*	*-4.08*	*-4.04*	*-4.47*
Exchange Rate Regime					-0.0538	-0.0608	-0.0033	-0.0061
(*ERCSUM*)					(0.0479)	(0.0476)	(0.0464)	(0.0456)
					-1.12	*-1.28*	*-0.07*	*-0.13*
R-squared (within)	0.129	0.130	0.165	0.165	0.129	0.130	0.165	0.165
GDP Controls	No	Yes	No	Yes	No	Yes	No	Yes

Columns	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5376	5376	5029	5024	5376	5376	5029	5024
Country-pairs	190	190	190	190	190	190	190	190

The Table reports (static and dynamic) panel fixed-effect instrumental variable coefficients. Panel A reports 2nd-Stage estimates. Panel B reports 1st-stage estimates and regression diagnostics and Panel C reports the reduced form estimates. All models include a vector of country-pair fixed-effects and a vector of year fixed-effects. Standard errors are adjusted for country-pair level heteroskedasticity and autocorrelation and corresponding t-statistics are reported below the estimates. In all specifications the dependent variable is minus one times the absolute difference of residual real p.c. GDP growth between country *i* and country *j* in year *t (SYNCH2)*.
BANKINT2 denotes the one year lagged value of the average of the logs of bilateral gross flows in assets and liabilities normalized by the sum of the two countries' population in year *t*. The banking integration measure is instrumented with a bilateral time-varying measure of legislative-regulatory harmoninzation policies in financial services, conducted in the context of the Financial Services Action Plan (that cover capital markets, banking, and insurance). The specifications reported in columns (5)-(8) include as control variable a bilateral time-varying measure of the flexibility of the exchange rate regime, based on the "coarse" regime classification of Reinhart and Rogoff (2004). The Data Appendix and Section 3.1. gives details on the construction and the sources of all variables.

Table 5: Legislative and Regulatory Harmonization in Financial Services, Banking Integration and Business Cycle Synchronization: Instrumental Variables Robustness

2SLS Estimates: Dependent Variable is Business Cycle Synchronization								
	Static				*Dynamic*			
Integration Measure	*BANKINT1*		*BANKINT2*		*BANKINT1*		*BANKINT2*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Banking Integration	-0.7062	-0.7601	-0.7970	-0.8552	-0.5863	-0.6326	-0.6827	-0.7350
(*BANKINT*)	(0.3159)	(0.3350)	(0.2318)	(0.2546)	(0.2506)	(0.2663)	(0.1980)	(0.2199)
	-2.24	*-2.27*	*-3.44*	*-3.36*	*-2.34*	*-2.38*	*-3.45*	*-3.34*
Exchange Rate Regime	-0.1557	-0.1710	-0.1757	-0.1947	-0.1196	-0.1329	-0.1490	-0.1652
(*ERCSUM*)	(0.1190)	(0.1211)	(0.1120)	(0.1134)	(0.0996)	(0.1009)	(0.0983)	(0.0998)
	-1.31	*-1.41*	*-1.57*	*-1.72*	*-1.20*	*-1.32*	*-1.52*	*-1.66*
Trade	1.8426	2.2900	2.5095	2.9228	1.6575	2.0170	1.9358	2.3124
(*TRADE*)	(4.7717)	(4.2788)	(3.6487)	(3.0220)	(3.8155)	(3.3700)	(3.0715)	(2.5526)
	0.39	*0.54*	*0.69*	*0.97*	*0.43*	*0.60*	*0.63*	*0.91*
Specialization	-0.1442	-0.1352	-0.1682	-0.1584	-0.1831	-0.1750	-0.1776	-0.1689
(*SPEC*)	(0.0809)	(0.0821)	(0.0649)	(0.0675)	(0.0635)	(0.0639)	(0.0535)	(0.0554)
	-1.78	*-1.65*	*-2.59*	*-2.35*	*-2.88*	*-2.74*	*-3.32*	*-3.05*
Log GDP in *i*	*3.8124*	*3.4076*	*2.9333*	*2.4555*	*3.0111*	*2.6821*	*2.3670*	*1.9671*
(*GDP*)	(0.9145)	(0.7604)	(0.6474)	(0.5556)	(0.7498)	(0.6285)	(0.5655)	(0.4872)
	4.17	*4.48*	*4.53*	*4.42*	*4.02*	*4.27*	*4.19*	*4.04*
Log GDP in *j*	4.8313	4.4450	2.7398	2.2924	3.9000	3.5699	2.1959	1.8044
(*GDP*)	(0.6336)	(0.5100)	(0.5016)	(0.4134)	(0.5401)	(0.4428)	(0.4626)	(0.3844)
	7.63	*8.72*	*5.46*	*5.54*	*7.22*	*8.06*	*4.75*	*4.69*
1st Stage *F*-score	17.06	16.43	17.06	16.43	16.72	16.16	16.60	16.09
p-value	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3587	3582	3587	3582	3587	3582	3587	3582
Country-pairs	190	190	190	190	190	190	190	190

The Table reports (static and dynamic) second-stage estimates of panel fixed-effect instrumental variable coefficients. All models include a vector of country-pair fixed-effects and a vector of year fixed-effects. Standard errors are adjusted for country-pair level heteroskedasticity and autocorrelation and corresponding t-statistics are reported below the estimates. In all specifications the dependent variable is minus one times the absolute difference of residual real p.c. GDP growth between country i and country j in year t *(SYNCH2)*.

BANKINT1 denotes the average of the logs of bilateral stocks of assets and liabilities normalized by the sum of the two countries' population in year t. *BANKINT2* denotes the average of the logs of bilateral gross flows of assets and liabilities normalized by the sum of the two countries' population in year t. *TRADE* denotes the log of real bilateral imports and exports as a share of the two countries' GDP. *SPEC* is an index of specialization that reflects the dis-similarities in industrial production (in manufacturing) between the two countries in each period. ERCSUM is a bilateral time-varying measure of the flexibility of the exchange rate regime, based on the "coarse" regime classification of Reinhart and Rogoff (2004). The specifications also control for the log level of GDP in countries i and j in each year t. All explanatory variables are one period lagged. The Data Appendix and Section 3.1. gives details on the construction and the sources of all variables. The two banking integration measures are instrumented with a bilateral time-varying measure of legislative-regulatory harmoninzation policies in financial services, conducted in the context of the Financial Services Action Plan (that cover capital markets, banking, and insurance).

Figure 1: Banking Integration over Time

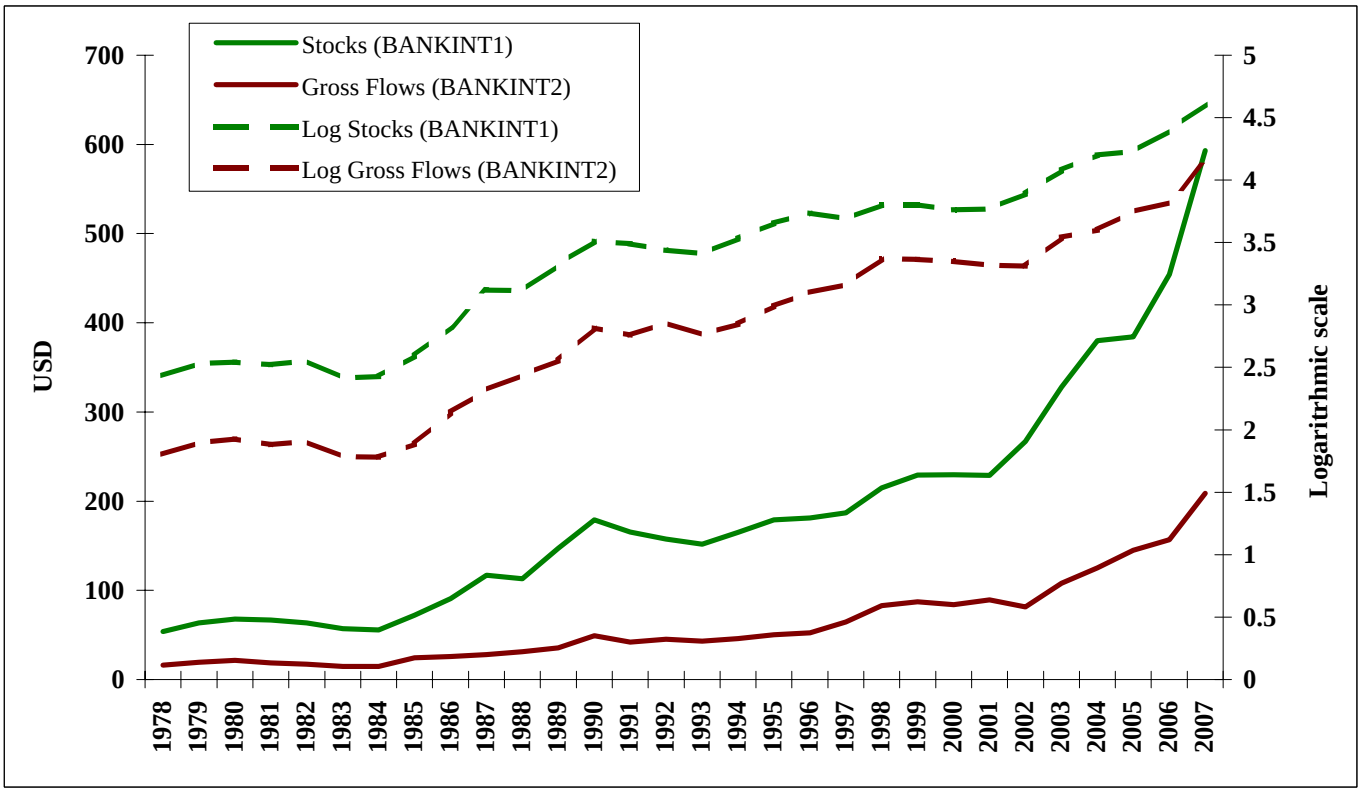


Figure 1 plots the evolution of the two banking integration measures, expressed in levels (solid lines) and in logs (dashed lines). *BANKINT1* denotes the average of the logs of bilateral stocks of assets and liabilities normalized by the sum of the two countries' population. *BANKINT2* denotes the average of the logs of bilateral gross flows of assets and liabilities normalized by the sum of the two countries' population.

Figure 2: GDP Synchronization across Time

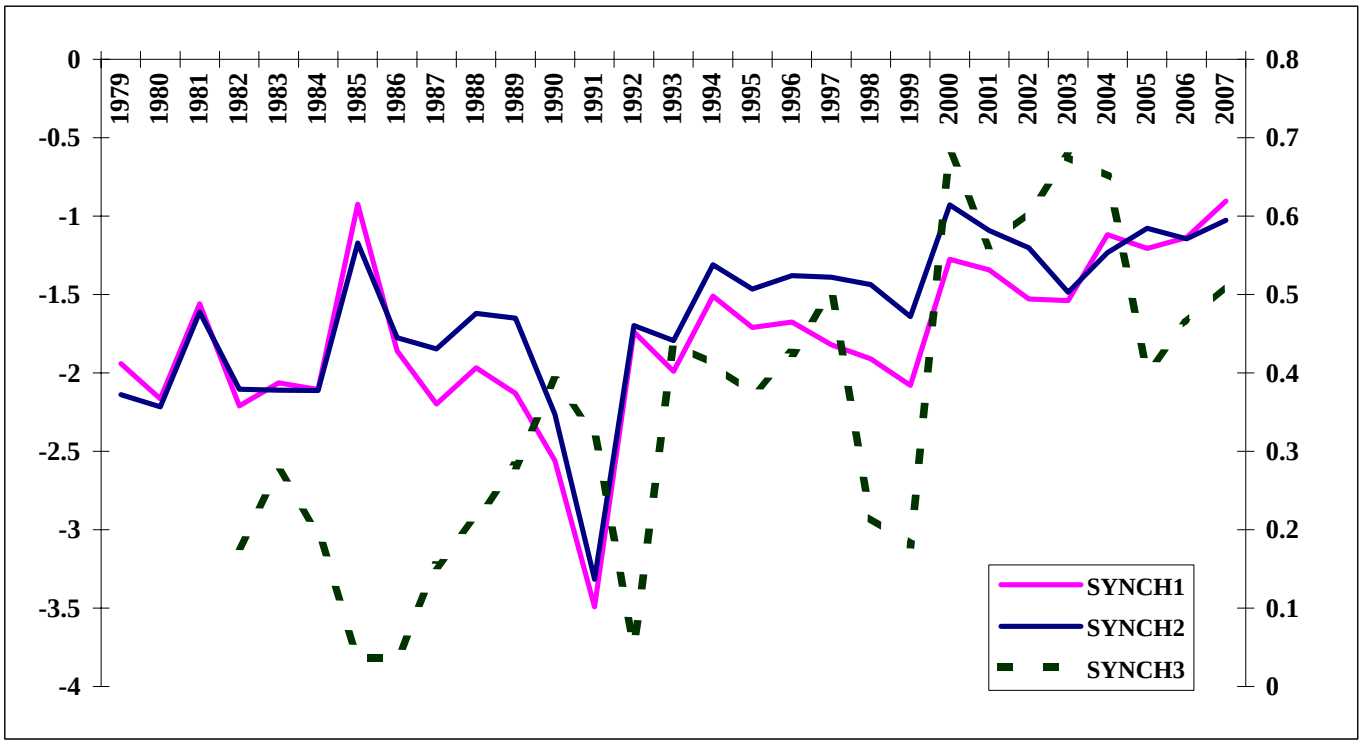
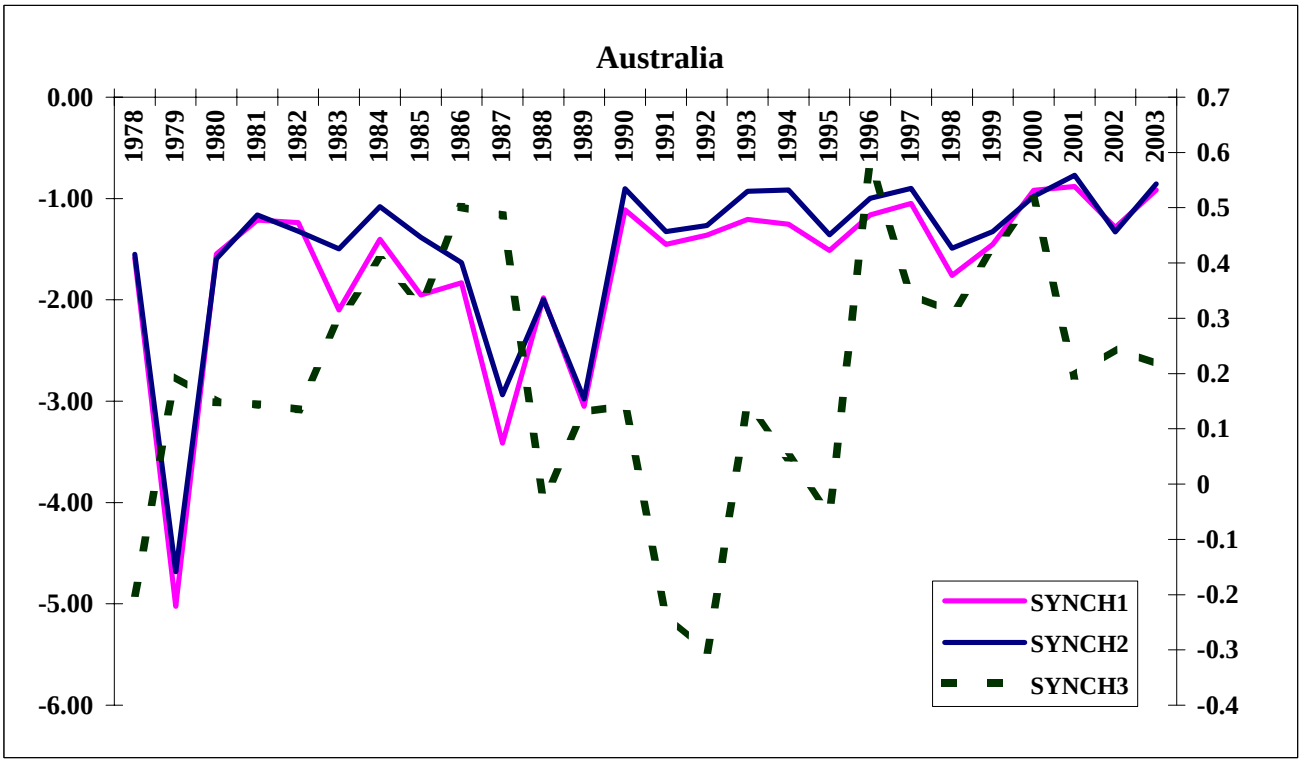


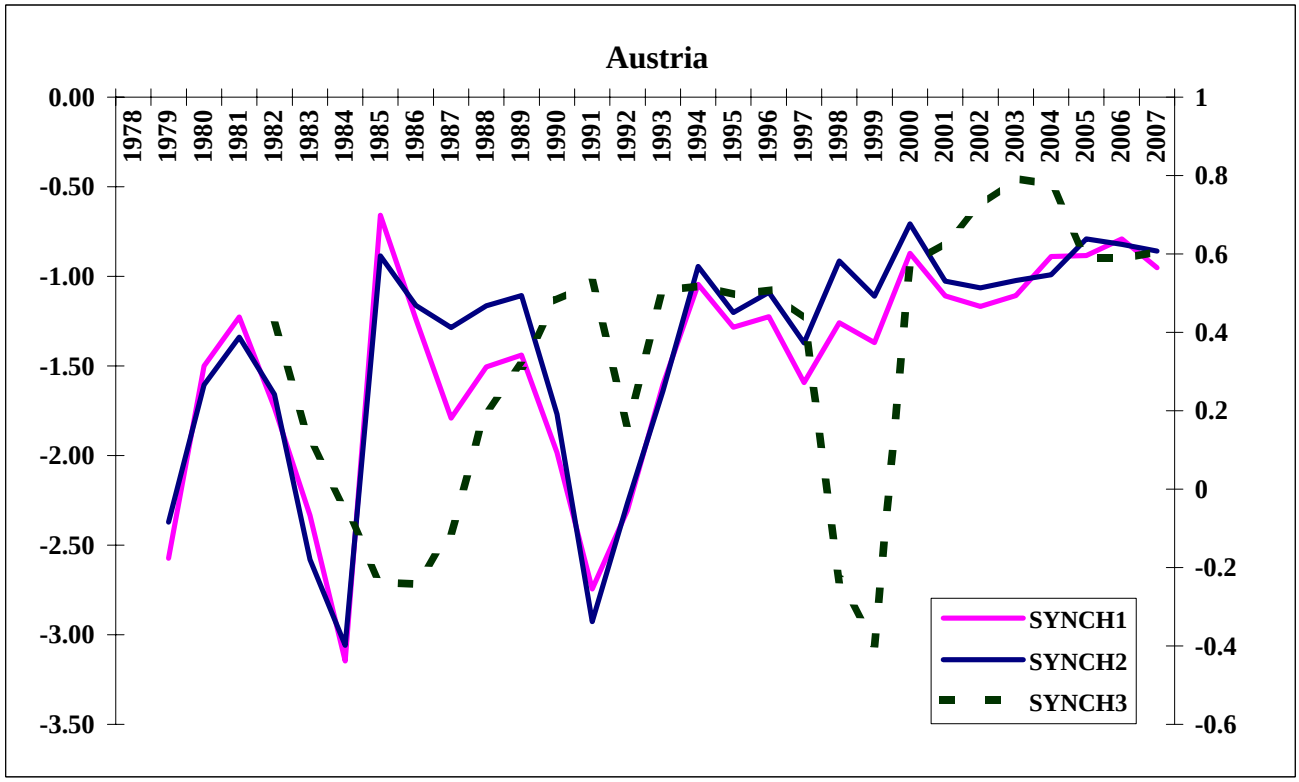
Figure 2 plots the evolution of the average value of each of the three synchronization measures employed in the empirical analysis across the 1978-2007 period. For each year the average is estimated across 190 country pairs (our sample spans 20 countries). *SYNCH1* is the negative value of the absolute difference in real p.c. GDP growth between country i and country j in year t. *SYNCH2* is the negative of the absolute difference of residual real p.c. GDP growth between country i and country j in year t. *SYNCH3* is the correlation of the cyclical component of real p.c. GDP between country i and j in each five-year period (estimated with the Baxter and King Band-Pass filter (2,8)). The correlation is estimated with a five-year rolling window. See the Supplementary Appendix for the evolution fo the three synchronization measures for each of the twenty countries in our sample.

Supplementary Appendix

Appendix Figure 1.1

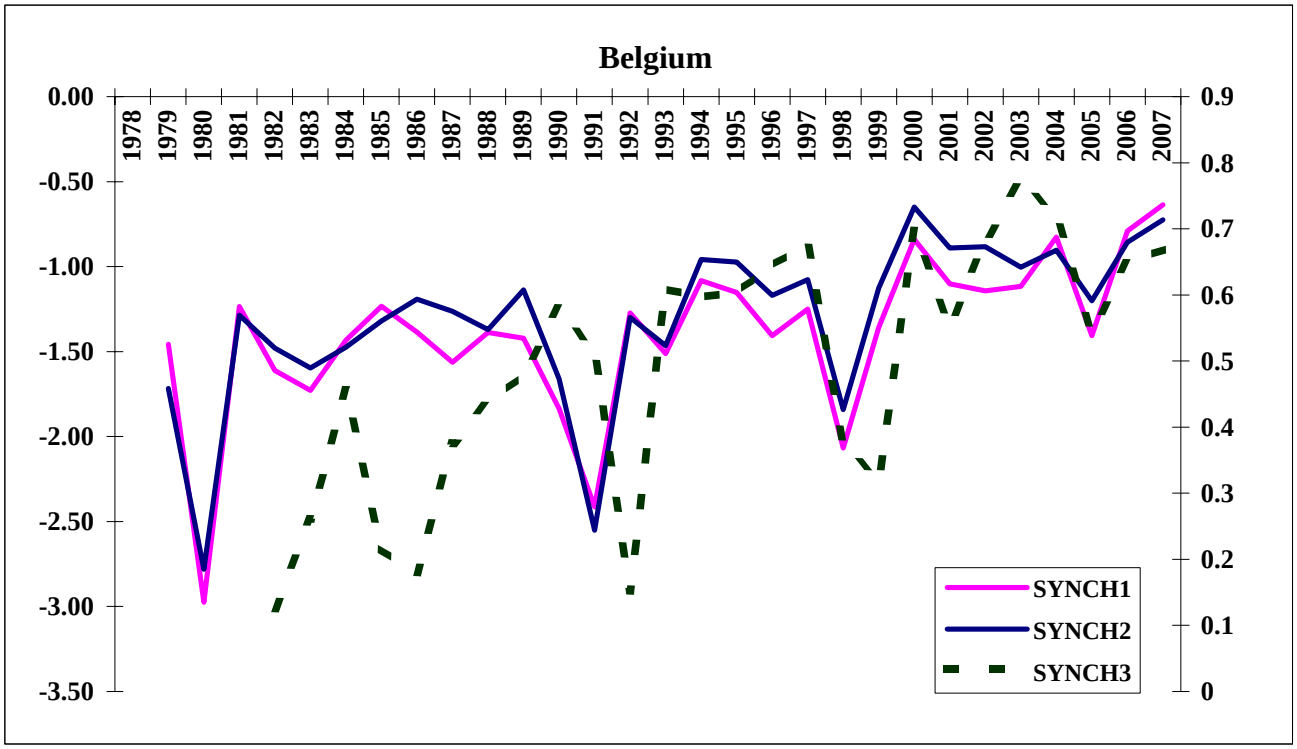


Appendix Figure 1.2

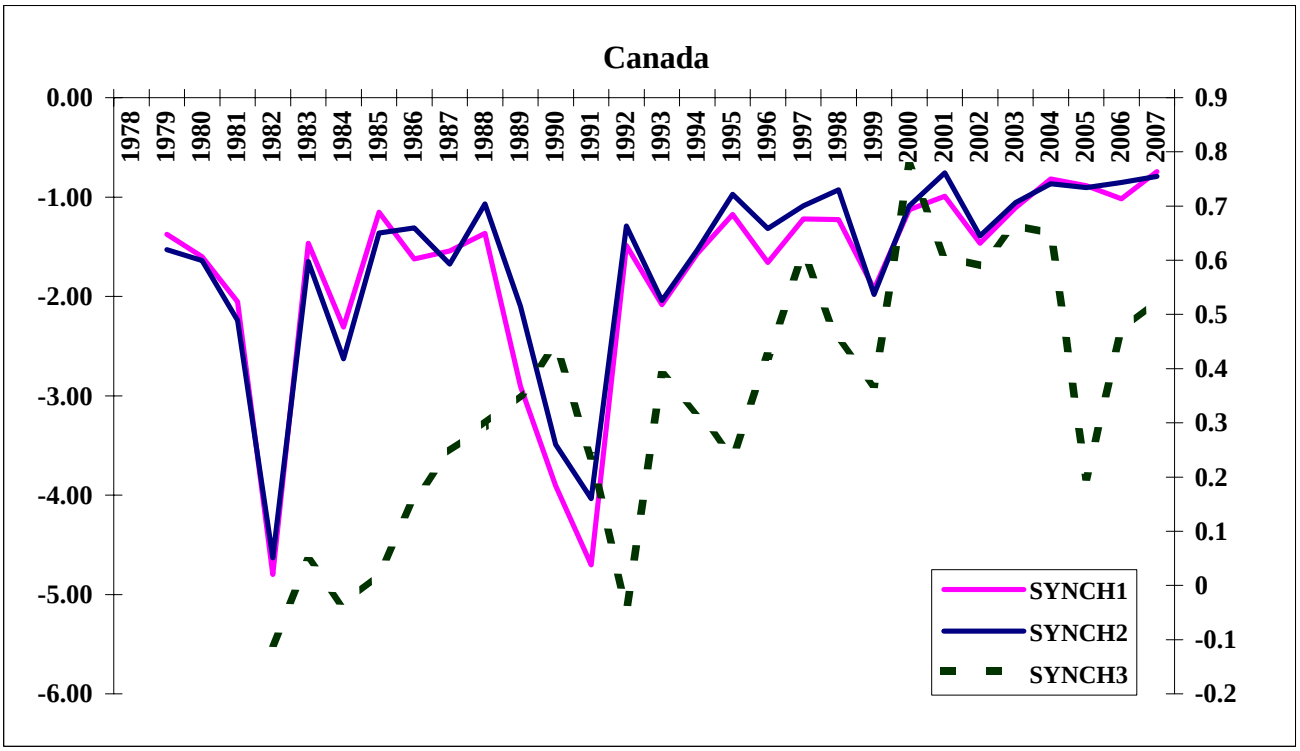


Supplementary Appendix

Appendix Figure 1.3

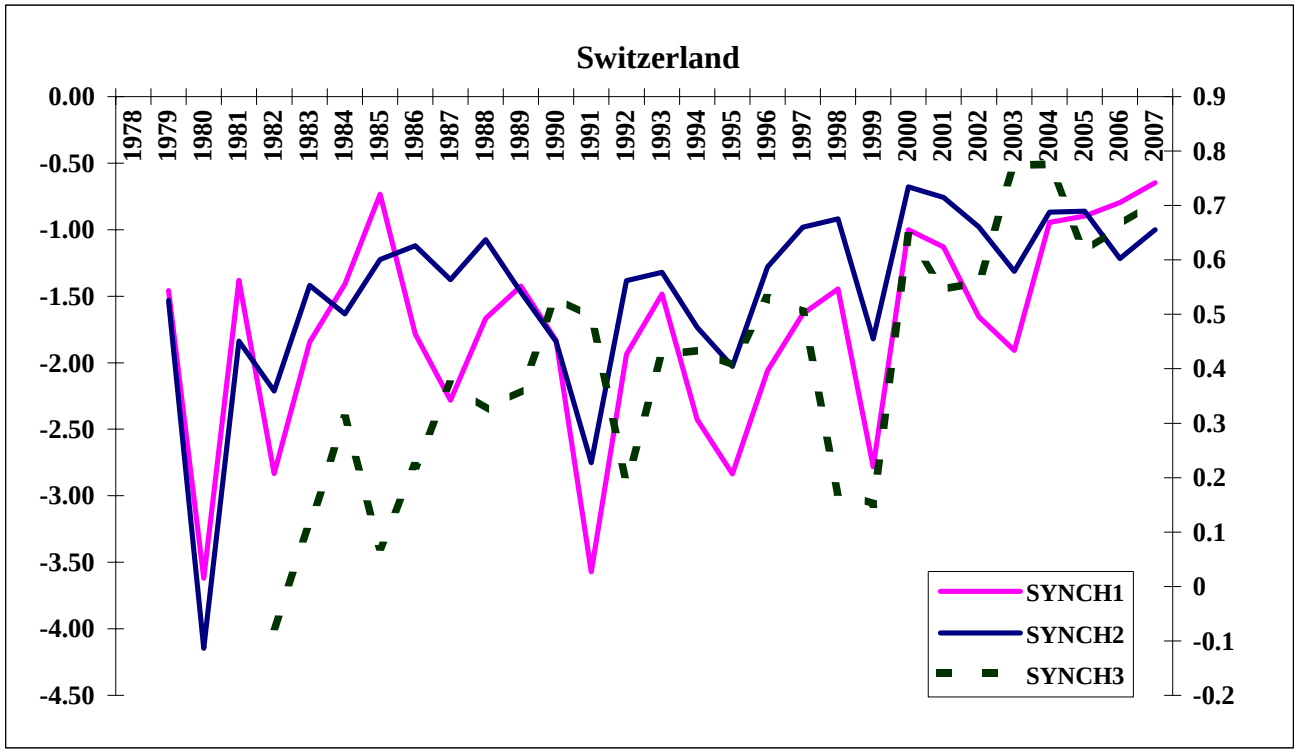


Appendix Figure 1.4

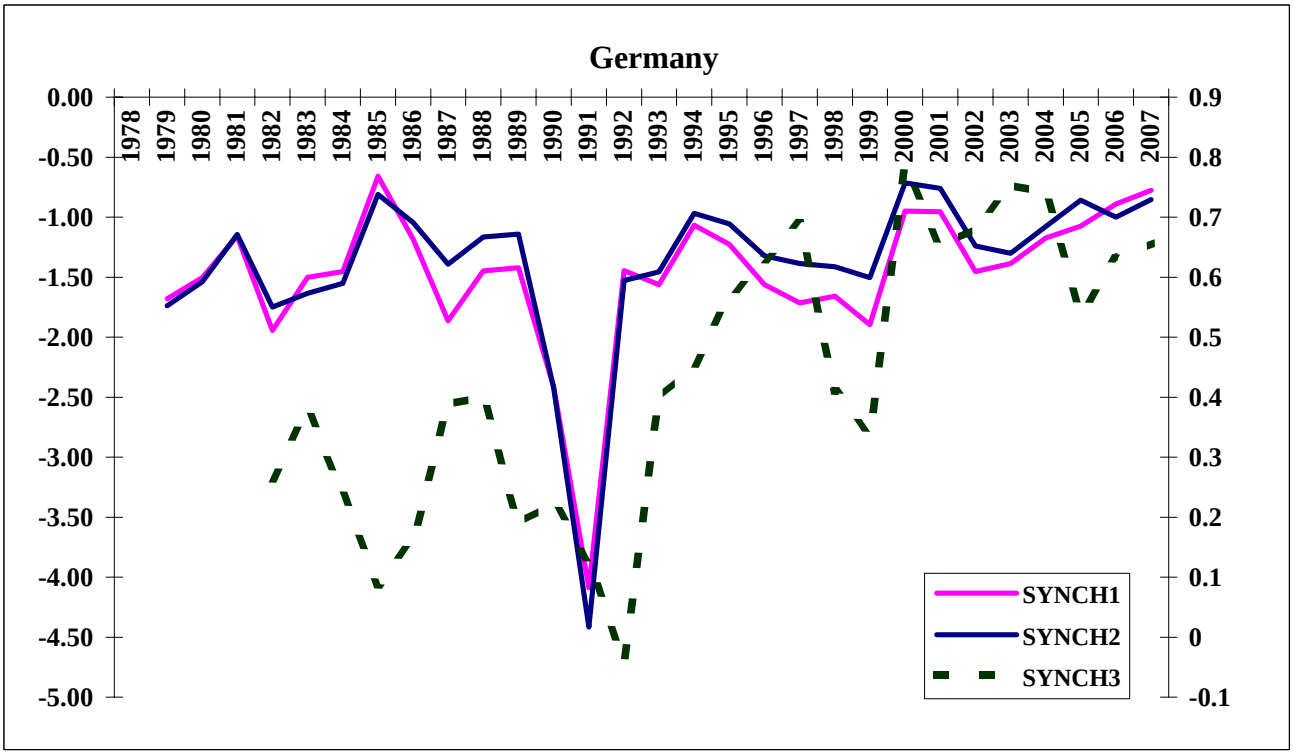


Supplementary Appendix

Appendix Figure 1.5

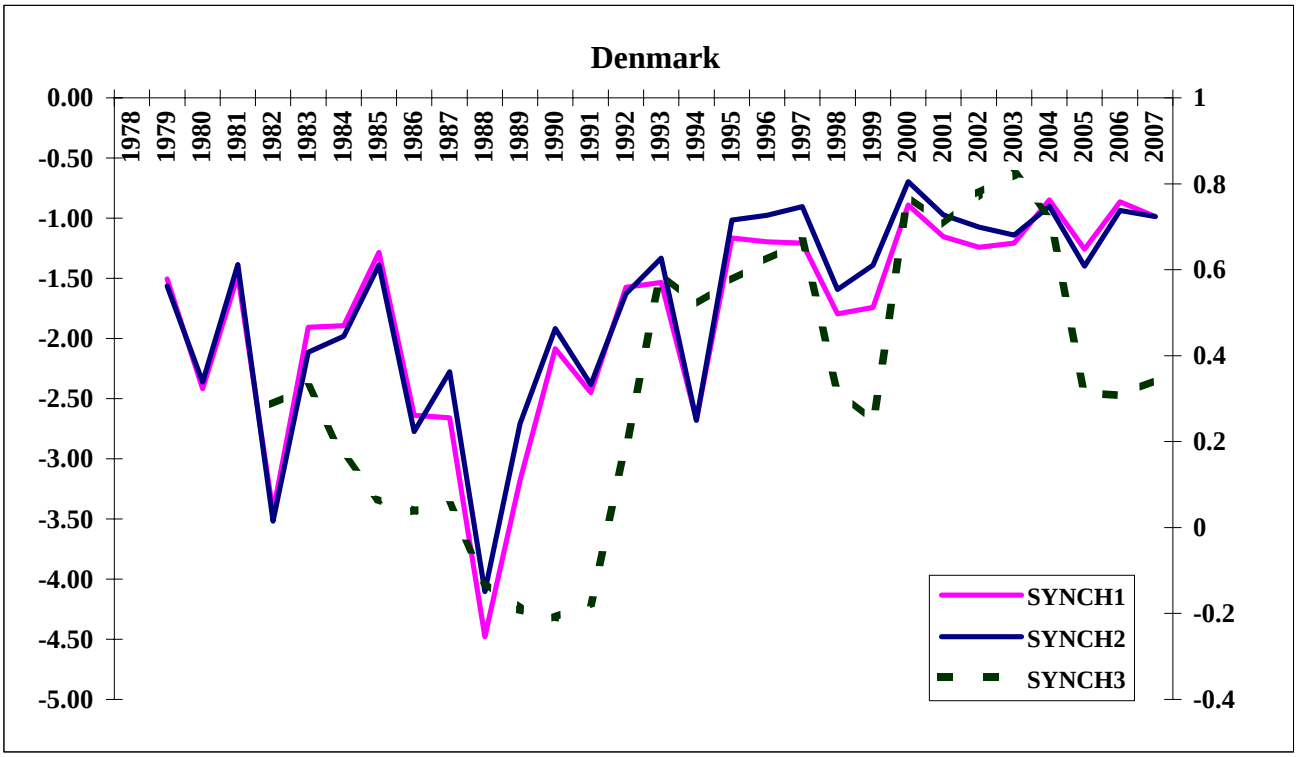


Appendix Figure 1.6

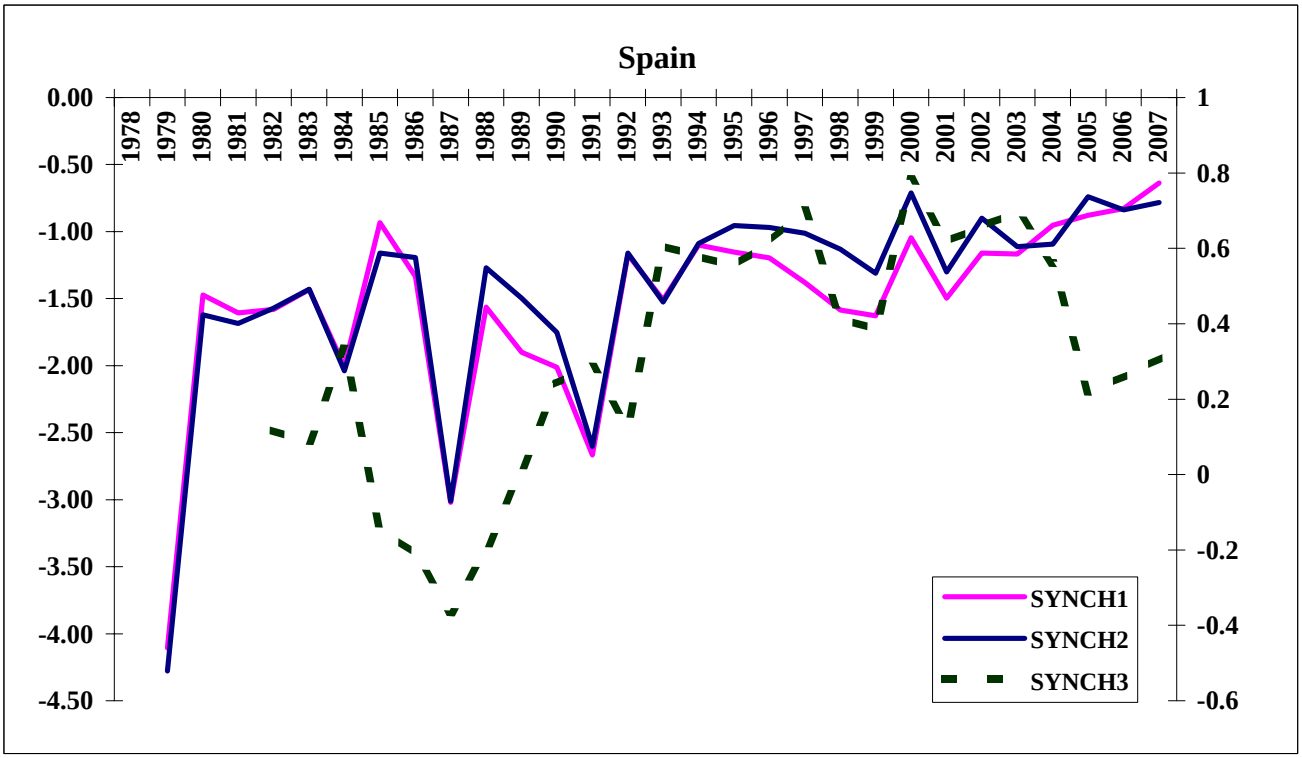


Supplementary Appendix

Appendix Figure 1.7

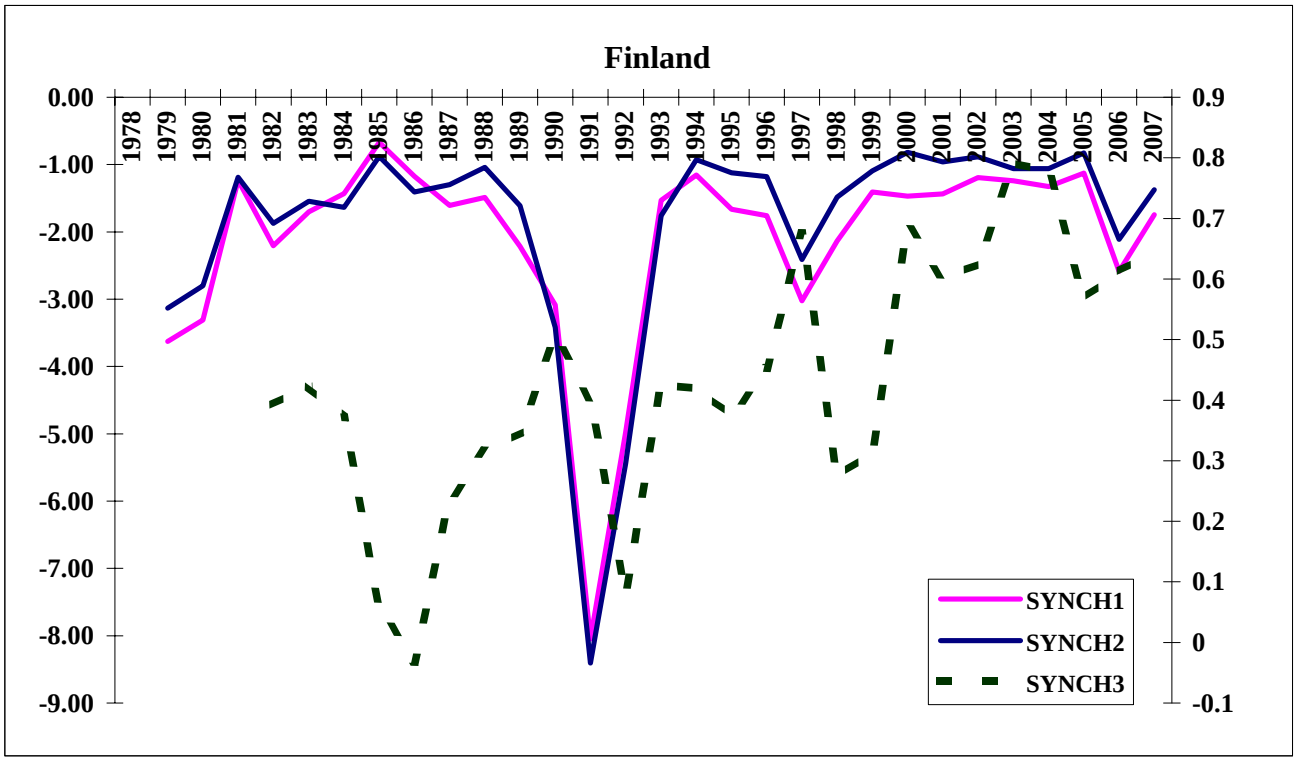


Appendix Figure 1.8

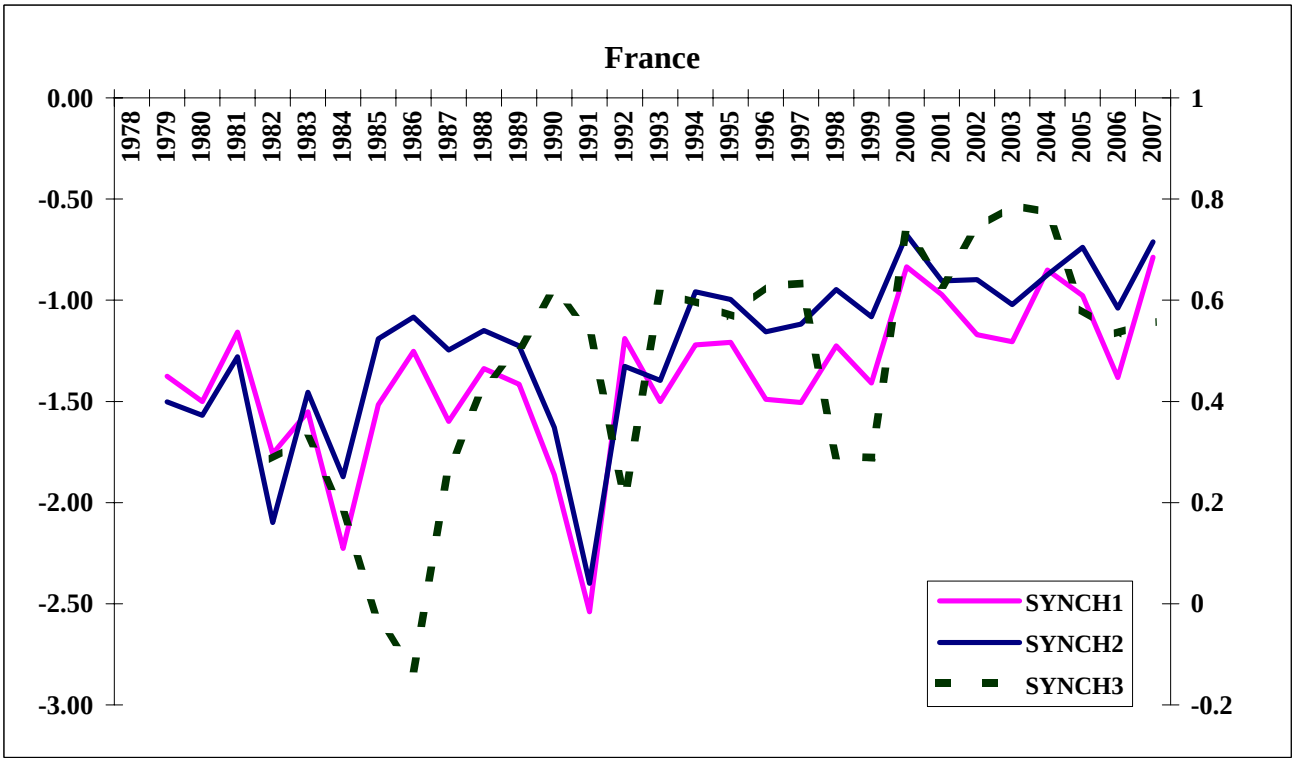


Supplementary Appendix

Appendix Figure 1.9

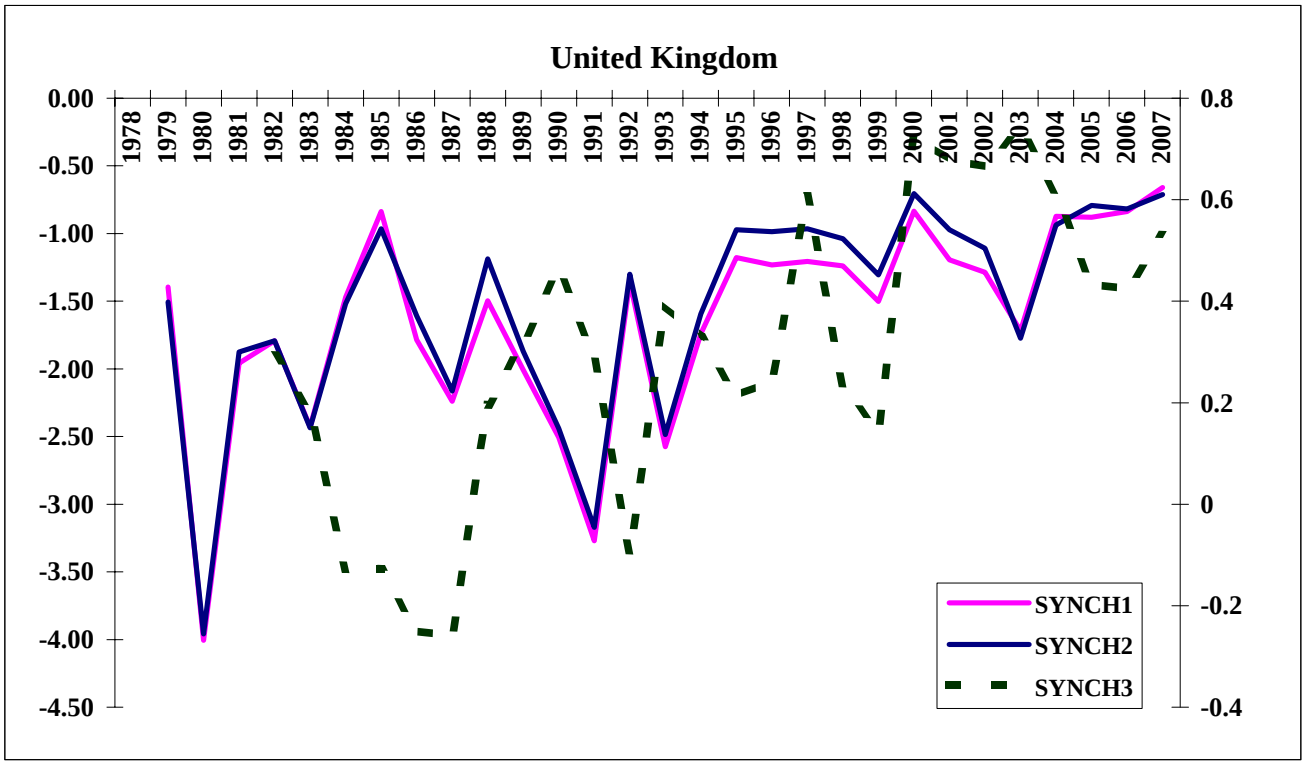


Appendix Figure 1.10

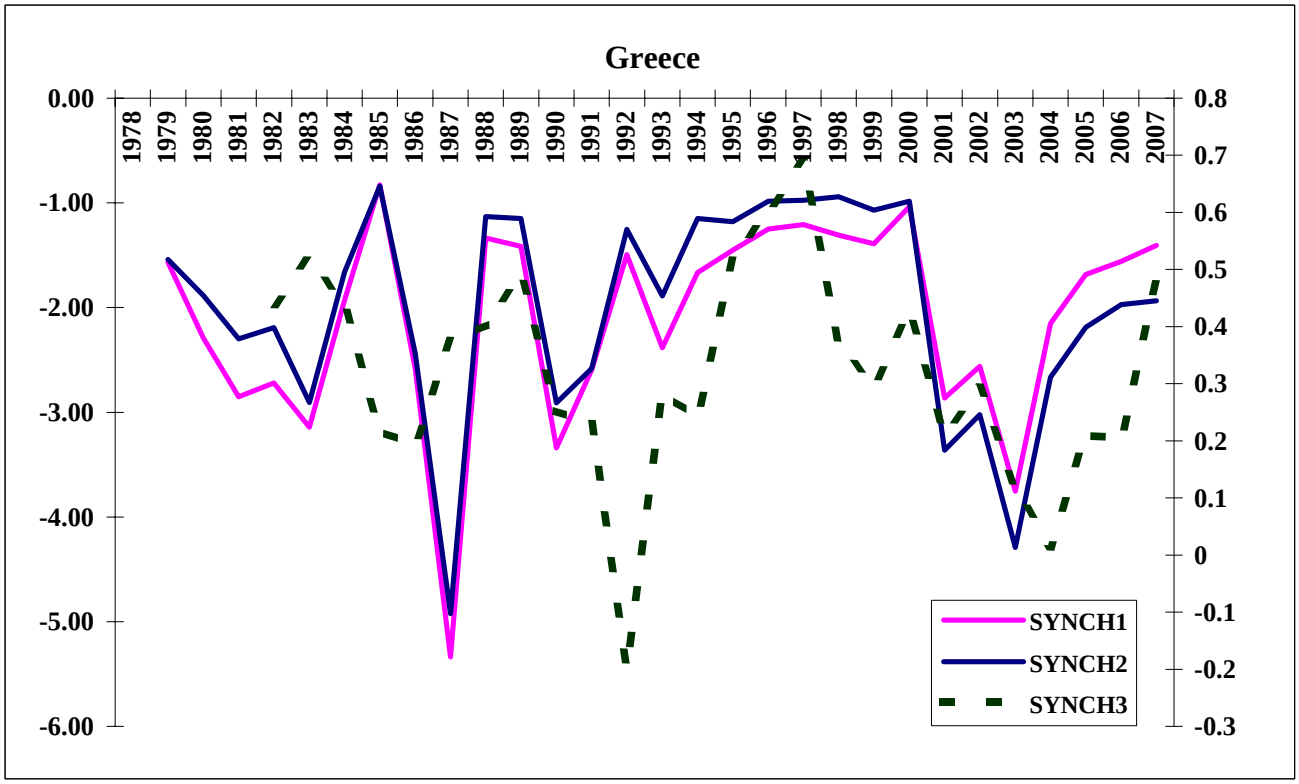


Supplementary Appendix

Appendix Figure 1.11

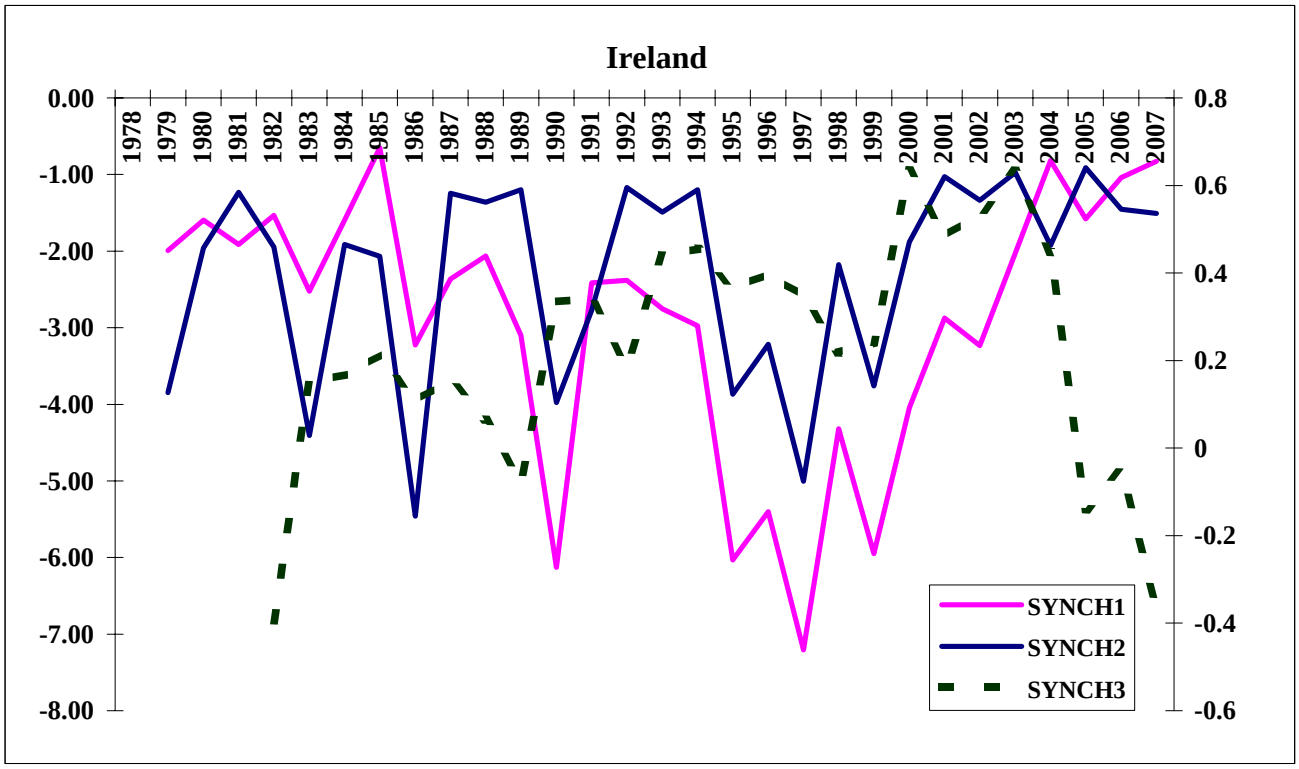


Appendix Figure 1.12

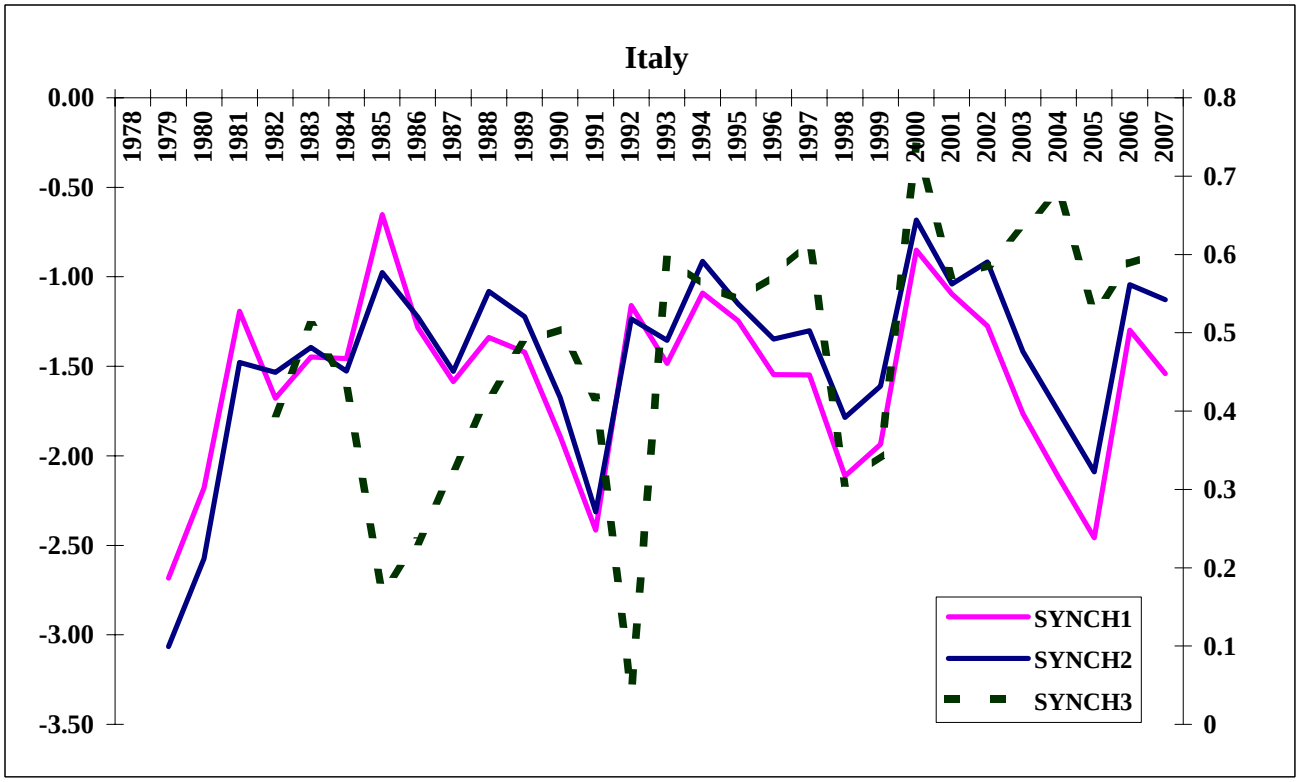


Supplementary Appendix

Appendix Figure 1.13

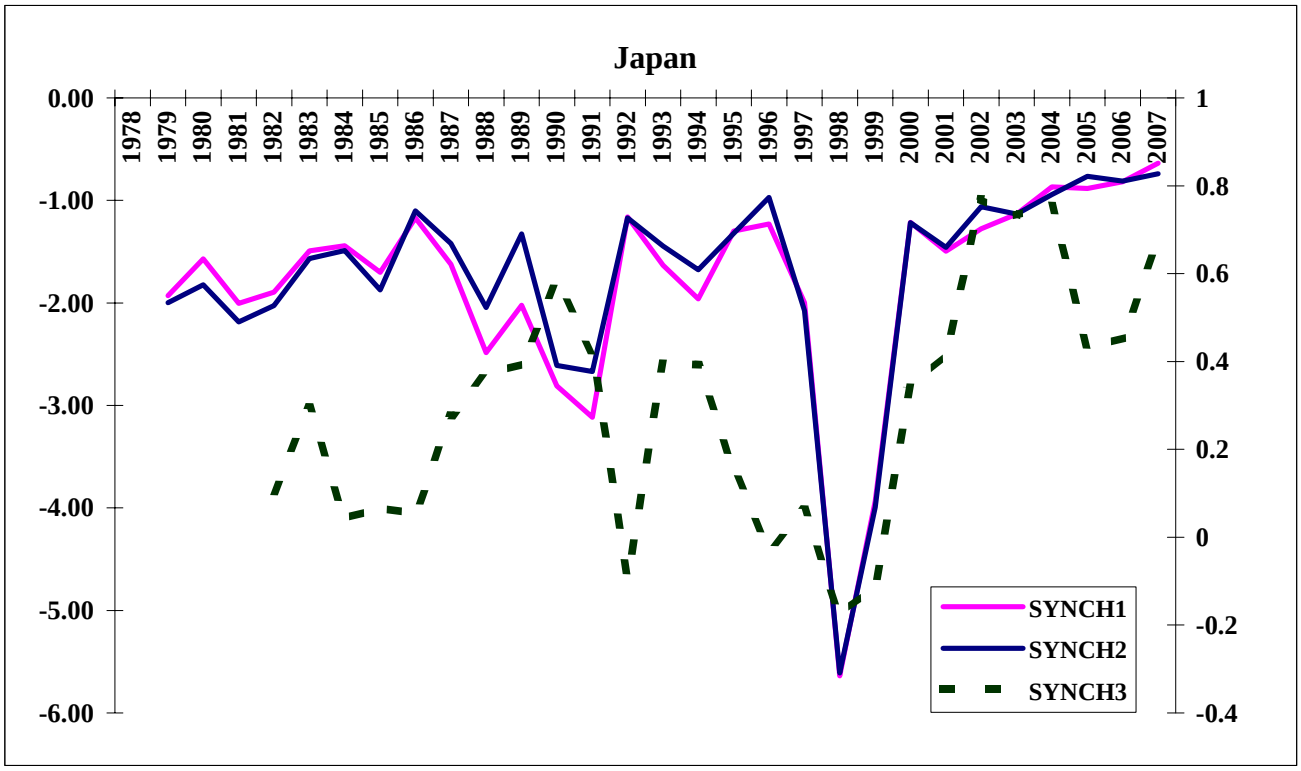


Appendix Figure 1.14

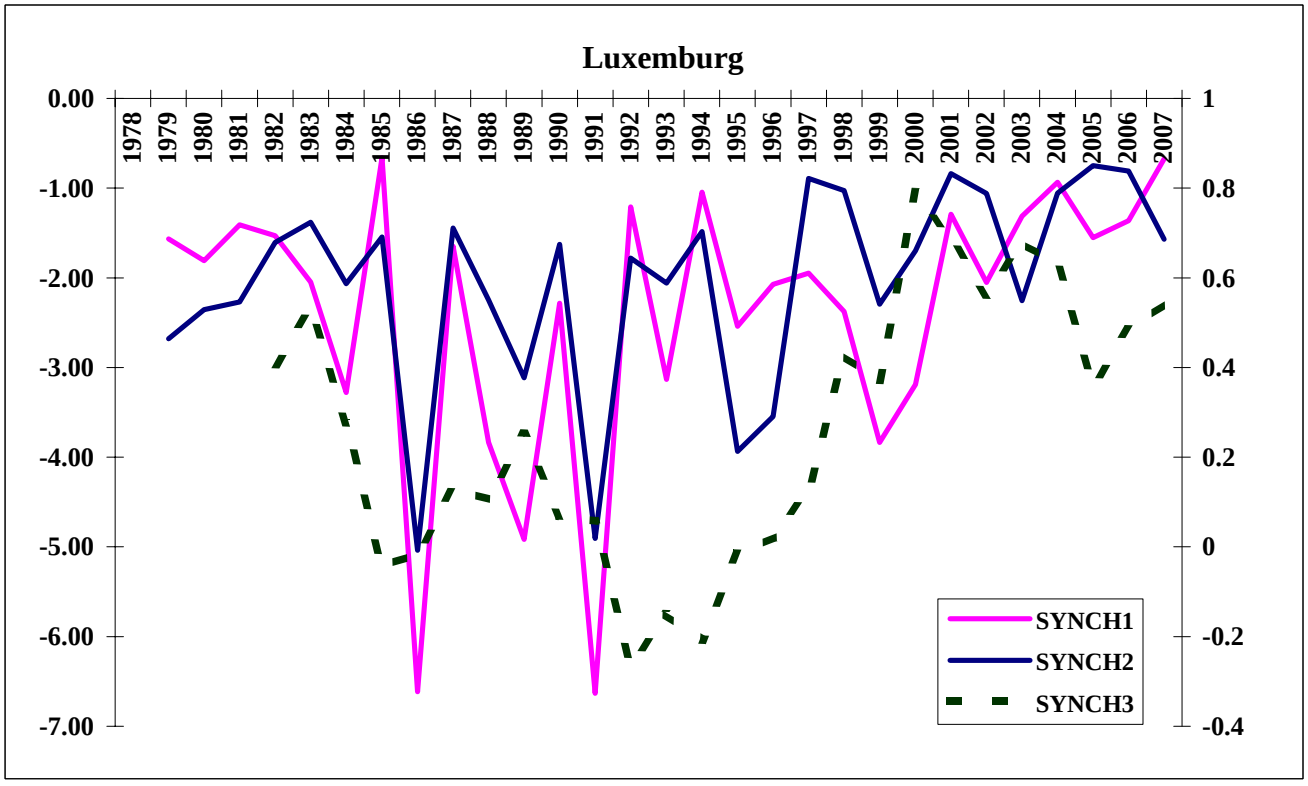


Supplementary Appendix

Appendix Figure 1.15

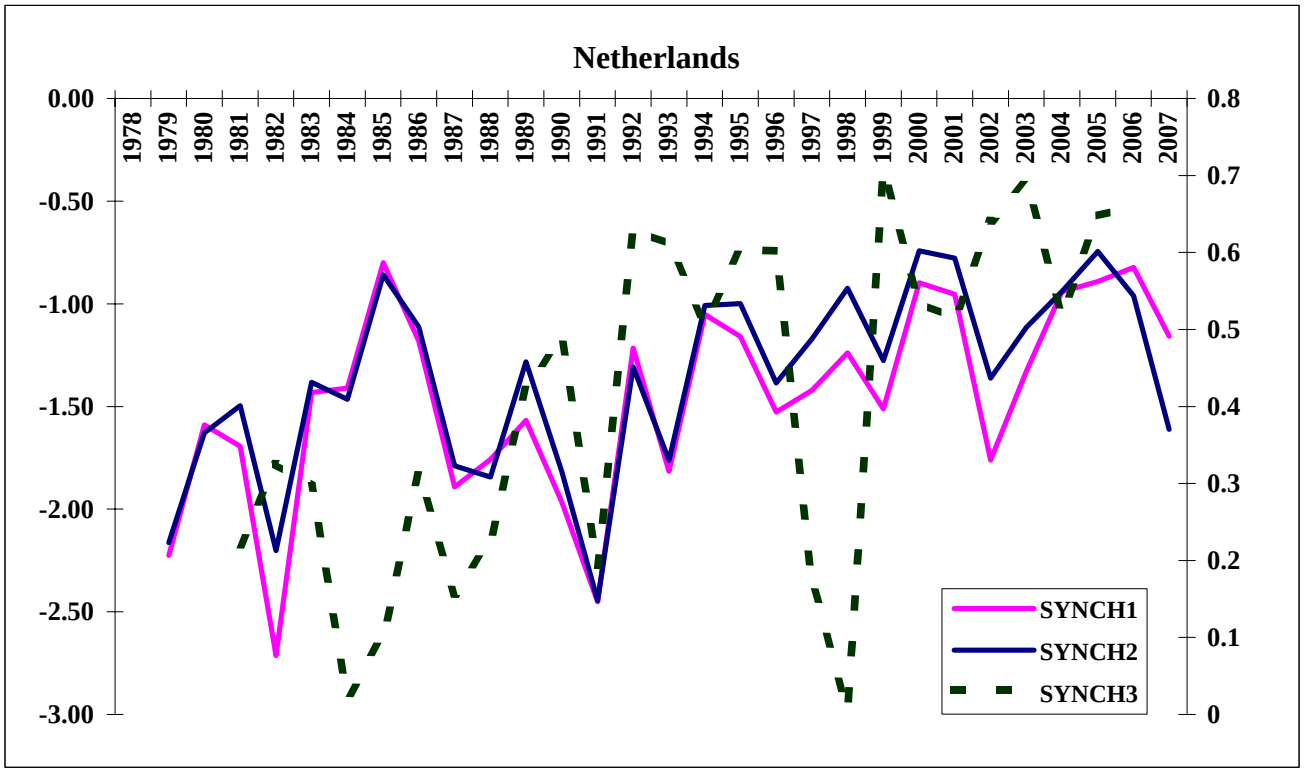


Appendix Figure 1.16

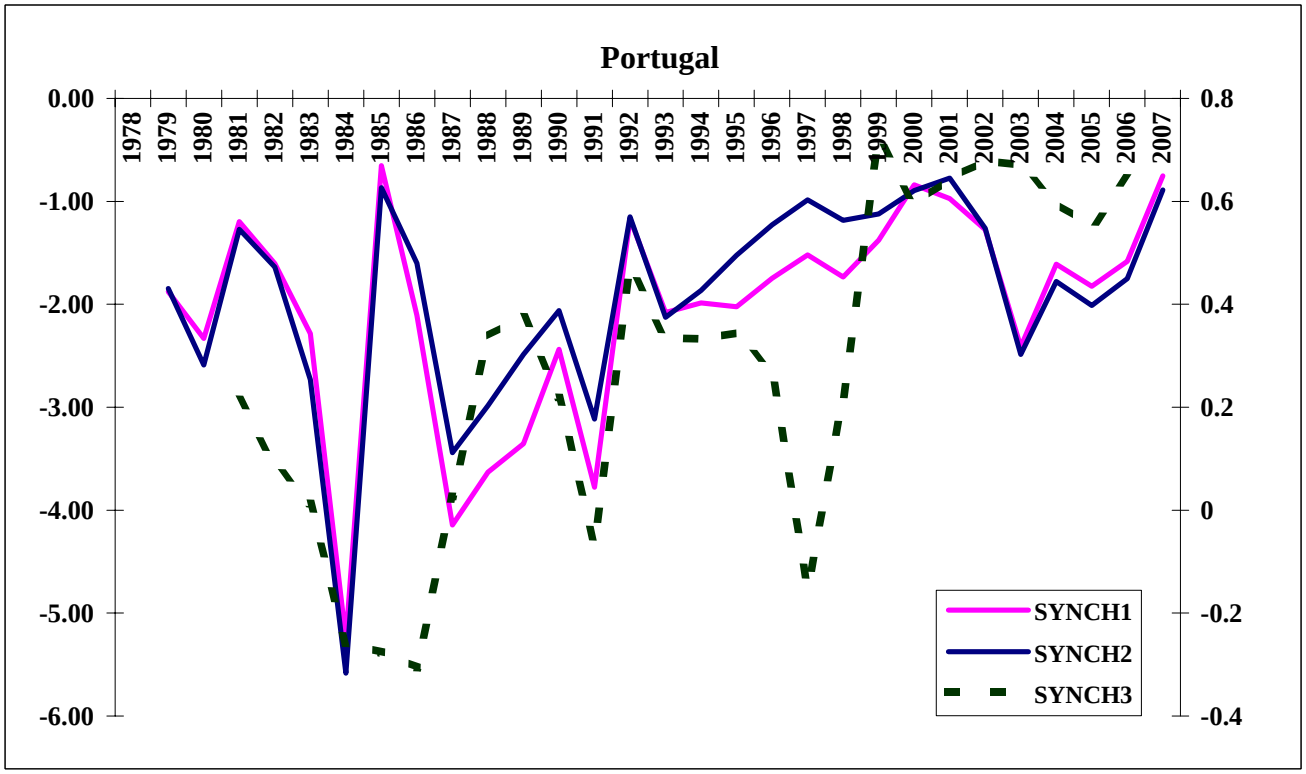


Supplementary Appendix

Appendix Figure 1.17

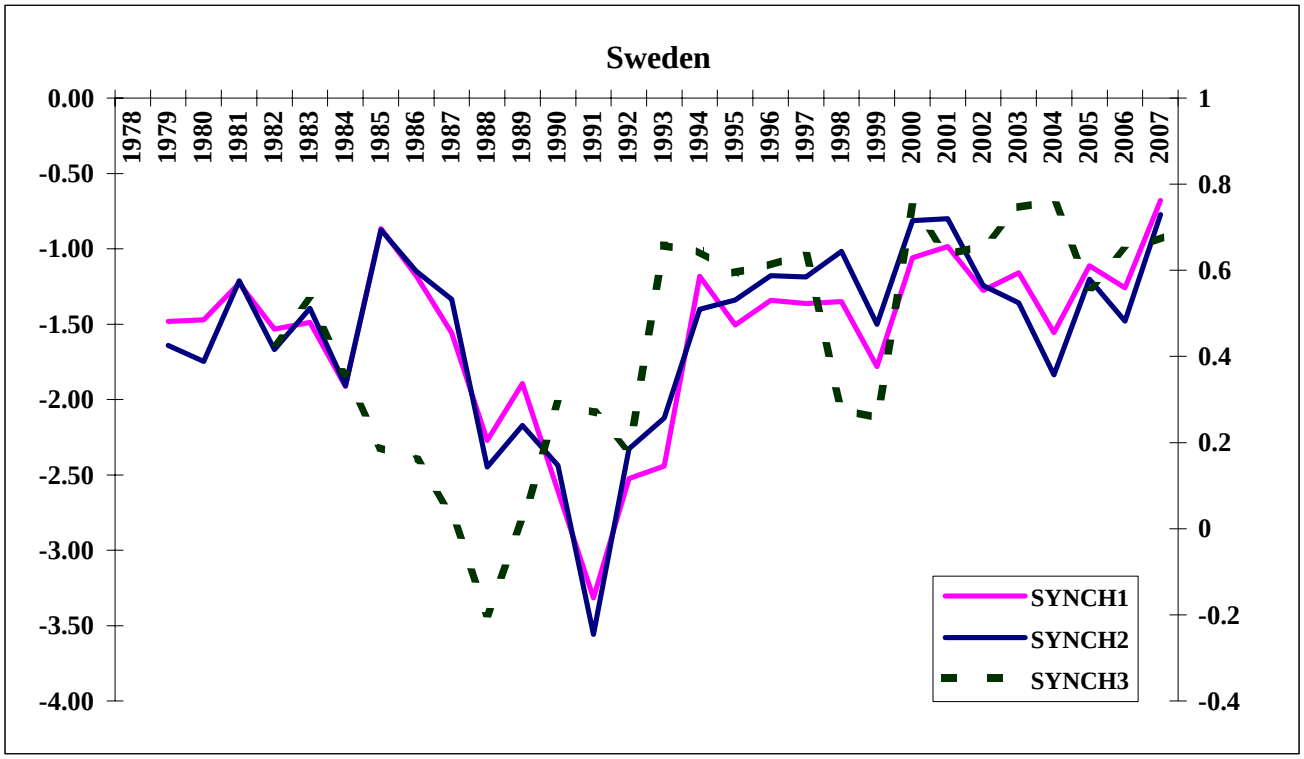


Appendix Figure 1.18

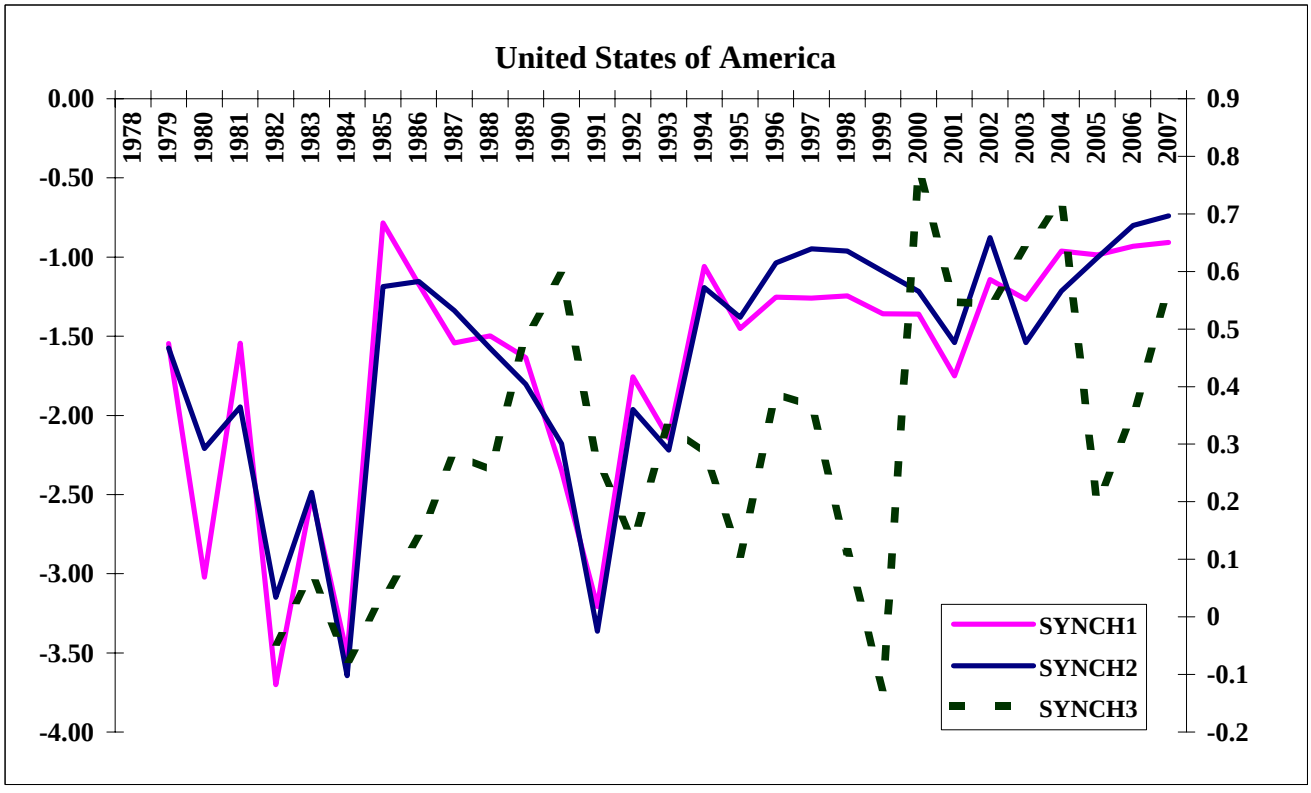


Supplementary Appendix

Appendix Figure 1.19

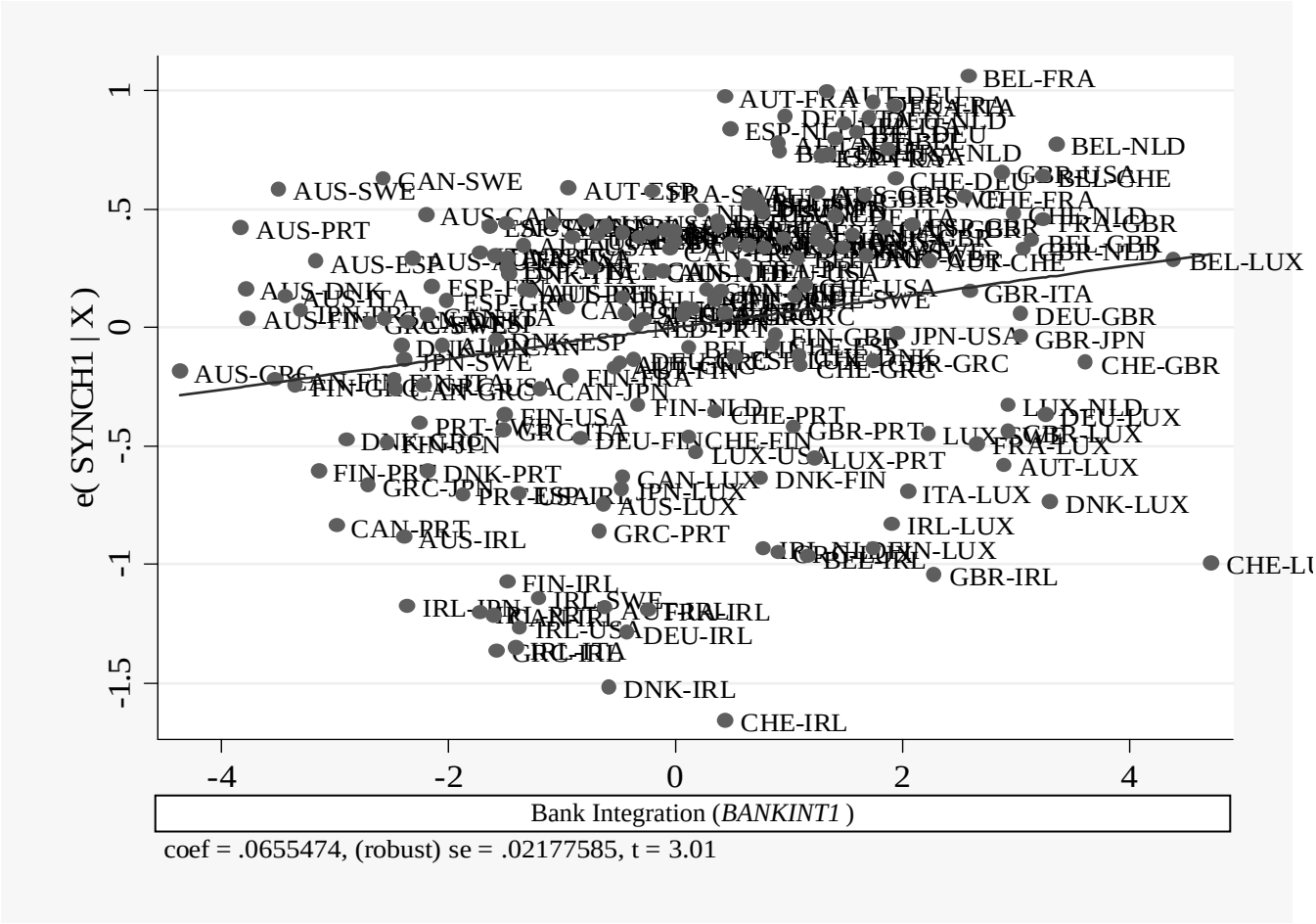


Appendix Figure 1.20



Supplementary Appendix

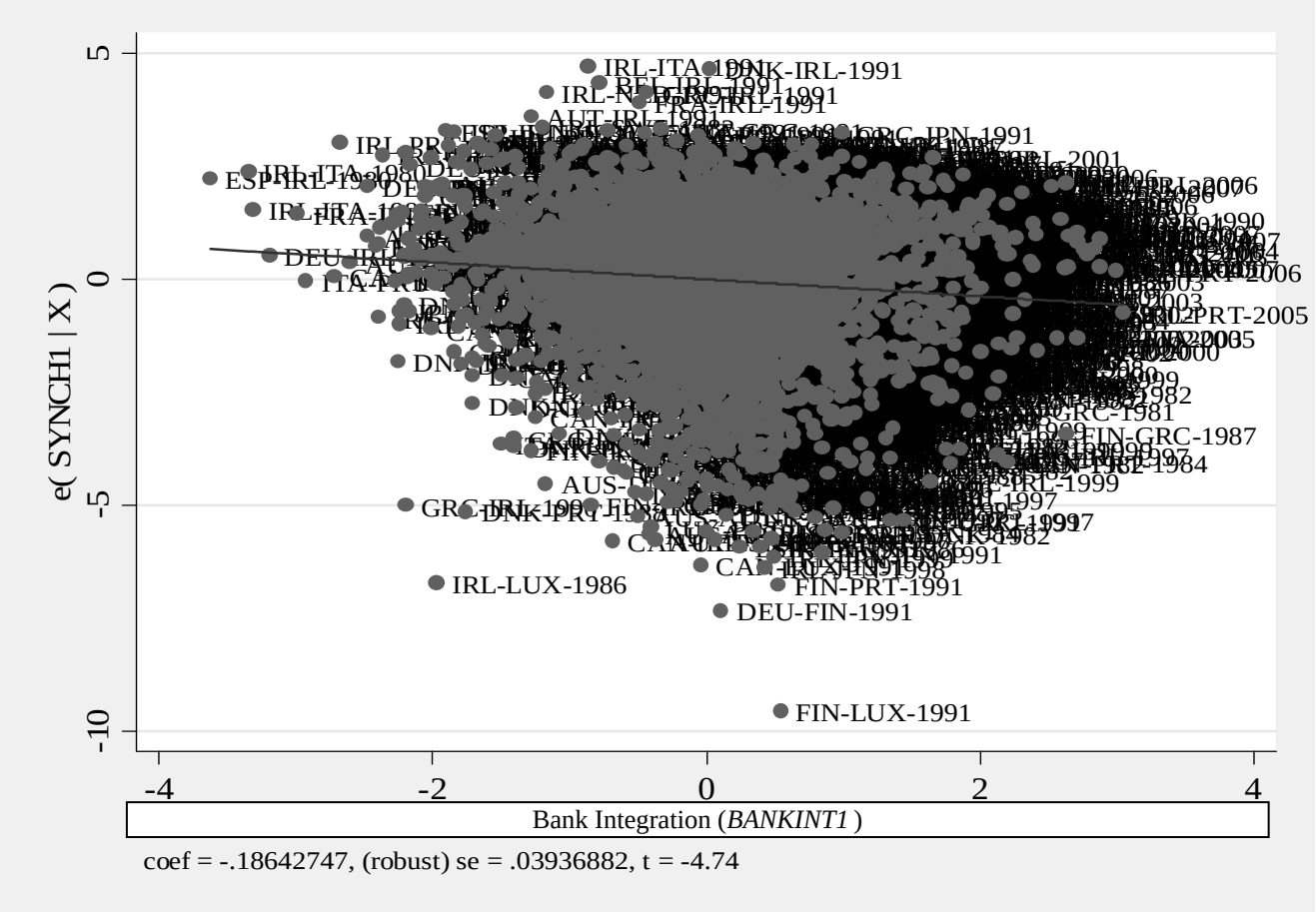
Appendix Figure 2 - Scatter Plot for Benchmark Cross-Sectional ("between") Specification



Supplementary Appendix Figure 2 plots the benchmark cross-sectional specification in column (1) of Table 2. The cross-sectional regression is estimated in a sample of 190 country pairs. The dependent variable is minus one times the absolute difference in real p.c. GDP growth between country *i* and country *j* averaged over the period 1978-2007 (*SYNCH1*). The regressor is the log of bilateral stocks of assets and liabilities normalized by the sum of the two countries' population averaged over the period 1978-2007 (*BANKINT1*).

Supplementary Appendix

Appendix Figure 3 - Scatter Plot for Benchmark Panel ("within") Specification



Supplementary Appendix Figure 2 plots the benchmark panel specification in column (2) of Table 2. The panel regression is estimated in a sample of 190 country pairs over the period 1978-2007. The specification includes a vector of country-pair fixed-effects and a vector of time (year) fixed-effects. The dependent variable is minus one times the absolute difference in real p.c. GDP growth between country i and country j in year t (*SYNCH1*). The regressor is the log of bilateral stocks of assets and liabilities normalized by the sum of the two countries' population averaged in year t (*BANKINT1*).