Financial Regulation, Financial Globalization and the Synchronization of Economic Activity*

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Abstract

We identify the effect of financial integration on international business cycle synchronization, by utilizing a confidential database on banks' bilateral exposure and employing a country-pair panel instrumental variables approach. Countries that become more integrated over time have less synchronized growth patterns, conditional on global shocks and country-pair factors. To account for reverse causality and measurement error, we exploit variation in the transposition dates of financial legislation. We find that increases in financial integration stemming from regulatory harmonization policies are followed by more divergent cycles. Our results contrast with those of the previous studies which suffer from the standard identification problems.

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1 Introduction

The broad question of how international financial linkages affect the propagation of country-specific shocks is at the center stage of the academic and policy debate. In the midst of the biggest economic crisis since the Great Depression, many argue that financial globalization, banking integration in particular, has been a catalyst for the transmission of the 2007–08 shock from the U.S. to the rest of the world, making GDP patterns more alike. These arguments find support in the pre-crisis synchronization of economic activity, which coincided with the spur of financial globalization.[1] The co-evolution of cross-country output correlations and cross-border financial linkages does not imply causation in either direction, though. Financial linkages and output can move together among country-pairs due to many possible other factors, such as similar policies, bilateral trade, and common shocks. It is important to know whether financial integration causes converging or diverging growth patterns since this will impact asset and commodity prices and henceforth the design of the appropriate financial and monetary policies.

While the textbook theories on international business cycles suggest that financial integration and output synchronization should be negatively related, most of the existing cross-sectional empirical studies document a positive correlation between financial integration and GDP co-movement.[2] We argue that one cannot provide well-identified estimates of financial integration on output co-movement with a cross-sectional approach. To account for endogeneity, we have to account both for unobserved heterogeneity, that stems from omitted country-pair factors and global shocks, and also for reverse causation. Our main contribution in this paper is to explicitly deal with these simultaneity issues and identify the causal effect of financial integration on the synchronization of economic activity. Our instrumental variables approach also allows us to deal with the measurement issues that are inherent in bilateral data.

We achieve this objective by advancing on two fronts over the existing literature. First, we utilize a unique, confidential, and so far unexploited database from the Bank of International Settlements (BIS) that reports bilateral bank assets and liabilities (stocks and flows) over the period 1978–2007 for twenty

[1] Figures 1 and 2 illustrate these phenomena in our sample of 20 industrial economies over the past three decades. Kose, Otrok, and Prasad (2008), Otto, Voss, and Willard (2001), and Rose (2009) also show that international business cycles have became more alike over time. 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 the 1980s. Heatcote and Perri (2004), 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.

[2] Imbs (2006) uses bilateral data on equity holdings constructed by the IMF on a large cross-section of countries and shows a significant positive correlation between bilateral portfolio equity flows 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.

developed countries. The extensive time dimension of our data allows us to account for global shocks and country-pair time-invariant factors, which may lead to spurious inference. Controlling for global factors is essential since theory suggests financial integration magnifies idiosyncratic, country-specific shocks. For example, Rose (2009) show that inflation targeting countries tend to have a higher degree of business cycle synchronization, and Inklaar, Jong-A-Pin, and de Haan (2008) find that fiscal policy convergence has a first-order effect on the synchronicity of output growth in the OECD economies.

The rich panel structure also allows us to control for time-invariant country-pair factors, such as distance, sociopolitical ties and differences in cultural norms. This is key as previous empirical work by Baxter and Kouparitsas (2005) shows that most of the robust correlates of output co-movement are indeed time-invariant factors related to proximity. Moreover a recent body of work shows that hard-to-measure informational frictions, cultural linkages and bilateral trust have also 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)).

We show that accounting for global shocks and country-pair characteristics is fundamental. While in the cross-section there is a significant positive correlation between financial integration and output synchronization, once we simply include in the specification country-pair fixed-effects and year fixed-effects, the coefficient changes sign and is highly significant. The within OLS estimates thus suggest that increases in financial integration are associated with less synchronized, more divergent, output fluctuations.

On the second front, we develop a novel country-pair time-varying instrumental variables method exploiting variation from a quasi-natural experiment, the Financial Services Action Plan (FSAP) of the EU. Due to reverse causation, omitted country-pair time-varying variables and measurement error in our financial integration variable, our OLS estimates do not necessarily reflect a causal effect of financial integration on synchronization. The FSAP was a package of reforms launched by the European Commission and the EU Council in late 1998 aiming to integrate EU financial markets and reduce the costs of cross-border financial intermediation. FSAP aimed to create a unique market for financial services to boost financial integration and for that financial regulation was to be harmonized. The FSAP included 29 legislative acts, 27 Directives and 2 Regulations, in corporate law, banking, payment systems, and corporate governance. In contrast to the EU Regulations that become immediately enforceable across the EU, Directives are laws that require from member states to achieve some well-specified results, but without clearly dictating the means. The Directives become enforceable only after the EU member countries pass domestic legislation that explicitly adopts the EU law. The transposition process is notoriously slow, as it usually requires modifications of existing institutional structures and the removal of previous regulations. Given these impediments, the transposition of the Directives takes in practice several years and differs considerably across the continent. As a result, we have significant country vari-

ation in the adoption time of the 27 Directives incorporated at the FSAP. Using information from the EU Commission and the EU15 member countries on the transposition timing of each of the Directives of the FSAP, we construct a bilateral time-varying index that reflects the degree of legislative-regulatory harmonization policies in financial intermediation among country-pairs.[3]

To the best of our knowledge, our paper is the first that estimates bilateral time-varying instrumental-variable (IV) specifications for financial integration (there is no such study for trade integration either). Our identification strategy is appealing as it links reforms in financial intermediation with outcomes in exactly the same sector and in turn to output synchronization. The exogeneity assumption for instrument validity is also plausible, because policy changes are unilateral (at the country-level), while the outcome we study (integration) is bilateral (i.e. the instrument reflects the situation when both countries in each pair have adopted exactly the same Directive). The exclusivity assumption seems also reasonable as harmonization policies in financial services should primarily affect business cycle patterns through financial integration.

The "reduced-form" panel estimates show that the structural measure of financial integration is negatively correlated with business cycle synchronization. The first stage estimates reveal a significant positive relationship between financial harmonization policies and bilateral banking integration. The first-stage fit is strong, even when we control for the flexibility of the exchange rate regime and other covariates. The second stage panel estimates reveal that the component of financial integration predicted by legislative harmonization policies in the financial sector makes business cycles less alike.

Our estimates imply an economically significant effect. Given our first stage estimates, country-pairs that adopt 5 to 6 identical directives at the same time, such as the Austria-Spain pair, experience a 50% increase in their bilateral banking integration, which is a typical increase in our sample. A 50% increase in banking integration in turn implies 0.2 percentage point decline in synchronization, based on our second stage estimates. Hence our IV estimates can explain up to 20% of the actual change in synchronization over our sample period.

Our empirical results are in support of the standard international business cycle theories, which imply that 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 (2004) for a multi-country model). Obstfeld (1994) formalizes another mechanism that also yields a negative effect of financial integration and business cycle

[3]See Enriques and Gatti (2008), and Kalemli-Ozcan, Papaioannou, and Peydró (2010) for details on the policies.

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.[4] There might also be the case, where the negative correlation between financial integration and business cycle synchronization is driven 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.

Introducing financial frictions mitigates the effect of the standard TFP shocks and may even reverse the sign of the partial correlation between financial integration and synchronization (e.g. Calvo and Mendoza (2001); Perri and Quadrini (2010); Devereux and Yetman (2009)). In the models where both financial and TFP shocks are present, negative shocks to capital supply or frictions to financial intermediation arising from asymmetric information and moral hazard may generate contagion and thus make business cycles among financially integrated economies more similar. This is because in response to a negative financial shock foreign investors will withdraw capital from both markets if these are integrated. Corporate finance theories focusing specifically on banking also yield an ambiguous sign on the correlation coefficient between integration and synchronization. Morgan, Rime, and Strahan (2004) 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.

Theoretical predictions differ depending on whether productivity or financial shocks dominate. As a result, we chose to focus on a sample of twenty developed countries over an unparalleled period of stability without major financial shocks. 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. Developing economies experienced many serious financial crises over the past three decades, while there have not been major financial shocks in the developed countries of our sample in the period till the 2008 crisis. In addition, the studies that investigate the impact of trade integration on business cycle synchronization document different patterns among these groups of economies (e.g. Kraay and Ventura (2000, 2007) and Calderon,

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

Chong, and Stein (2007)). Thus, although the BIS dataset includes some data on developing countries we limit our analysis to a group of relatively homogenous advanced economies. Overall, our results are consistent with productivity shocks being the main source of fluctuations throughout our sample period, 1978–2007.

The paper is structured as follows. In the next section we describe our data and construction of the main variables used in the empirical analysis. Section 3 reports the cross-sectional and the bilateral time-varying fixed-effects OLS estimates on the effect of financial integration on business cycle synchronization. In Section 4 we report 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

2.1 BIS Dataset and Measures of Financial Integration

Our dataset comes from the confidential version of 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 and to 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 the United States. According to the Lane and Milesi-Ferretti (2007) data on foreign positions, the share of these twenty countries in world's total international assets and liabilities during our sample period are 81% and 76% respectively.

The data is originally collected from domestic monetary authorities and includes all of banks' on-balance sheet exposure. The data captures mainly international bank to bank debt, such as inter-banks loans and deposits, credit lines, and trade-related activities.[6] The data also cover bank's investment

[5] We prefer to use annual data given the noisy nature of quarterly data. Our panel has $1/2N * (N-1) * T$, i.e. $20*19*30 = 5,700$ observations. Cross-border capital (or trade) flows data usually have many gaps that makes logarithmic transformations questionable. This is not the case in our data. There are only a few of 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.

[6] The BIS Locational Statistics are based on the residence principle (as aggregate country-level capital account data), reflecting therefore quite accurately the overall exposure of countries to other economies. The data include loans to subsidiaries and affiliate entities, although for most of the period such transactions were small.

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 equity investment of banks. Yet the data mainly reflect debt holdings and flows (Lane and Milesi-Ferretti (2007)). BIS (2003a,b) and Wooldridge (2002) argue that while FDI and equity have become more important after the mid-nineties, their weight is still quite small as standard banking activities still consist of the bulk of cross-border holdings. International bank M&A activity and direct lending to foreign residents have been limited overall (see Lane and Milesi-Ferretti (2008)). Besides stocks, the BIS also reports asset and liability flows in each period.

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. For completeness we construct measures of financial integration based on both stock and gross flows. While stocks may be more theoretically appropriate, changes in holdings may be driven by "valuation" effects. Since reporting countries report to the BIS the currency in which the assets and liabilities are denominated, the BIS in their estimates of bilateral flows account for swings in the exchange rate (see BIS 2003a). Thus the flow statistics may more accurately reflect changes in banking integration.

Our first measure of financial integration ($BANKINT1$) is the average value 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).[8]

2.2 Measures of Synchronization

We construct 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).[9] 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.

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

[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] 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.

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

This index, which follows Giannone, Lenza, and Reichlin (2009), is simple and easy-to-grasp. 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.

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

The residuals ($v_{i,t}$ and $v_{j,t}$) reflect how much GDP growth 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.

In contrast to the correlation measures that cross-country studies mainly work with, both of the above indices are not sensitive to various filtering methods that have been criticized previously (e.g. Canova (1998, 1999)). They also do not contain estimation error. Again differently from the correlation measure, these indices do not directly 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 output volatility has fallen considerably in the industrial economies (e.g. Cecchetti, Flores-Lagunes, and Krause (2006)).

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 these works, we have six 5-year observations rather than a single observation estimated over a longer period.

2.3 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%). 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).

Figure 1 gives a graphical illustration on the evolution of the average (across each country-pair) value of the three measures of business cycle synchronization over the 30 years of our examination (in the Supplementary Appendix we tabulate the evolution of the three measures of synchronization for each country in our sample). Growth divergence measures, $SYNCH1$ and $SYNCH2$ are plotted on the left y-axis; the correlation measure, $SYNCH3$, is tabulated on the right y-axis. Clearly, there is a considerable degree of short-term variability which will enable our identification through time-changes. One might worry that these time changes may reflect noise, but then we should not be able to find anything in our empirical estimation. In spite of these variable time-changes, 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. Likewise average differences in real GDP p.c. growth in the late 1970s and the 1980s were in the range of $2.5\% - 3.5\%$, while after the late 1990s the average difference fell to $1\% - 1.5\%$.

Figure 2 plots the evolution of cross-border banking holdings and transactions (gross flows) in the period 1978–2007. Cross-border banking activities have increased considerably over the past three decades. Lane and Milesi-Ferretti (2007) document similar patterns for other types of cross-border investment flows, such as FDI and equity. Yet international banking activities are by far the largest component of foreign capital holdings/flows throughout this period. According to our calculations based on the unilateral data of Lane and Milesi-Ferretti (2007), debt flows reflect 67% of the total flows between 1978–2007 for our group of countries, while equity and FDI jointly account for a third of total foreign investment. Banking activities in particular account for half, 48.5%, of total foreign holdings and flows, while for most of the thirty-year period they accounted for around 60%. Figure 2 shows that 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 dollars per person as of the end of 2007.

3 Ordinary Least Squares Estimation

3.1 Econometric Specification

We start our analysis estimating with OLS variants of the following specification:

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

($SYNCH_{i,j,t}$) 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 $(t-1)$.[10] 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. Vector $\mathbf{X}'_{i,j,t-1}$reflects other country-pair time-varying factors, such as trade and specialization, that are shown to be strong correlates of output synchronization in the previous studies.

3.2 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 capita GDP ($SYNCH3$) estimated over a 5-year period as the dependent variable. These models are estimated in six non-overlaping 5-year periods. The unconditional coefficient estimates on banking integration reported in (5) and (7) continue to be positive and significant, implying that countries with stronger financial linkages have more synchronized output cycles.

In columns (6) and (8) we also examine whether our results reflect differences on trade intensity

[10] We use lagged values to partly account for reverse causation. We also estimated specifications using contemporaneous values of financial/banking integration finding similar (and if anything stronger) results. We formally deal with reverse causation and other forms of endogeneity in the next section.

and industrial specialization. To control for differences in trade intensity, we use the log of bilateral real (deflated with the U.S. price deflator) exports and imports as a share of the two countries's GDP ($TRADE$; this measure follows Calderon *et al.* (2007))). Following Krugman (1991), Imbs (2006), and Kalemli-Ozcan, Sørensen, and Yosha (2003), among others, we measure specialization with an index that reflects how dissimilar is industrial production in manufacturing ($SPEC_{i,j,t} \equiv \sum_{n=1}^{N} \left| s_{i,t}^{n} - s_{j,t}^{n} \right|$, 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). 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 Frankel and Rose (1998) and also 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 trade enters with a positive estimate, suggesting that countries that trade more have more similar output patterns. Our regressions further show that countries with dissimilar production structures have less synchronized cycles (see also Kalemli-Ozcan, Sørensen, Yosha (2003) and Imbs (2004)). Most importantly for our focus, while trade intensity and differences in industrial specialization enter with significant estimates, the estimate on $BANKINT$ continues to be at least two standard errors above zero in both permutations.[11]

3.3 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 time 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 shocks and other common time-invarying factors, a higher degree of international banking activities is associated with less or more similar GDP fluctuations.[12] 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 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 cross-sectional coefficients in

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

[12] 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.

Panel *A*. In all 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 models 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 this result is not driven by changes on goods' trade and changes on the industrial structure.[13] 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 rates 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.

One might be worried that our previous results are driven by inertia in output synchronization patterns. To account for this, in Table 3 we estimate auto-regressive specifications, controlling for persistence in business cycle synchronization.[14] While differences in GDP fluctuations are not particularly persistent (the first auto-regressive coefficient is around 0.20), the auto-regressive models are useful to quantify the short and the long-run effect of banking integration on business cycle synchronization.[15] 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 $0.08-0.09$) due to the positive serial correlation in the dependent variable. This long-run coefficient of 0.1 on average implies that, a rise in bilateral financial integration from the $10th$ percentile to the $90th$ percentile of the distribution, which is similar to the increase in financial integration between Italy and Portugal during 1978–2007 (a quadrupling), is followed by an average decrease in growth differences of 0.4 percentage points of these two countries.

In columns (3) and (4) we include in the specification the 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 at the same time converging to a new steady state. Including the lagged log level of GDP also allows us to account for the cyclical properties of international synchronization (for example there is an increased degree of international synchronization in turbulent times).[16] In line with this

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

[14] 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.

[15] 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. For example, Monte Carlo simulations in the similar to ours context of growth regressions, suggest that the "Nickel" bias on the lagged dependent variable is around $1-2\%$ of the true coefficient value when T is greater than 20 and less than 1% when the time horizon exceeds 30 (Judson and Owen (1999)). More importantly, the bias on the independent variables (in our application banking integration) becomes less than 1%.

[16] We thank Fabrizio Perri and Gian-Maria Milesi-Ferretti for suggesting to control for GDP differences to account for

idea, the log level of GDP p.c. in countries i and j enters with a positive and significant coefficient, implying that when GDP is below trend output growth differences are smaller. Yet this has little effect on our main result.[17] The coefficient on banking integration continues to be negative and at least three standard errors below zero, indicating that increasing bilateral financial linkages within country-pairs are followed by a lower level of output co-movement.

3.4 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 (within country-pair) correlation of output synchronization and banking integration.[18] 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 to guard against the influence of small country pairs, obtaining similar results.[19] 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 similar to the ones reported in Tables 2-3. Forth, we experiment with alternative proxy measures of trade intensity and production similarities, finding similar results. Fifth, we used unstandardized measures of banking integration and controlled directly for population. Again the results are similar.

4 Instrumental Variables Estimation

Our results show a strong negative effect of banking integration on business cycle synchronization in a panel of countries. Although this result is robust to controlling for inertia in output synchronization, differences in trade intensity, specialization patterns and the level of income, one could still argue that the OLS 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 are driven from a common possibly trending omitted variable.

output convergence and the counter-cyclical nature of business cycle synchronization.

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

[18] For brevity, we do not report the estimates of our robustness analysis. All these results are available upon request.

[19] 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).

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). Given the low persistence of output co-movement, employing lagged values is reasonable. Yet, clearly it is far from ideal.

Third, there are worries that the OLS 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). As long as the correlation between equity flows and debt flows is high our empirical strategy will be valid and the estimates of Tables 2-3 will not be systematically biased. We thus investigated in detail the correlation of the different types of international investment. According to the latest vintage of the Lane and Milesi-Ferretti dataset of aggregate (at the country-level) foreign holdings, the correlation of total debt, portfolio debt, banking, FDI and equity in levels (either expressed as a share of total assets or as a share of GDP) is very high, in the range of $0.75 - 0.99$, on average in our sample. In first differences the correlation weakens but is still always larger than 0.50. Country-pair datasets on foreign capital holdings and flows also reveal a strong co-movement between the various types of international investment. For example, Kubelec and Sa (2009) document that the correlation between our BIS data and CPIS bilateral debt data, which has a broader coverage of debt assets and liabilities, to be 80% for the years that CPIS has data for (mainly after 2000).

Yet some theoretical models suggest that the impact of integration through ownership and equity flows might have stronger effects on risk sharing and output divergence compared to financial integration through debt instruments.[20] 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 (2007)), then our estimates in Tables 2 and 3 might suffer from attenuation bias and thus we may have under-estimated the (negative) effect of financial integration on synchronization. Attenuation might also arise because the Locational statistics, due to their residential nature, miss a significant portion of bilateral investment that occurs through financial (or off-shore) centers.[21]

[20]The ideal measure of financial integration will be based on bilateral data on all types of capital flows. Unfortunately, the data on bilateral FDI from UNCTAD and the data on bilateral portfolio equity flows from CPIS has no time dimension suitable for a panel analysis, and thus mostly used in cross-sectional studies so far. Our data has the big advantage of being over a long time period and hence lends itself naturally to our panel estimation strategy, although it focuses only on bank debt flows.

[21]Felettigh and Monti (2008), using CPIS data, which is also constructed based on the residence principle, calculated ultimate exposures both for equity and debt type investment of France, Germany, Italy and Spain into Luxembourg and Ireland, given large mutual fund industries in these host countries. Comparing exposures from this methodology to the

To account for potential country-pair time-varying omitted variable bias, reverse causality, and these types of measurement error 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 integration, in this section we develop such an identification scheme.

4.1 Financial Sector Legislative-Regulatory Harmonization

We construct a policy instrument for banking 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 and each EU15 member state on the implementation of the legislative acts of the Financial Services Action Plan. The FSAP was a major policy initiative launched in 1998 that aimed to remove regulatory and legislative barriers across European countries in financial services. The FSAP included new legislation on securities regulation (e.g. the Prospectus Directive and the Directive on Insider Trading), corporate governance (e.g. the Transparency Directive and the Takeover Bids Directive), banking (e.g. Directive on Capital Adequacy), and insurance (e.g. the Solvency Directive).[22] Besides technical recommendations and communications, the FSAP included 29 major pieces of legislation, 27 Directives and 2 Regulations.[23] 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.

As with other pieces of EU-initiated legislation, there is a great deal of heterogeneity 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 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).[24]

original CPIS data, the authors find almost no difference between the calculated ultimate exposures and what is reported in the data for debt assets but find big differences for the equity assets. Hence, this further justifies our focus on debt investments. Once can still worry about the fact that many bank claims are booked outside the home country. McGuire and Goetz (2009) show that for our countries more than 60% of the claims held in the home country.

[22]Malcom *et al.* (2009) and Enriques and Gatti (2008) give details on the FSAP and the transposition of EU financial legislation into national law.

[23]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).

[24]Kalemli-Ozcan, Papaioannou, and Peydró (2010) provide details on the adoption process and a complete codebook of

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 the bilateral legislative-regulatory harmonization policy measure, as follows: First, we define 27 indicator variables ($LEX^k_{i,,j,t}$, one for each Directive k) 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 by summing the values of these 27 indicator variables ($LEX^k_{i,,j,t}$). Since the variable is highly skewed in the regressions we use the log value, i.e., $HARMON_{i,j,t} \equiv \ln\left(\sum_{k=1}^{K=27} LEX^k_{i,,j,t}\right)$.[25]

4.2 Identification

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

$$BANKINT_{i,j,t} = \delta_{i,j} + \delta_t + \gamma HARMON_{i,j,t} + X^{'}_{i,j,t}\Phi + \nu_{i,j,t} \tag{4}$$

The index of legislative harmonization policies in financial services ($HARMON$) will serve as a valid "excludable" instrument if: *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 $X^{'}$) it affects business cycle synchronization only through banking integration (i.e. $COV(HARMON_{i,j,t}, \varepsilon_{i,j,t})|X^{'}_{i,j,t}, \alpha_i, \delta_t = 0$ where $\varepsilon_{i,j,t}$ is the error term in the second stage (equation 3)).

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. In other words this identification scheme links policy changes in a particular aspect of law (financial intermediation) with outcomes in exactly the same industry (financial integration). FSAP was designed for to achieve a single integrated and liquid market. Thus conditional on other bilateral characteristics it seems quite reasonable that harmonization policies in financial services affect output synchronization through increasing bilateral financial linkages.

Our identification builds on insights of the law and finance literature that argues that differences

the transposition of each Directive by each EU15 member country.

[25] Imbs (2006) and Kalemli-Ozcan, Sorensen and Yosha (2001) employ a bilateral instrumentation strategy by summing the La Porta *et al.* (1997, 1998) measures of investor protection of the two countries. Yet in contrast to these studies our instrument is "truly" bilateral as it reflects whether *both* countries have transposed into the domestic legal order of each country, each of the 27 Directives of the FSAP. Note that in order for the two EU countries to have harmonized their regulatory practices in financial intermediation, both members in each country-pair cell need to have transposed each Directive.

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

Before presenting the first-stage and the second-stage estimates, we examine the "reduced-form" relationship between output synchronization and legislative-regulatory harmonization policies in financial services. Table 4 reports static and dynamic specifications. 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 co-movement. 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)).

In columns (5)-(8) we control for differences in the exchange rate regime. This is important as there is the possibility that harmonization policies among EU countries might reflect monetary unification that occurred around 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). The Reinhart and Rogoff "coarse" 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 ($ERC = \ln(ER_{i,t}) + \ln(ER_{j,t})$). In all permutations the exchange rate flexibility index enters with an insignificant estimate. In contrast the bilateral index of regulatory-legislative harmonization policies in financial services continues to enter with a highly significant coefficient.

In our set-up the "reduced-form" estimates are particularly interesting because the harmonization index is a structural measure of financial integration. So far most of 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). In contrast to these outcome measures, the legislative-regulatory harmonization index reflects structural features of the regulatory and supervisory 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. In addition the specifications reported in columns (5)-(8) reassure that the impact of $HARMON$ does not proxy an effect of monetary union.

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

Table 5, Panel B reports the first stage estimates that link banking integration with harmonization policies in financial services. 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 in capital markets, insurance, and banking became more financially integrated through international banking activities.[26] 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)).

In columns (5)-(8) we control for the bilateral flexibility of the exchange rate regime. In all permutations ERC 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 participating in the ERM or joining the euro. This result is in line with the evidence of the "fear-of-floating" literature that argues that countries adopt strict de facto exchange rate arrangements in an effort to attract foreign investment.

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)). Even when we control for the nature of the exchange rate regime the estimate of $HARMON$ is at least 4 standard errors larger than zero in all specifications.[27]

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

[27] In our set-up the Stock and Yogo critical value for weak identification (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 "weak instrument" pathologies.

The first stage estimates are in line with the literature in law and economics that argues that prior to FSAP financial market integration in the EU was still unachievable given the diversity of the legal regimes and the costs associated with this diversity (see Enriques and Gatti (2008)). While many argue that the FSAP could have included bolder harmonization measures, the estimates in Panel B of Table 5 suggest a considerable economic effect. Given the log-log first-stage specification, the coefficient on $HARMON$ suggests that a 10% increase in legislative harmonization in financial services is associated with a $2\% - 3\%$ spur in bilateral banking activities. In our sample, the typical increase in banking integration for our country-pairs is much higher then 10%, more around $50 - 100\%$. Our first stage estimates also imply a similar effect. For example, the pair Austria-Belgium has adopted only 2 identical laws (an increase of 100% in our $HARMON$ index), whereas the pair Austria-Spain has adopted 6 identical laws (an increase of 200% in our index). Given our first stage estimates, this implies that the banking integration for Austria-Belgium pair has increased 30% and for Austria-Spain pair, it has increased 60%. If we look at the standardized β coefficients (that are obtained after transferring the variables to have mean zero and standard deviation one), $HARMON$ and ERC have the exact same coefficients, 0.10 and -0.10, respectively. Thus, the quantitative importance of legal harmonization is as important as the elimination of exchange rate risk on spurring the banking integration in Europe.

4.5 2SLS Estimates

We now turn to the second-stage estimates that identify the one-way effect of financial integration on output synchronization. Panel A of Table 5 reports the second-stage coefficients. In all permutations the 2SLS estimate 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 2SLS estimates are larger than the analogous OLS coefficients (in Tables 2 and 3). Again using our typical increase in banking integration of 50%, the second stage estimates of about 0.4 implies a decrease in synchronization of 0.2 percentage points, twice the effect implied by the OLS estimates. Given the fact that the actual change in synchronization (divergence in growth rates) is 1 percentage point throughout the sample period, our estimates can explain up to 20% of the actual changes in output divergence, after the effect of other regressors (such as fixed effects) has been removed. This is very plausible and economically significant.

The larger in absolute magnitude 2SLS estimates suggest that the OLS estimates were contaminated by measurement error and that reverse causation was not in practice a fundamental problem.[28]

[28]This should come at no surprise given the low level of inertia in output synchronization and the evidence of a lack of international diversification, especially between dissimilar economies.

Specifically there are two main sources of attenuation in the OLS estimates that the 2SLS helps to resolve. First, bilateral banking activities are just one part of financial integration; although international banking activities are by far largest component of foreign investment, theoretical works suggest that the impact of other forms of financial integration, mostly 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. As the harmonization index that we use as an "instrument" for banking integration is much broader than banking, covering legislative convergence in all segments of financial intermediation (specifically in capital markets, insurance industry, company law) the larger second stage coefficients should come at no surprise. This is because now the second stage coefficients reflect the impact of all aspects of cross-border financial integration and not solely banking.

Second, attenuated OLS estimates may arise because a sizable portion of international investment and lending is redirected through financial centers (e.g. Kubelec and Sa (2009); Lane and Milesi-Ferretti (2007)) and thus standard measures of bilateral integration miss indirect linkages. Since our legislative-regulatory harmonization index is truly bilateral and not systematically biased for financial center countries (like Luxemburg, Switzerland, and the United Kingdom) it helps accounting 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, which in turn also affect output synchronization.[30]

Thus, Table 6 reports second-stage estimates of 2SLS specifications with additional covariates. We run these models 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. Besides the other conditioning variables, in Table 6 we also control for EU and euro area membership. We do so augmenting the specification with an indicator variable that takes on the value one when both countries in each year are members of the EU and the euro zone respectively and zero otherwise ($EUBOTH_{i,j,t}$

[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.

[30]Note that in our group of economies the within correlation between trade in goods and synchronization is weak. The same applies for specialization (see Table 2-Panel B columns (7)-(8)). Thus controlling for trade and/or specialization in the annual frequency has no major effect on the results reported in Table 6.

and $EUROBOTH_{i,j,t}$). The first-stage relationship between legislative-regulatory harmonization policies and cross-border banking integration continues to be strong (F-statistics around $16-17$). The second-stage coefficient on banking integration is negative and significant at least at the 5% level in all permutations. The estimates in Table 6 imply that conditional on country-pair fixed-factors, common global effects, changes in the flexibility of the exchange rate regime, and output convergence, the component of banking integration explained by harmonization policies in financial services, is associated with a lower degree of output synchronization.

The EU dummy enters with a positive and significant estimate. Yet the euro area dummy variable that switches to one for countries that joined the currency union in 1999 (and for Greece in 2001) enters with an insignificant coefficient. These results are in line with recent works showing that the introduction of the euro did not change business cycles patterns across euro area economies (Giannone, Lenza, and Reichlin (2009)). Most importantly given our focus on financial integration, the 2SLS estimates in Table 6 show that it is financial integration driven by harmonization policies in capital markets, corporate law, and insurance rather than monetary union that lead to more divergent output cycles.

5 Conclusion

How does financial globalization affect the propagation of country-specific shocks? The current crisis has brought this question to the center stage of the academic and policy debate. Theoretical studies have produced conflicting results on the effect of financial integration on output synchronization, and empirical studies does not provide a consensus so far. As we show in this paper, the reason for this is the fact that identifying the one way effect of financial integration on synchronization of economic activity faces a multitude of 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 for 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 unobserved heterogeneity due to factors that affect both business cycle co-movement and financial integration. Fourth, one has to account for endogeneity arising not only from these other factors but also from reverse causation. Fifth, what is needed for the above is data on bilateral financial linkages, which has been scarce and measured with error.

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.

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 results suggest that policy suggestions based on simple time-series or cross-sectional correlations can be quite misleading. As the data will start becoming available, future research should analyze the effect of financial globalization on the synchronization of economic activity after 2007. Theoretical work show that if a credit shock is dominant instead of a productivity shock, the effect of financial integration on synchronization is positive.[31] Consistent with this prediction, most countries have experienced large contractions together during the 2007–2008 crisis. However, this can also be due to the fact that the crisis turned into a global shock very quickly and hence one tide sank all the boats. Whether, the predictions about the partial effect of financial integration on the synchronization of economic activity under a credit shock are borne out by the data remains to be seen.

[31] See Perri and Quadrini (2010) and Mendoza and Quadrini (2010) among others.

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 [$HARMON$]**:** Index of regulatory-legislative harmonization in financial services based on the transposition of the Directives of the Financial Services Action Plan (FSAP). We construct the bilateral harmonization index in two steps. First, we define 27 indicator variables ($LEX_{i,,j,t}^{k}$, one for each Directive k) 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 ($LEX_{i,,j,t}^{k}$). Since the variable is highly skewed in the regressions we use the log value, i.e., $HARMON_{i,j,t} \equiv \ln\left(\sum_{k=1}^{K=27} LEX_{i,,j,t}^{k} \right)$. *Source: Kalemli-Ozcan, Papaioannou, and Peydró (2010), based on data from the EU Commission and each EU15 member country.*

Exchange Rate Flexibility [ERC]**:** Bilateral index of the flexibility of the exchange rate, based on "coarse" regime classification of Reinhart and Rogoff (2004). The country-specific index ranges from 1 to 5 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 ($ERC = \ln(ER_{i,t}) + \ln(ER_{j,t})$). *Source: Ilzetzki, Reinhart, and Rogoff (2008) and Reinhart and Rogoff (2004).*

European Union Membership Both [$EUBOTH$]: Indicator variable that takes on the value one when both countries are members of the European Union in year t. *Source: EU Commission.*

Euro Area Union Membership Both [$EUBOTH$]: Indicator variable that takes on the value

one when both countries are members of the euro zone in year t. *Source: EU Commission*

Income [GDP]: Log level of real GDP (in constant US dollars) for country i and country j in year t. *Source: World Bank World Development Indicators Database.*

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Figure 1: GDP Synchronization across Time

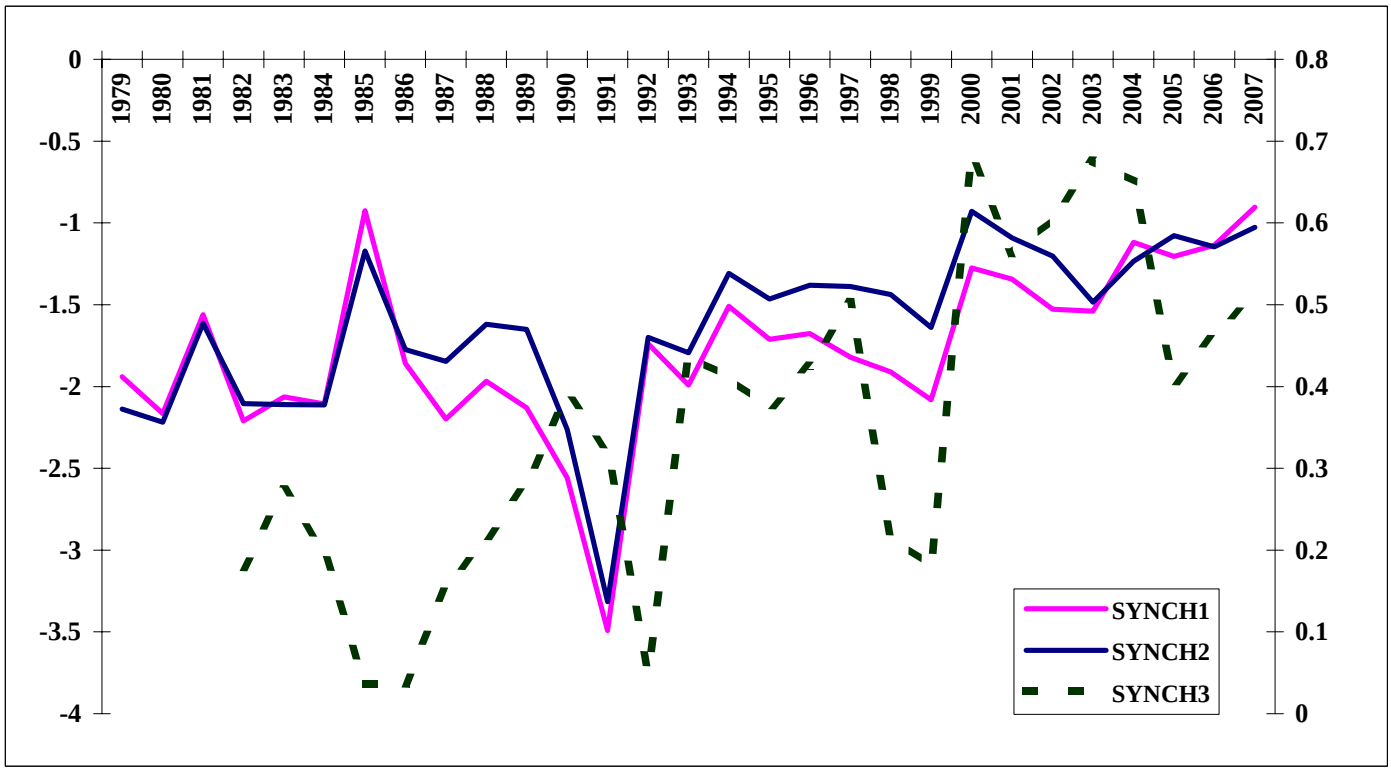


Figure 1 plots the evolution of the average value of each of the three synchronization measures employed in the empirical analysis across the 1978-2007 period. For each year the average is estimated across 190 country pairs (our sample spans 20 countries). *SYNCH1* is the negative value of the absolute 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.

Figure 2: Banking Integration over Time

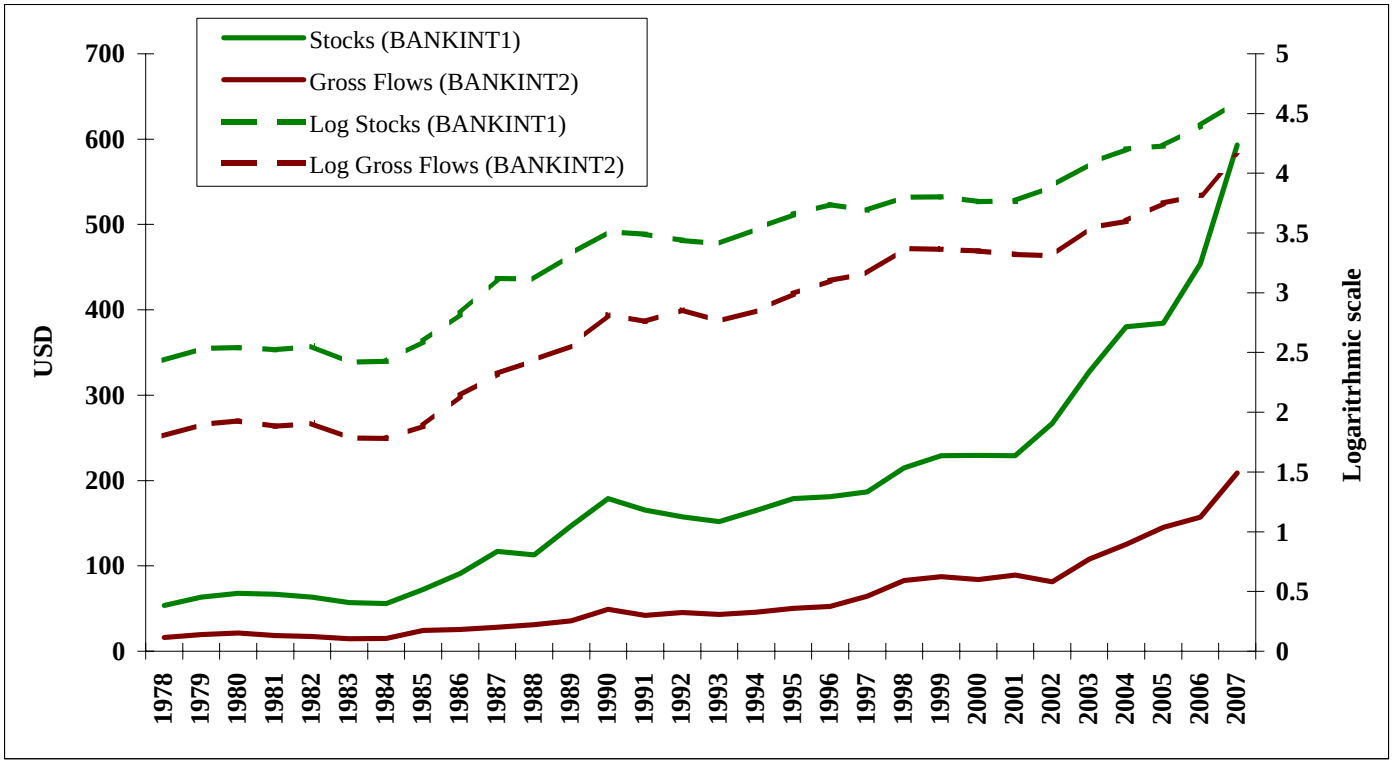


Figure 2 plots the evolution of the two banking integration measures, expressed in levels (solid lines) and in logs (dashed lines). *BANKINT1* denotes the average of the logs of bilateral stocks of assets and liabilities normalized by the sum of the two countries' population. *BANKINT2* denotes the average of the logs of bilateral gross flows of assets and liabilities normalized by the sum of the two countries' population.

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.

ERC 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 (Country-Pair) 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 Integration (*BANKINT*)	0.0655	0.0776	0.0655	0.0867	0.0314	0.0247	0.0432	0.0382
	(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 (*TRADE*)						5.0151		4.7380
						(1.208)		(1.191)
						4.15		*3.98*
Specialization (*SPEC*)						-0.0424		-0.0455
						(0.019)		(0.019)
						-2.22		*-2.36*
R-2 (between)	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 Integration (*BANKINT*)	-0.1864	-0.0677	-0.1574	-0.0818	-0.0537	-0.1125	-0.0392	-0.1035
	(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 (*TRADE*)						-1.3548		-1.3286
						(1.405)		(1.463)
						-0.96		*-0.91*
Specialization (*SPEC*)						-0.0240		-0.0151
						(0.029)		(0.029)
						-0.83		*-0.53*
R-2 (within)	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 (Country-Pair) 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: Reduced- Form Estimates
Legislative Harmonization in Financial Services and Business Cycle Synchronization
Panel (Country-Pair) Fixed-Effects Specifications

	Static		Dynamic		Static		Dynamic	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Financial Sector Harmonization (*HARMON*)	-0.1246	-0.1322	-0.1236	-0.1311	-0.1380	-0.1474	-0.1244	-0.1326
	(0.0355)	(0.0341)	(0.0292)	(0.0279)	(0.0374)	(0.0362)	(0.0308)	(0.0297)
	-3.51	*-3.87*	*-4.23*	*-4.71*	*-3.69*	*-4.08*	*-4.04*	*-4.47*
Exchange Rate Regime (*ERC*)					-0.0538	-0.0608	-0.0033	-0.0061
					(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
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. 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)*.

HARMON is 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 (*ERC*), 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. The specifications in even-numbered columns also control for the lagged log level of GDP in countries *i* and *j* (coefficients not reported), while the dynamic spcifications in columns (3), (4), (7), and (8) include two lags of the dependent variable (coefficients not reported).

Table 5: Legislative and Regulatory Harmonization in Financial Services, Banking Integration and Business Cycle Synchronization:
Benchmark Panel (Country-pair) 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 (*SYNCH2*)								
Banking Integration (*BANKINT2*)	-0.4044	-0.4672	-0.4060	-0.4764	-0.5417	-0.6674	-0.5428	-0.6720
	(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 (*ERC*)					-0.1746	-0.2328	-0.1760	-0.2285
					(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 (*BANKINT2*)								
Financial Sector Harmonization (*HARMON*)	0.3146	0.2879	0.3038	0.2743	0.2597	0.2236	0.2312	0.1983
	(0.0523)	(0.0458)	(0.0509)	(0.0445)	(0.0498)	(0.0430)	(0.0479)	(0.0417)
	6.02	*6.28*	*5.97*	*6.16*	*5.22*	*5.20*	*4.82*	*4.76*
Exchange Rate Regime (*ERC*)					-0.2221	-0.2596	-0.3074	-0.3237
					(0.0589)	(0.0587)	(0.0625)	(0.0602)
					-3.77	*-4.42*	*-4.92*	*-5.38*
First Stage *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*
GDP Controls	No	Yes	No	Yes	No	Yes	No	Yes
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

Table 5 Notes

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 (*ERC*), 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.

The specifications in even-numbered columns also control for the lagged log level of GDP in countries i and j (coefficients not reported), while the dynamic spcifications in columns (3), (4), (7), and (8) include two lags of the dependent variable (coefficients not reported).

Table 6: Legislative and Regulatory Harmonization in Financial Services, Banking Integration and Business Cycle Synchronization
Robustness - Panel (Country-pair) Instrumental Variables Estimation

	Static Panel Fixed-Effects				*Dynamic Panel Fixed-Effects*			
Integration Measure	*BANKINT1*		*BANKINT2*		*BANKINT1*		*BANKINT2*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Banking Integration	-0.5151	-0.6626	-0.5928	-0.7427	-0.5190	-0.6768	-0.6071	-0.7760
(*BANKINT*)	(0.1917)	(0.2356)	(0.2228)	(0.2664)	(0.1762)	(0.2331)	(0.2102)	(0.2743)
	-2.69	*-2.81*	*-2.66*	*-2.79*	*-2.95*	*-2.90*	*-2.89*	*-2.83*
Log GDP in *i*	1.3367	1.8362	1.0660	1.4368	1.4472	1.9304	1.1873	1.5552
(*GDP*)	(0.5538)	(0.6804)	(0.4670)	(0.5534)	(0.5239)	(0.6702)	(0.4536)	(0.5613)
	2.41	*2.70*	*2.28*	*2.60*	*2.76*	*2.88*	*2.62*	*2.77*
Log GDP in *j*	1.7474	2.1429	1.4374	1.7116	1.7380	2.1320	1.3900	1.6585
(*GDP*)	(0.5355)	(0.6523)	(0.4330)	(0.5059)	(0.4968)	(0.6359)	(0.4002)	(0.4904)
	3.26	*3.29*	*3.32*	*3.38*	*3.50*	*3.35*	*3.47*	*3.38*
EU members	0.2358	0.2140	0.3282	0.3334	0.2065	0.1982	0.2812	0.2948
(*EUBOTH*)	(0.0931)	(0.0990)	(0.1069)	(0.1102)	(0.0850)	(0.0942)	(0.0945)	(0.1019)
	2.53	*2.16*	*3.07*	*3.03*	*2.43*	*2.10*	*2.98*	*2.89*
Euro area members	-0.1035	-0.2174	-0.0704	-0.1627	-0.0706	-0.1721	-0.0286	-0.1108
(*EUROBOTH*)	(0.1540)	(0.1440)	(0.1556)	(0.1450)	(0.1387)	(0.1290)	(0.1440)	(0.1332)
	-0.67	*-1.51*	*-0.45*	*-1.12*	*-0.51*	*-1.33*	*-0.20*	*-0.83*
Exchange Rate Regime		-0.2968		-0.2598		-0.2956		-0.2706
(*ERC*)		(0.1001)		(0.0904)		(0.1143)		(0.1089)
		-2.96		*-2.87*		*-2.59*		*-2.49*
1st Stage *F*-score	19.382	17.585	22.65	18.32	22.44	16.08	21.51	15.59
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	5376	5376	5376	5376	5029	5029	5024	5024
Country-pairs	190	190	190	190	190	190	190	190

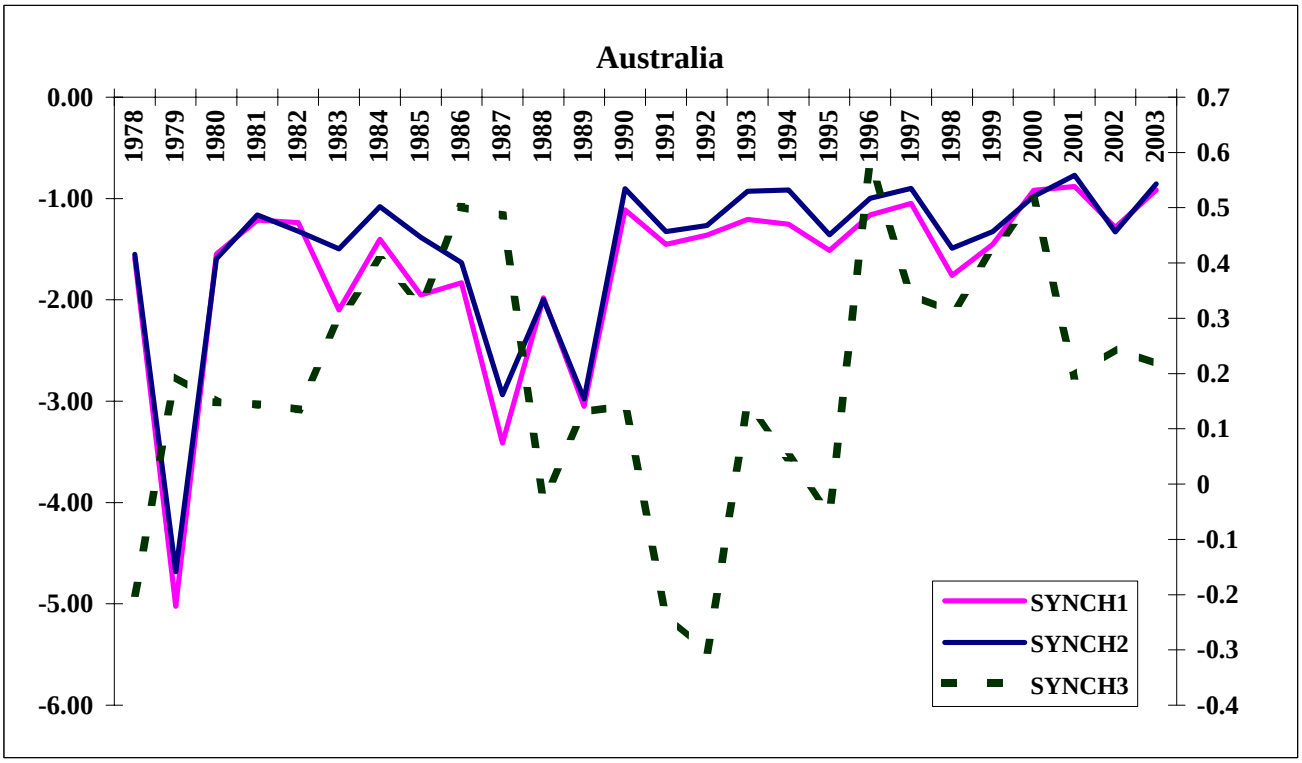
Table 6 Notes

The Table reports (static and dynamic) panel fixed-effect instrumental variable coefficients. The table only reports the 2nd-Stage estimates. The table reports the first-stage F-score and the corresponding p-value of the excludable instrument. 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)*.

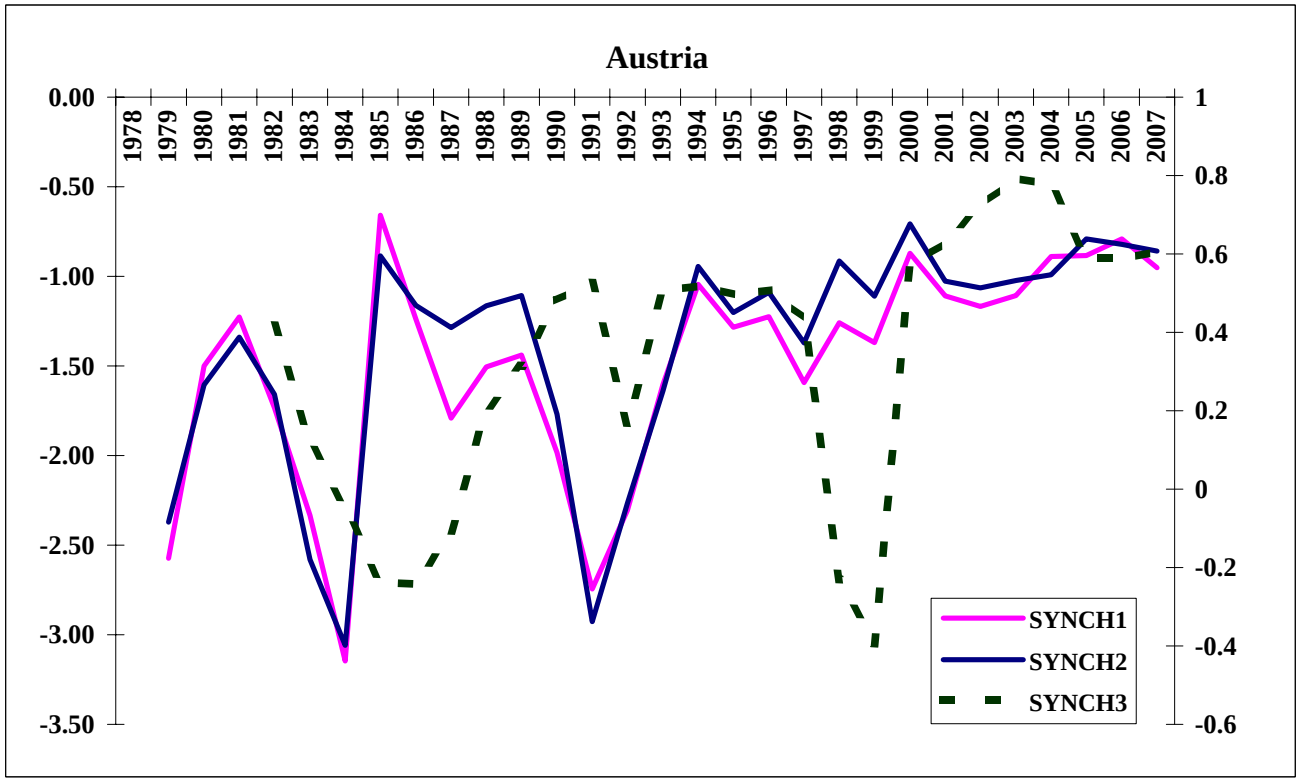
BANKINT2 denotes the one year lagged value of the average of the logs of bilateral gross flows in assets and liabilities normalized by the sum of the two countries' population in year t. The banking integration measure is instrumented with a bilateral time-varying measure of legislative-regulatory harmoninzation policies in financial services, conducted in the context of the Financial Services Action Plan (that cover capital markets, banking, and insurance). *EUBOTH* is a time-varying indicator variable that takes on the value one when both countries are members of the European Union (EU) in year t and zero otherwise. EUROBOTH is a time-varying indicator variable that takes on the value one when both countries are members of the euro area in year t and zero otherwise.. The specifications reported in even-numbered columns include as control variable a bilateral time-varying measure of the flexibility of the exchange rate regime (*ERC*), 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.

Supplementary Appendix

Appendix Figure 1.1

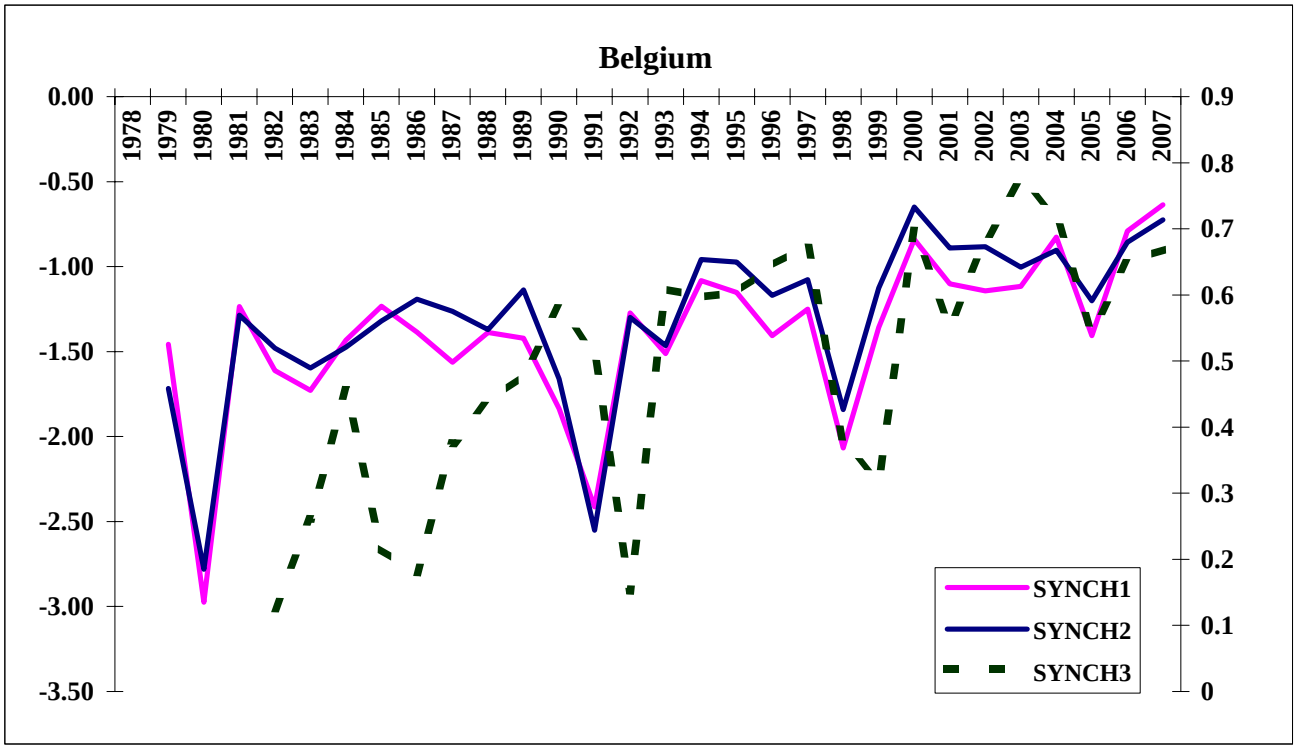


Appendix Figure 1.2

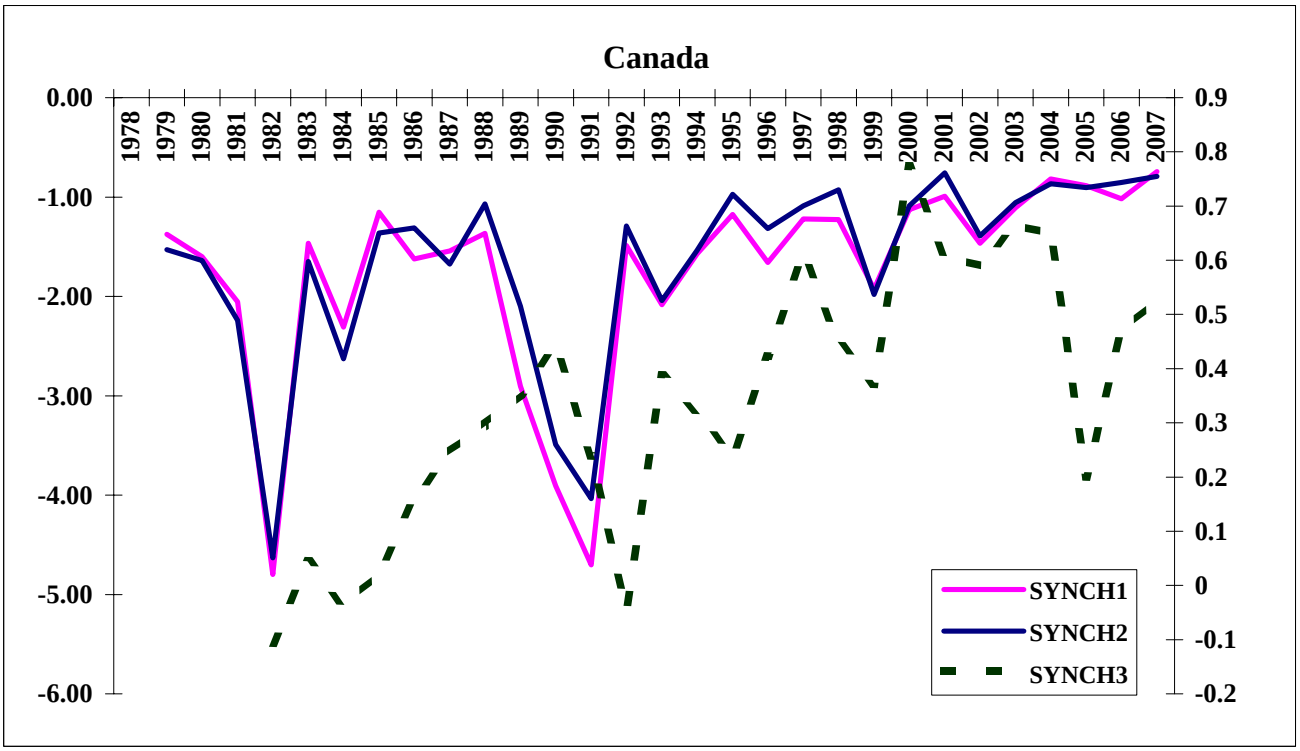


Supplementary Appendix

Appendix Figure 1.3

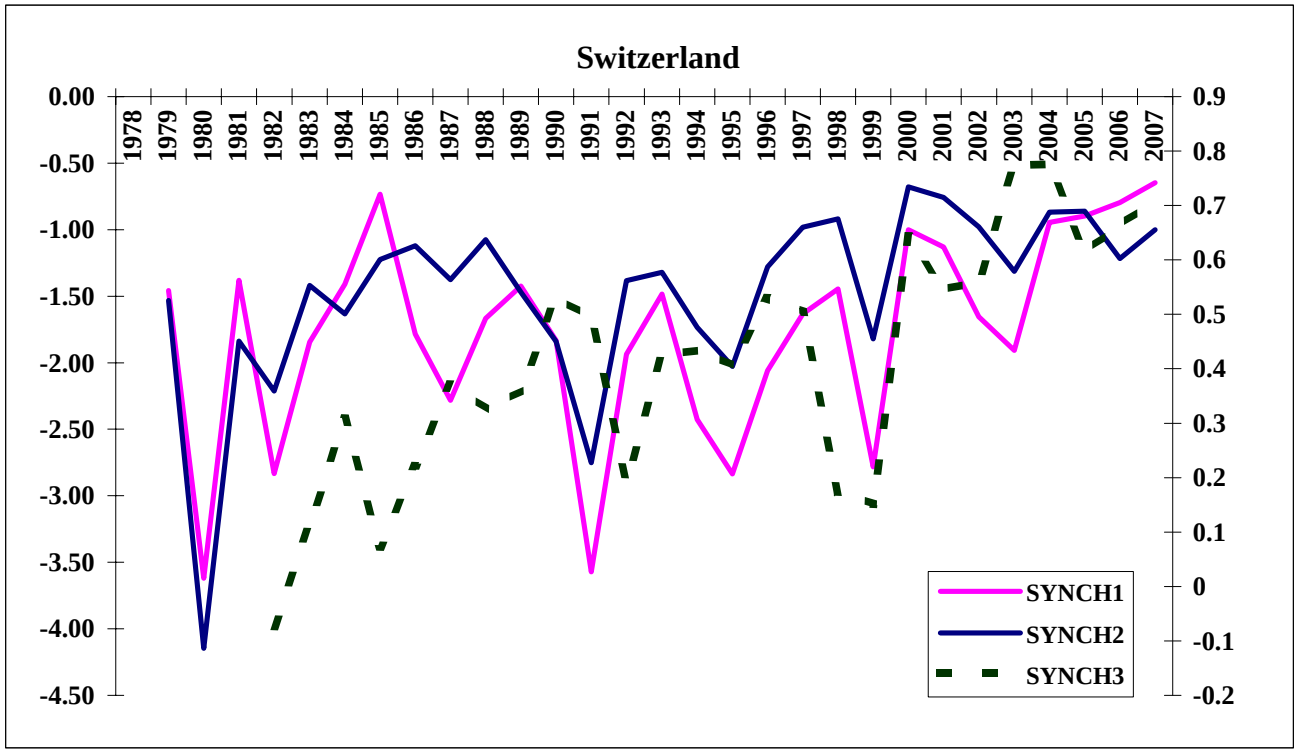


Appendix Figure 1.4

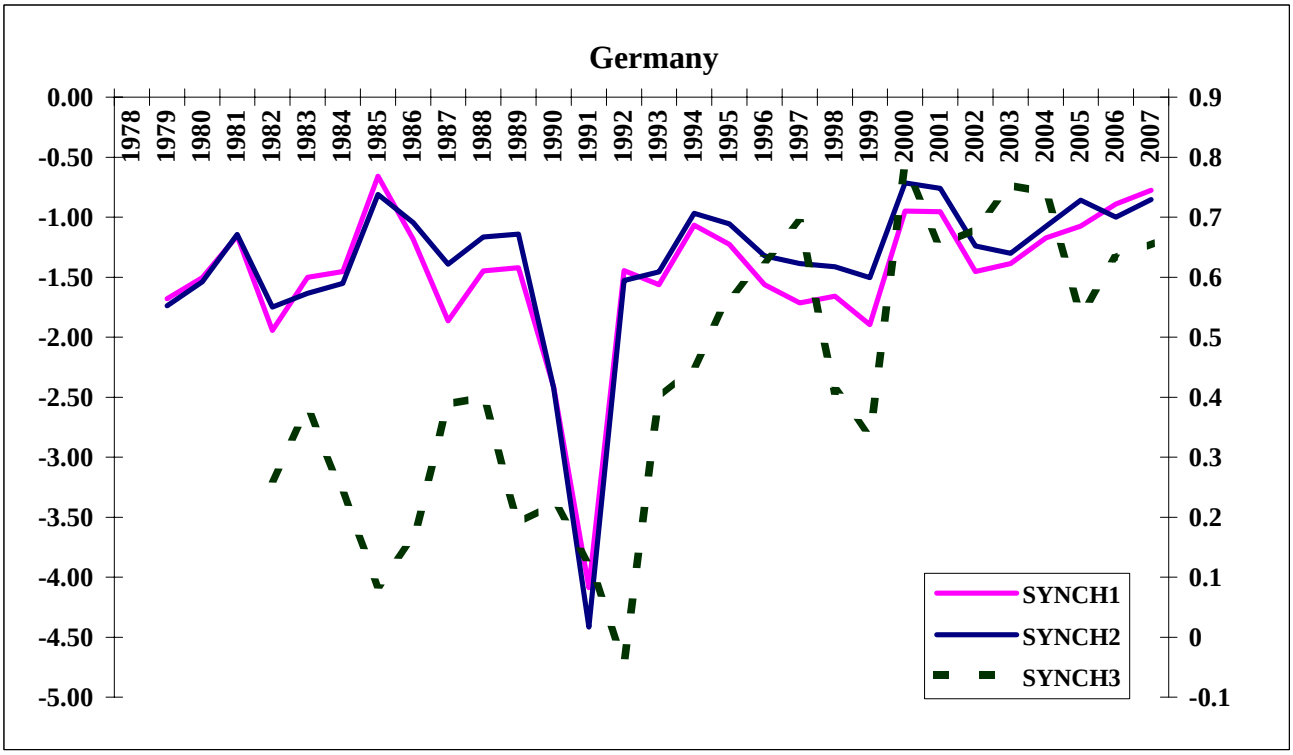


Supplementary Appendix

Appendix Figure 1.5

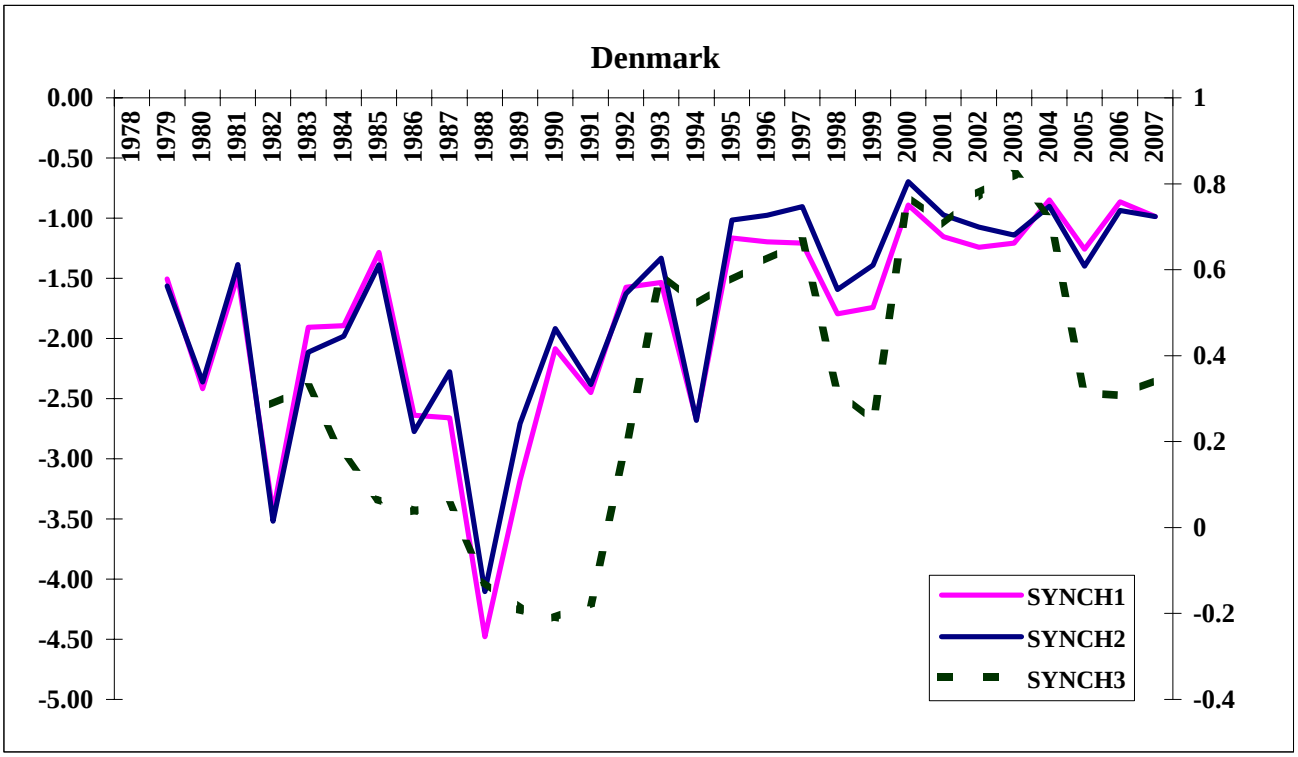


Appendix Figure 1.6

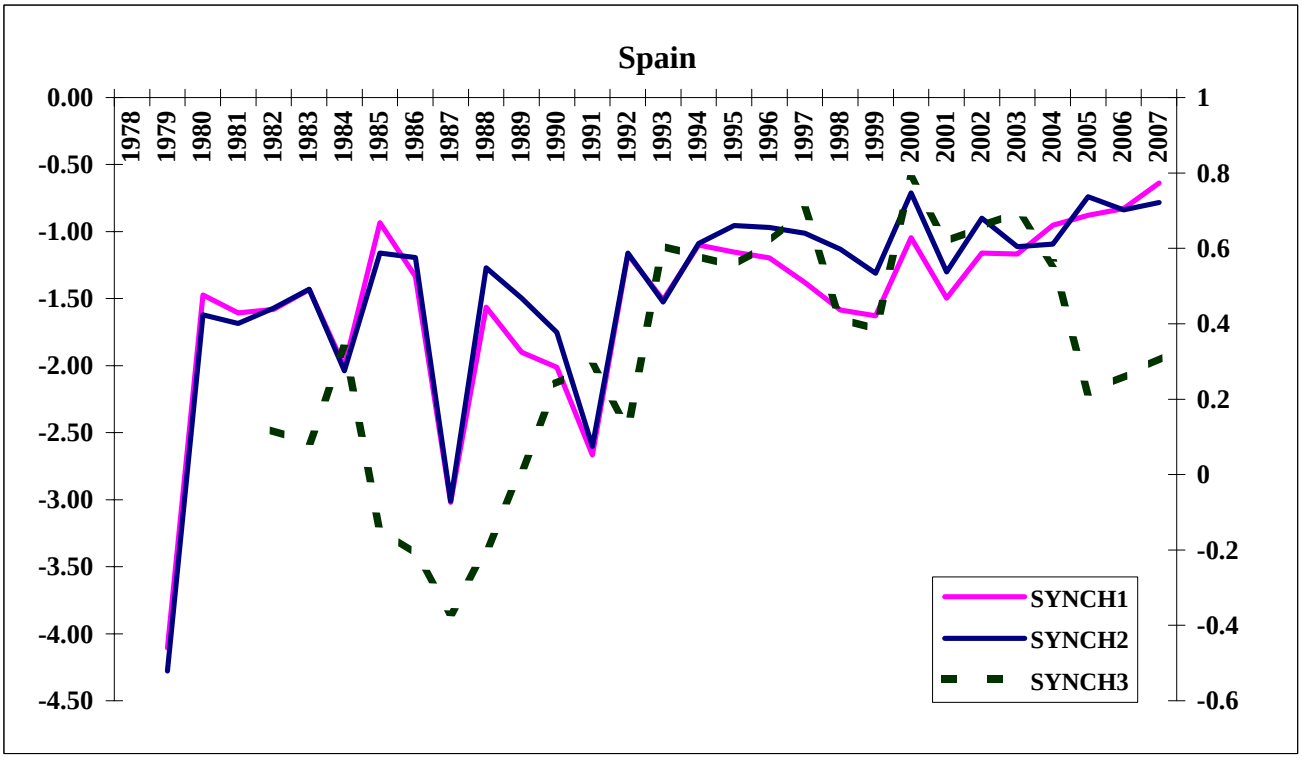


Supplementary Appendix

Appendix Figure 1.7

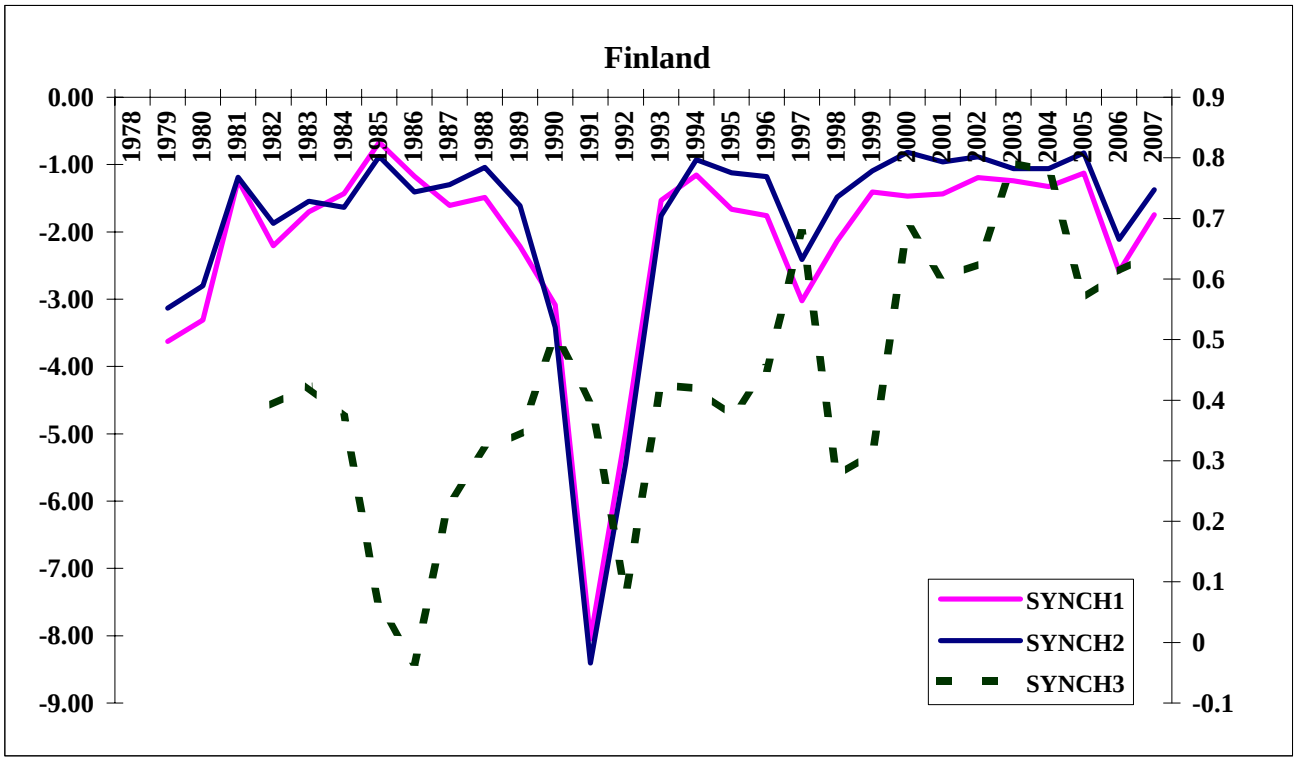


Appendix Figure 1.8

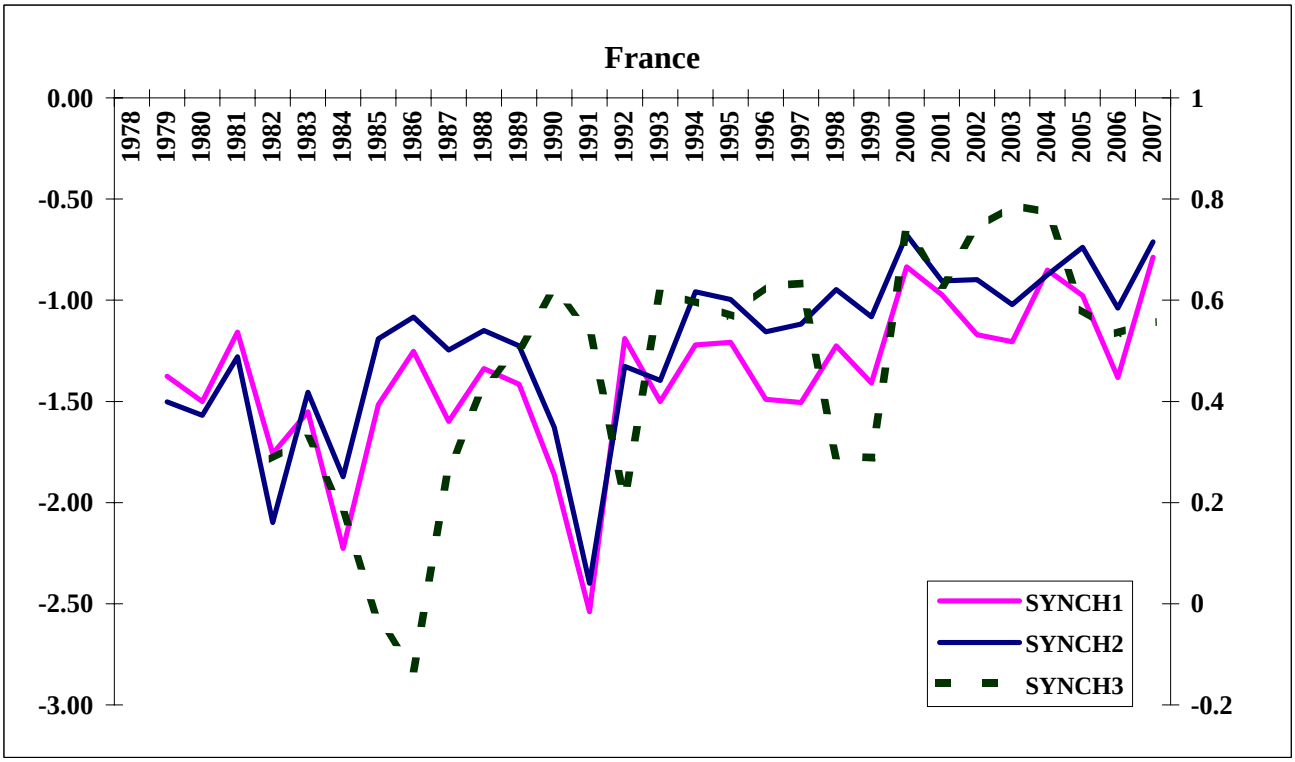


Supplementary Appendix

Appendix Figure 1.9

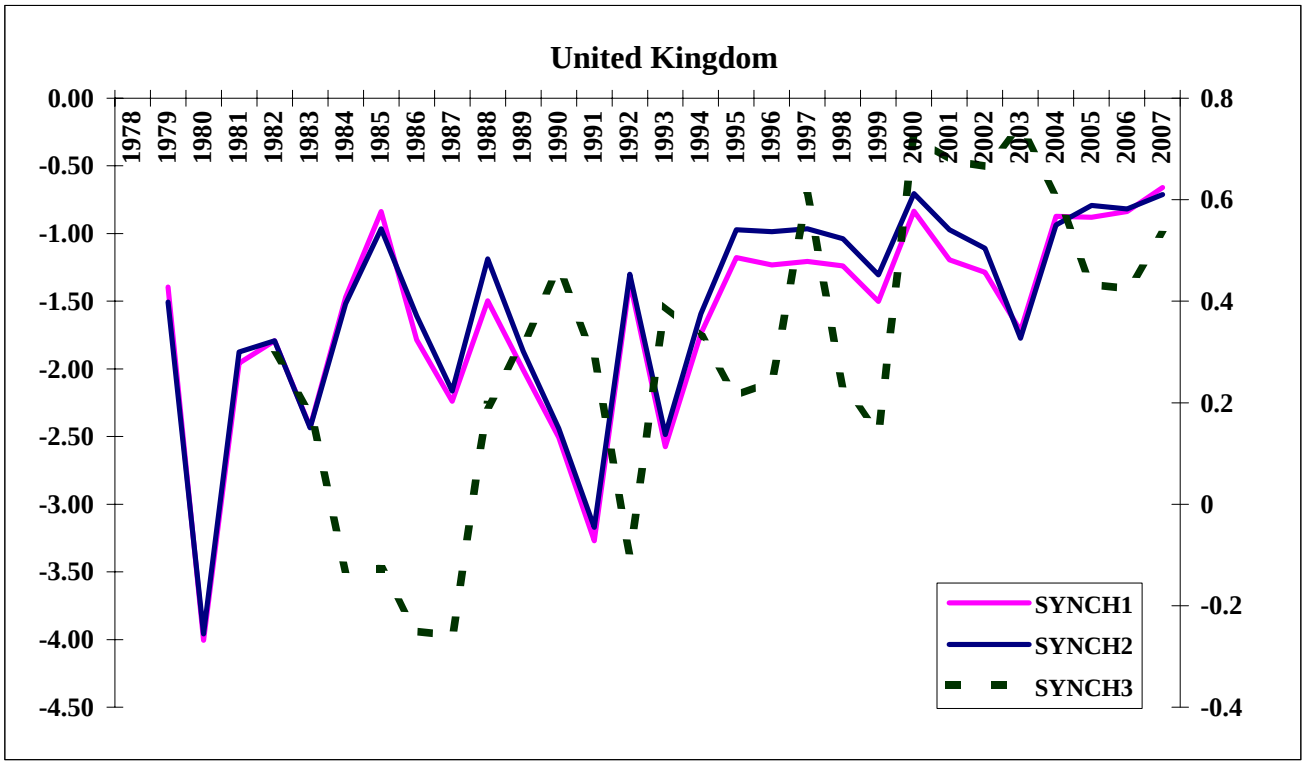


Appendix Figure 1.10

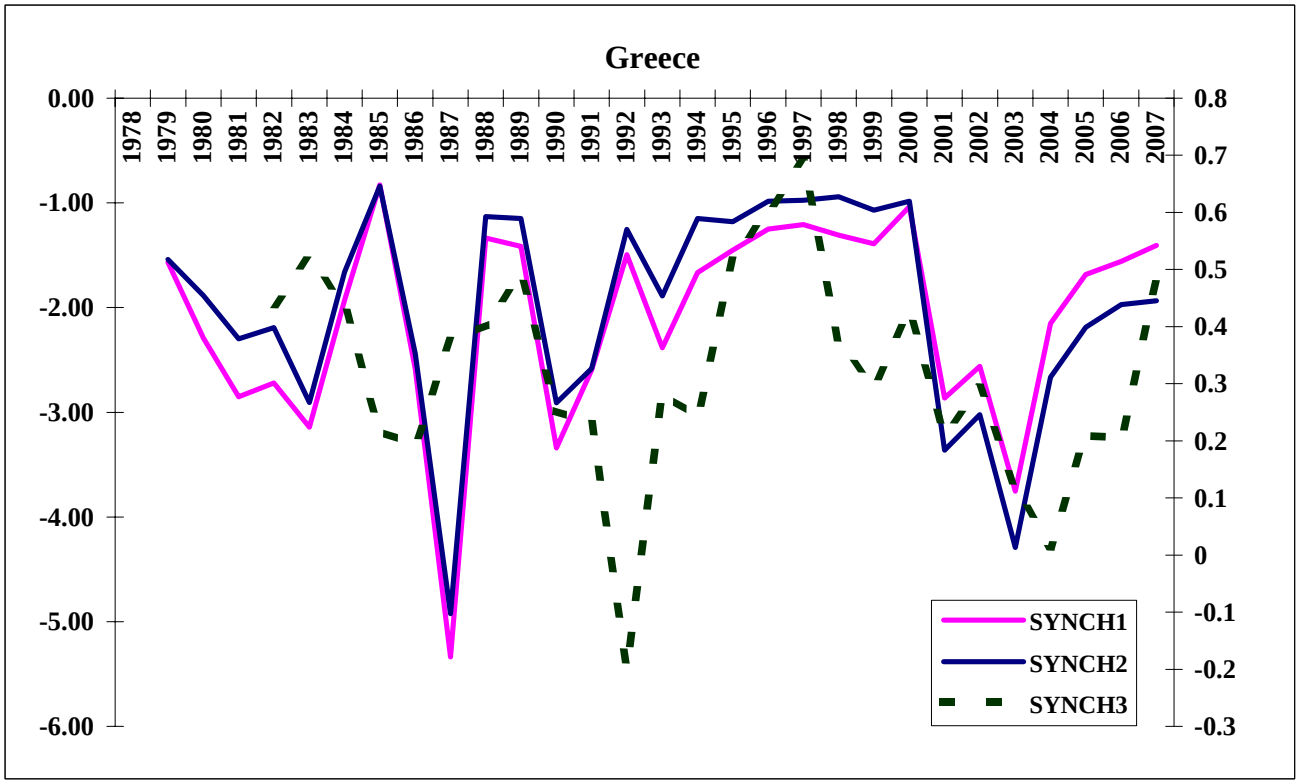


Supplementary Appendix

Appendix Figure 1.11

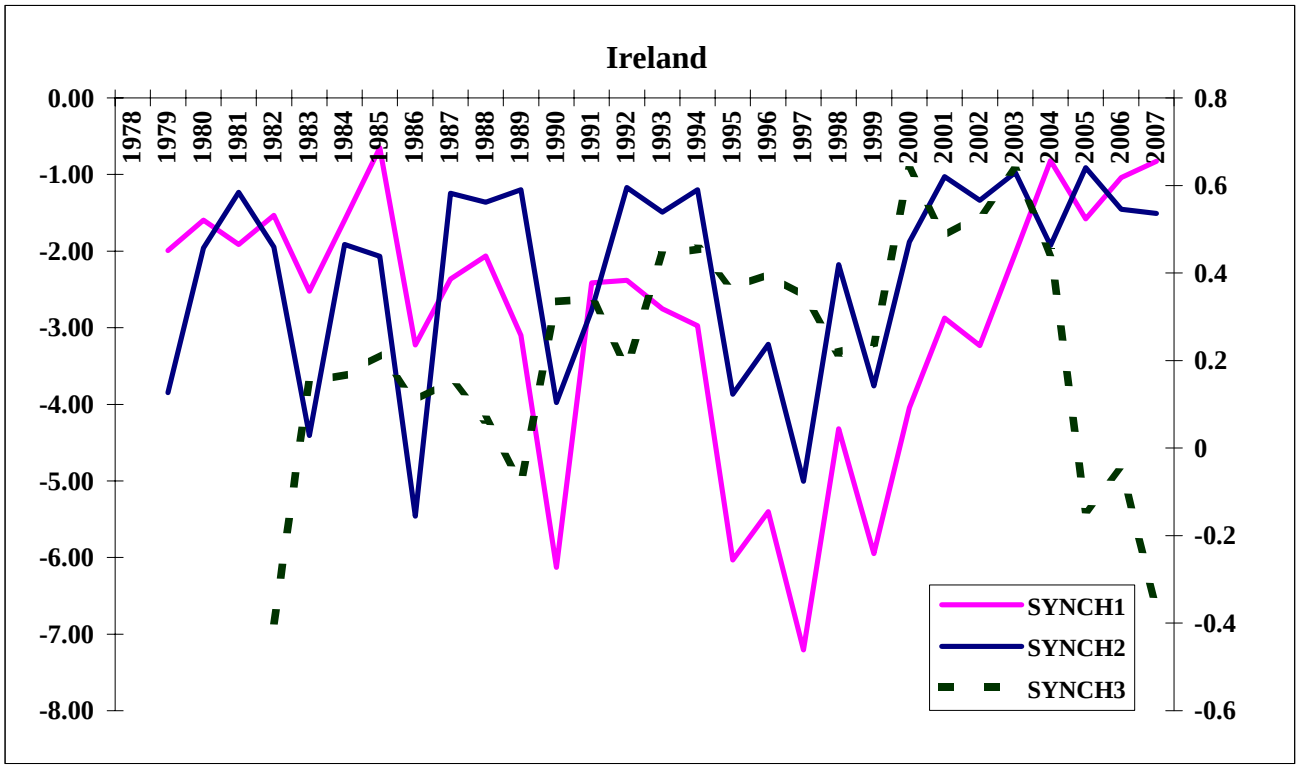


Appendix Figure 1.12



Supplementary Appendix

Appendix Figure 1.13



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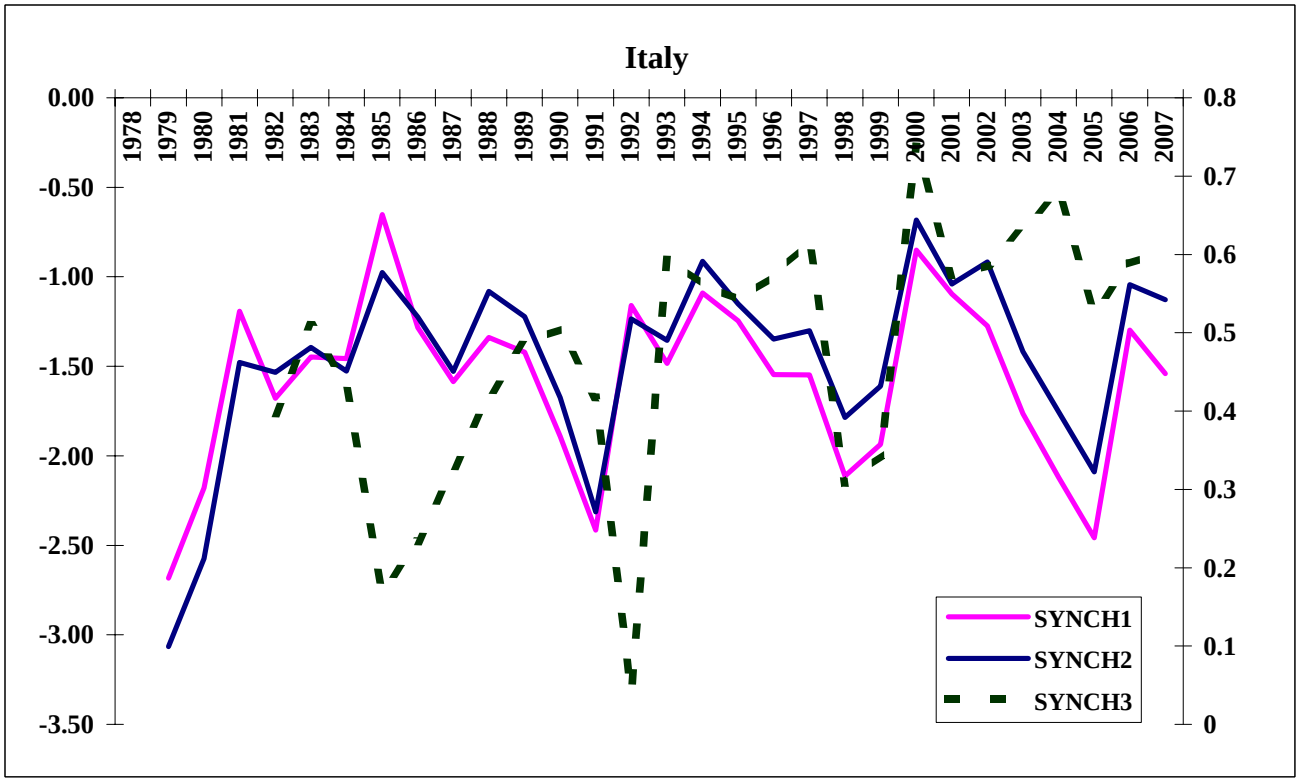
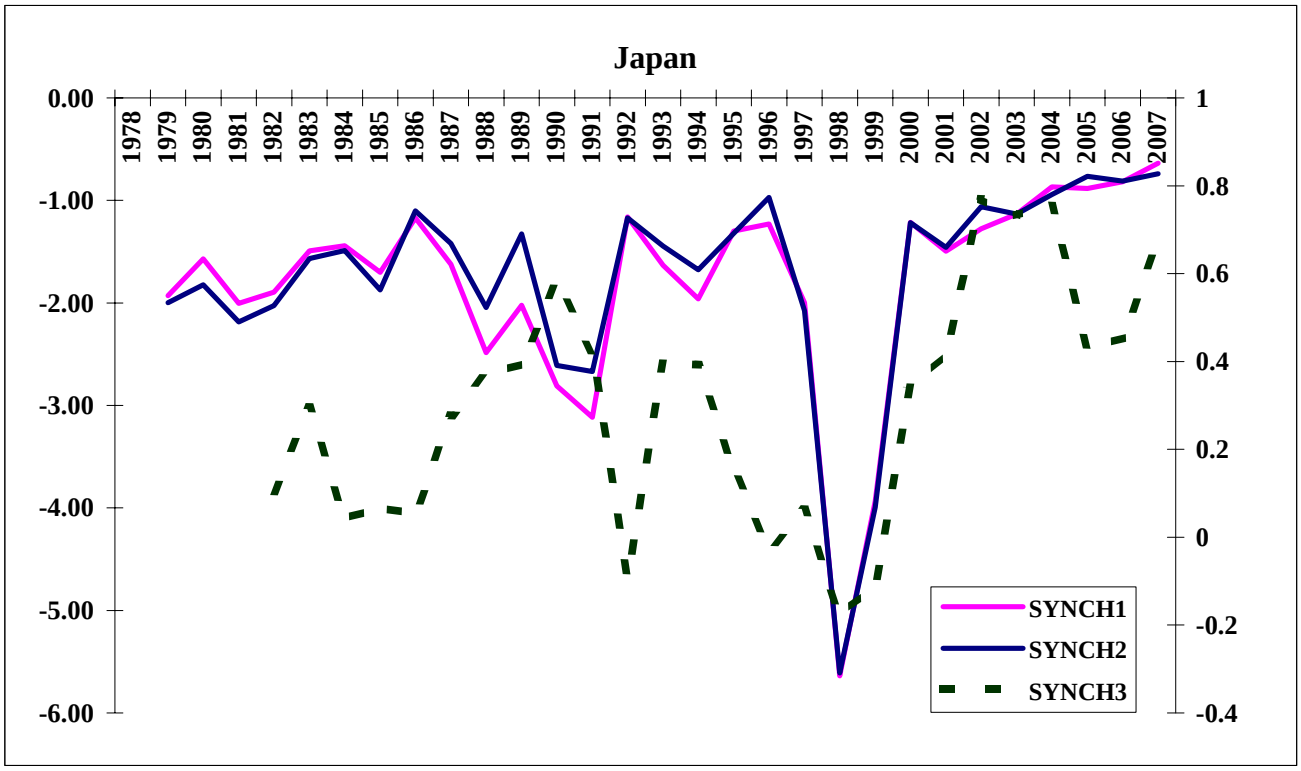
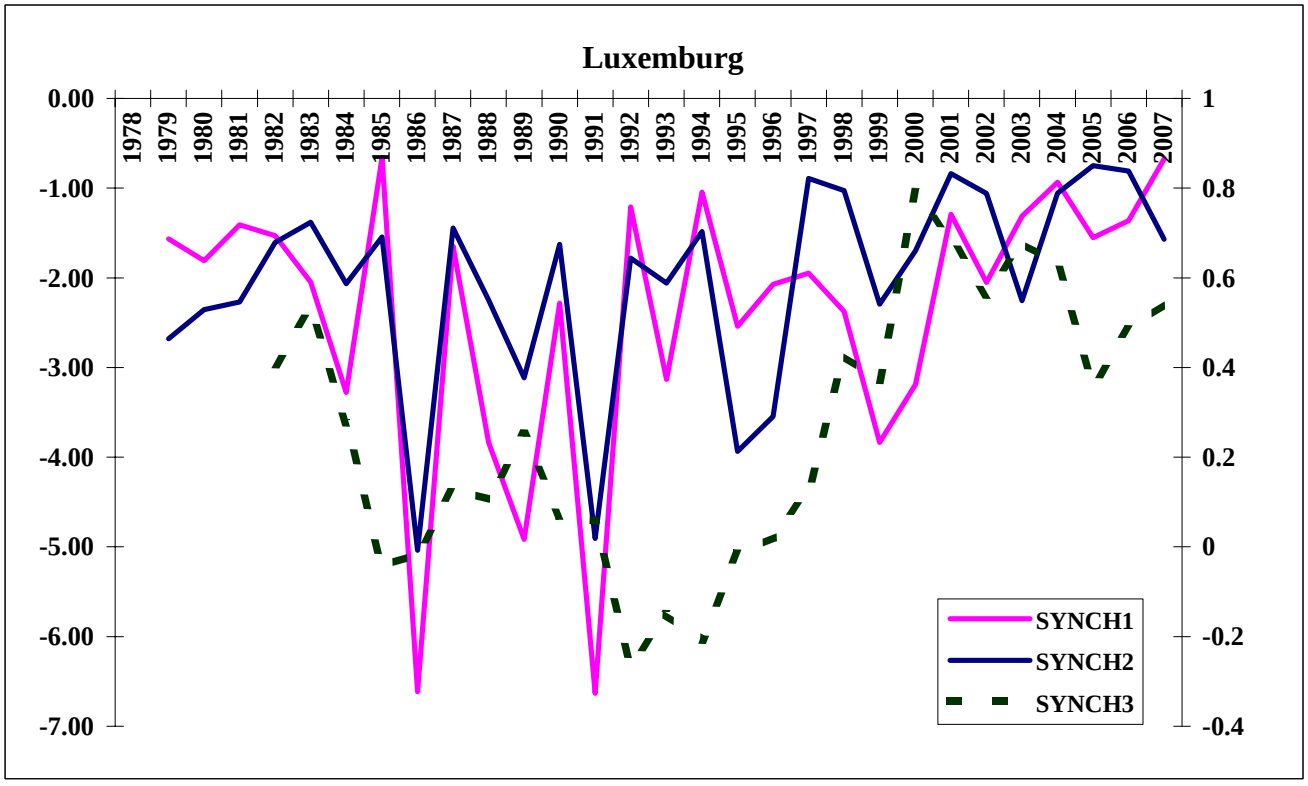


Supplementary Appendix

Appendix Figure 1.15

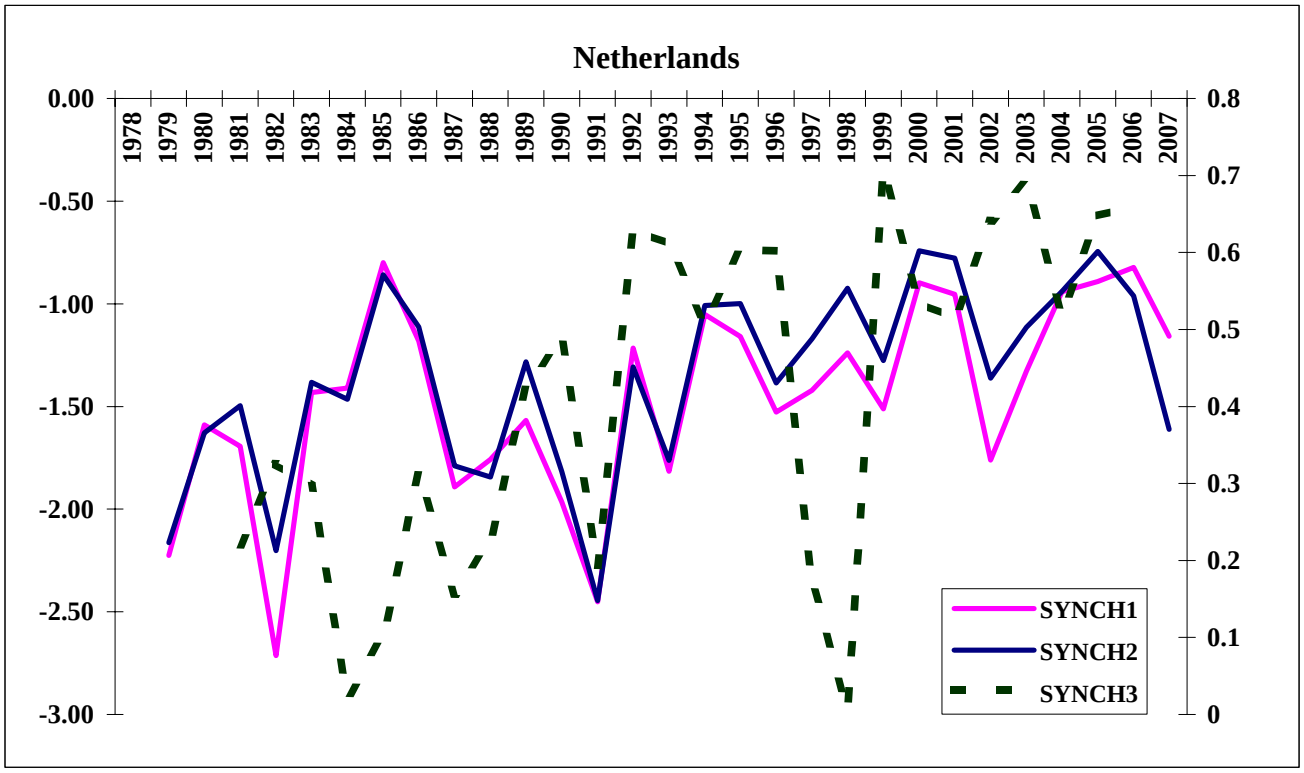


Appendix Figure 1.16

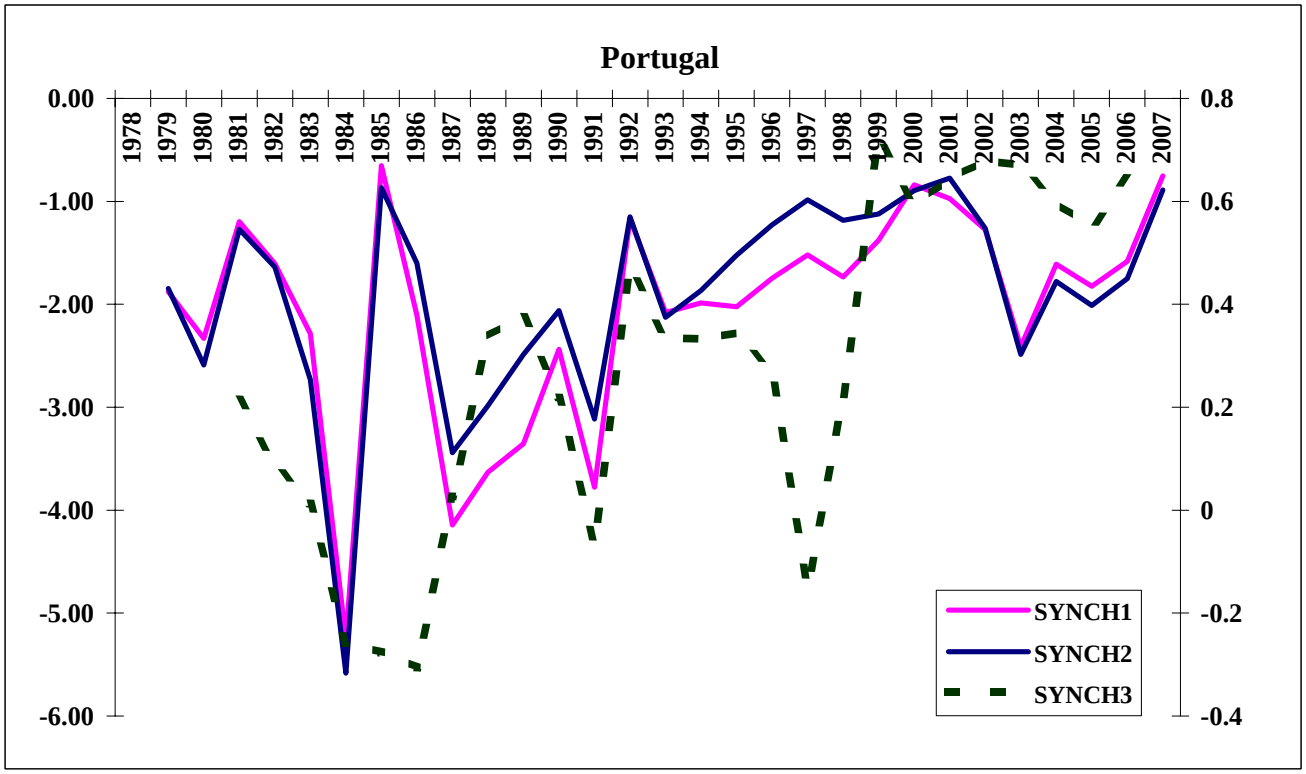


Supplementary Appendix

Appendix Figure 1.17

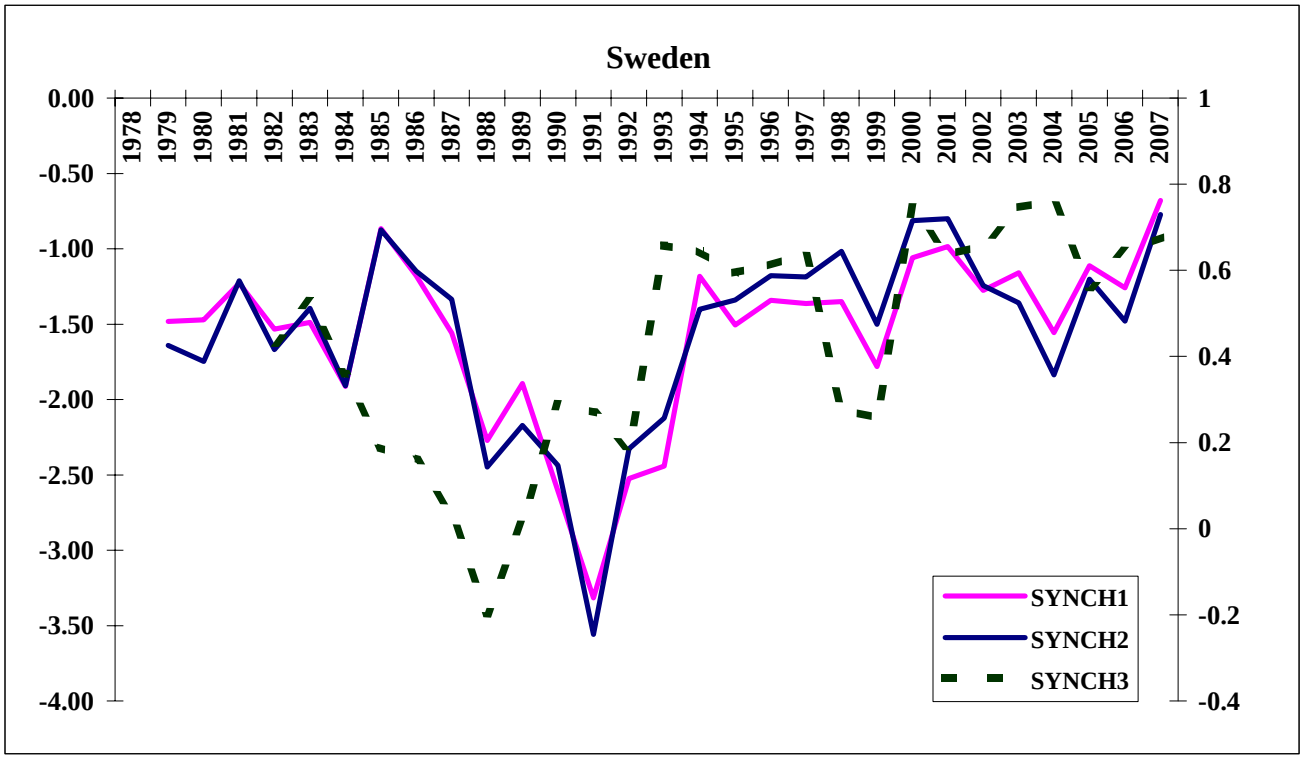


Appendix Figure 1.18

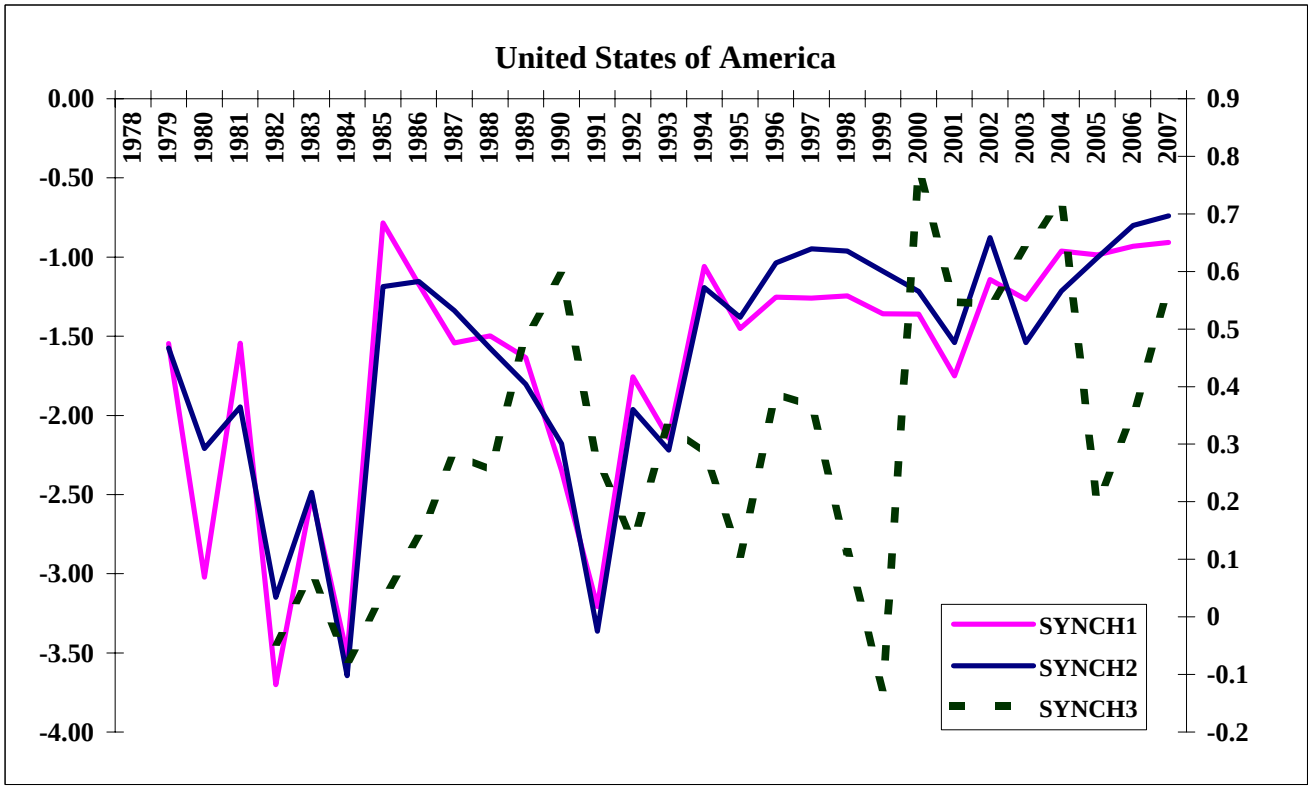


Supplementary Appendix

Appendix Figure 1.19

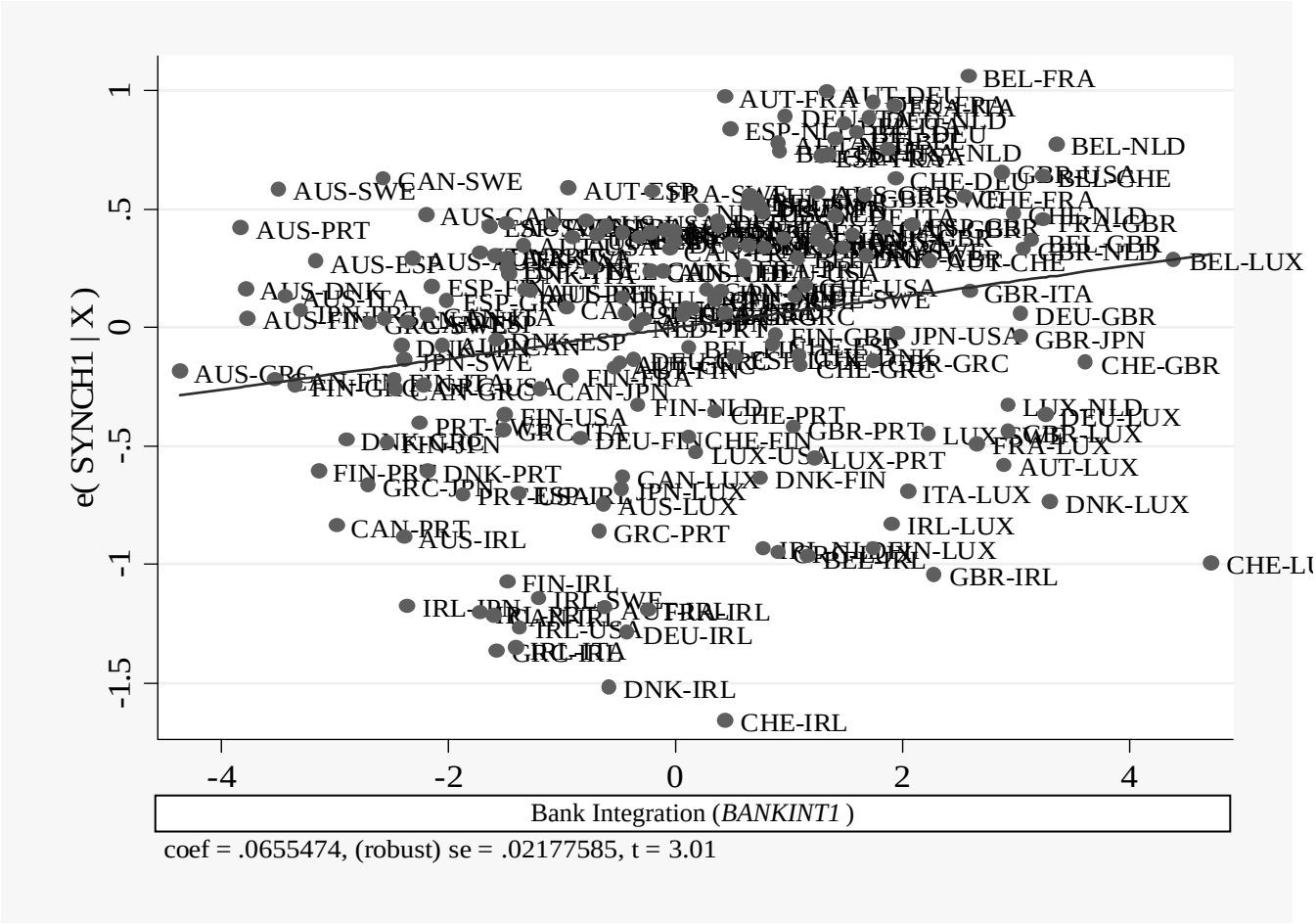


Appendix Figure 1.20



Supplementary Appendix

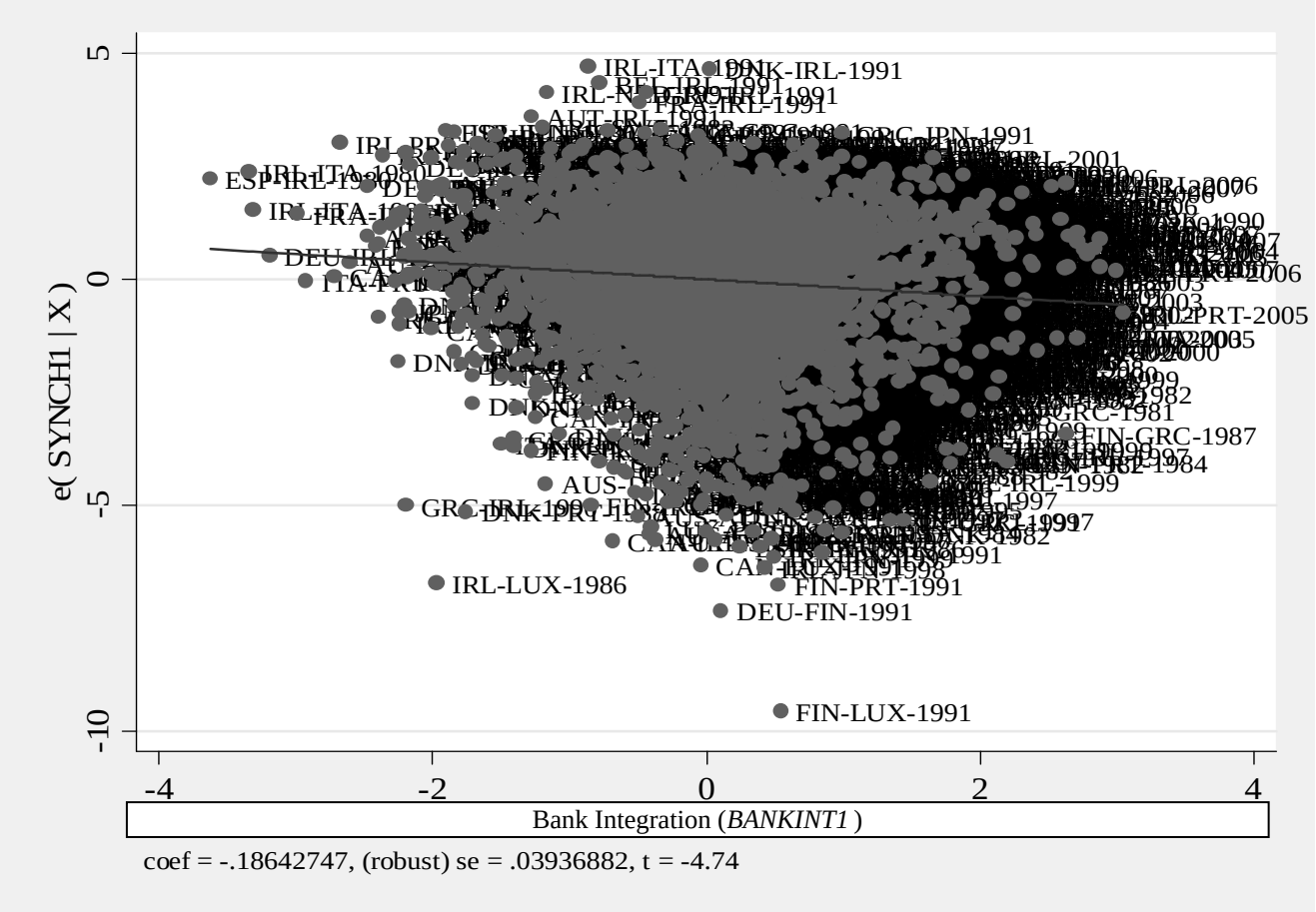
Appendix Figure 2 - Scatter Plot for Benchmark Cross-Sectional ("between") Specification



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*).