International Financial Integration and Output Co-Movement

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Abstract

I study effects of cross-border financial integration in stocks, bonds, and bank loans on output co-movement. Using bilateral data on cross-border portfolio asset and bank loan holdings for 58 economies from 2001-2015, I build on simultaneous equation estimation to disentangle the main drivers of bilateral output co-movement. I find evidence consistent with effects of international financial integration being heterogeneous and varying with time and geography. Yet, when controlling for country-level financial stress effects become homogenous: In times of low financial stress, greater stock and bond market integration lead to less and more co-movement, respectively. Heightening country-level financial stress reverses the signs of all effects. Opposite signs of stock and bond/loan integration effects across all specifications suggest that stock market integration acts as a buffer to global output co-movement effects induced by bond/loan market integration.

Keywords: Output Co-Movement, Financial Integration, Portfolio Investment, Loan integration, Financial Crises

I examine the links between the financial and the real sector to better understand how financial integration shapes output co-movement. While the Great Financial Crisis (GFC) of 2008 has prompted a large debate about spillovers from the financial to the real sector, there is still little evidence on effects of financial integration on output co-movement depending on different asset types and geography.

Specifically, I study the effects of cross-border holdings in three asset types (stocks, bonds, bank loans) on co-movement across the global economy, country-groups, and individual economies. It is important to combine data on bank system exposure and portfolio investment because different asset holdings are often driven by different objectives. For instance, portfolio investors often use bond holdings to counterbalance volatility in stock holdings across their portfolio. Similarly, asset holdings also de-

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pend on geography, implying that changes in capital flows should affect individual economies differently. Understanding effects of greater financial integration on output co-movement may help understanding implications of greater financial integration, in particular in the European setting.

This paper aims at explaining whether effects of cross-border financial integration in stocks, bonds, and bank loans on output co-movement differ across time, geography, and country specific situations. Using bilateral IMF and BIS data on cross-border portfolio asset and bank loan holdings for 58 economies from 2001-2015, I build on simultaneous equation estimation to disentangle the main drivers of bilateral output co-movement. To interpret the empirical evidence, I examine effects of cross-border financial integration on co-movement through the guidance of three different theoretical mechanisms: (i) Wealth effects via stock market holdings enabling consumption/output smoothing. (ii) Balance sheet effects via bond markets leading to financial multiplier effects due to bond defaults or movements in bond prices. (iii) Bank loan effects directly leading to greater co-movement via the financial multiplier if two economies expand bank lending in similar directions. Are wealth, balance sheet, and loan effects of financial integration homogenous across economies and time? Or, do country specific factors determine how financial integration shapes output co-movement?

I find evidence consistent with effects of international financial integration being heterogeneous and varying with time and geography. Magnitudes of wealth, balance sheet, and loan effects are sizable and they shape co-movement across individual economies and country groups differently. Yet, when interacting financial integration variables with indicators on country-level financial stress effects become homogenous. In times of low financial stress, stock and bond market integration effects lead to less and more co-movement, respectively. Heightening country-level financial stress reverses the signs of all effects. The opposite wealth and balance sheet effects of stock and bond/loan integration suggest that stock market integration acts as a buffer to global output co-movement induced by bond and bank loan market integration.

I begin by outlining the three theoretical mechanisms linked to cross-border stock, bond, and loan market integration. (i) Cross-border stock market integration leads to greater risk sharing and output smoothing. Therefore, it tends to decrease output co-movement because the country owning stocks abroad has a temporary advantage of 'taking leisure' while the other works (Baxter and Crucini, 1995; Davis, 2014). (ii) Balance sheet effects involve bond market integration, which is at the origin of 'financial multiplier' effects of leveraged intermediaries. Because banks earn interest and non-interest income through lending and trading, a change of economic situation in one economy has two effects. First, to safeguard their trading portfolio, banks withdraw assets from risky economies. Second, banks adjust lending because they need to follow Basel II regulations and lower risk exposure. This sequencing of events drives co-movement across country-groups. (iii) Bank loan effects affect co-movement indirectly or directly. Either they are the indirect result of changes in cross-country stock or bond market holdings, or they affect co-movement directly as banks simply adjust lending abroad.

Next, I argue that financial integration is different across economies. I present a set of stylized patterns using data from the IMFs Coordinated Portfolio Investment Survey (CPIS) showing that the US is at the center of the world financial system. But other

important secondary financial networks have evolved over the last decade. Thus, it is important to analyze financial integration in a global cross-country setting.

Based on these premises, I build an econometric framework to disentangle wealth, balance sheet, and bank loan integration effects from real drivers of output co-movement. I regress indices of cross-border financial and real integration on indicators of GDP growth co-movement. The main identification challenge arises because financial market integration can affect output through multiple channels. To identify the causal impact of each channel on output co-movement I need one separate instrument per channel. To address this issue, I use simultaneous equation estimation also accounting for direct and indirect relationships between endogenous variables. Important contributions by Imbs (2004, 2006) and Davis (2014) have used comparable approaches in cross-sections. In such a setting cross-country variation of instruments ensures identification. Pyun and An (2016) recently applied a similar estimation strategy in a panel setting. Beyond the standard instruments of the literature, I also account for exchange rate differences. Low exchange rate flexibility across a country-pair should heighten co-movement in crisis times. High exchange rate flexibility should have the opposite effect. To gauge theses differences, I use data from the 'fine' peg index by Ilzetzki et al. (2017). Finally, I add time-year dummies to control for potential time trends common to all economies.

Then, I investigate the different effects of financial integration on output co-movement over the 2001-15 period. I call these effects the *average effects of financial integration* since they reflect the average contribution of cross-border financial integration to more or less output co-movement over the total sample period. Evidence on *average effects of financial integration* points to large differences across country groups: On average, greater stock market integration across advanced economies leads to less business cycle co-movement over the 2001-15 period. Yet, output smoothing via stock markets does not take place among EME or European Union economies. *Average bond market integration effects* lead to greater co-movement across the total, advanced, and European Union subsamples; across Emerging Market Economies (EME) it drove greater decoupling of output. *Average loan market integration effects* contributed to greater decoupling of co-movement across all specifications.

To further investigate why average effects of financial integration differ, I discuss two aspects of the results in more detail: (i) time and (ii) financial stress dependency. Effects of financial integration are highly correlated with specific time periods. Previous research on the effects of cross-border financial integration on output co-movement usually applied simultaneous equation estimations to cross-sectional data using one specific wave of the CPIS data.[1] To gauge time dependency I run repeated cross-sectional estimations on the coefficients of financial integration on output co-movement. I show that effects are constantly changing signs, magnitude, and statistical significance over time.

The second aspect I consider is financial stress dependency, which I call '*financial fragility*'.[2] I interact financial integration variables (stocks, bonds, bank loans) with

[1] See for instance Imbs (2004, 2006) and Davis (2014).

[2] I use the term *financial fragility* to describe country-level financial stress to distinguish it from the

updated data on country-level financial fragility originating from Laeven and Valencia (2013). I find evidence of country-level financial fragility explaining the change in signs and magnitudes over the 2001-15 period across all subsample specifications. Once controlling for financial fragility all effects linked to stock and bond market integration have the same signs: In absence of financial fragility, greater cross-border stock market integration leads to less, and greater bond market integration leads to more co-movement. The signs of these effects are consistent with the initial wealth and balance sheet effects found in Davis (2014). Magnitudes are similar across advanced and European Union economies, while across EME economies effects linked to cross-border stock market integration are roughly 10 times larger. With rising financial fragility, the signs of these effects turn with similar magnitude.

This reversal of signs is consistent with theory suggesting that in presence of high financial fragility output smoothing via stock markets stops because all economies become worse-off as shocks propagate across stock market holdings. The sign of the balance sheet effect linked to cross border bond holdings also turns as investors withdraw bond holdings and seek safe havens. These findings are in line with Pyun and An (2016) who show that wealth and balance sheet effects turned between the US and the rest of the world during the GFC of 2008. However, results in this paper also hold for country groups excluding the US, thereby showing that reversal of wealth and balance sheet effects in crisis times was not limited to the US. It is a common phenomenon in times of high financial fragility: Greater cross-border financial integration may come at the cost of greater volatility in output co-movement in times of high financial fragility. However, the evidence also shows that greater co-movement via bond/loan market integration is generally lowered via stock market integration.

My results support the literature on the effects of financial integration on output co-movement. Influential contributions by Kalemli-Ozcan et al. (2003) and Imbs (2004) have shown that financial integration affects specialization patterns, which in turn alter co-movement. Kose et al. (2003) and Imbs (2006) use cross-sectional data to show that greater financial linkages lead to more output synchronization. But, Heathcote and Perri (2003, 2004) and Kalemli-Ozcan et al. (2013b) argue that financial integration induces greater decoupling of co-movement.

The two papers closest to mine are Davis (2014) and Pyun and An (2016) . First, Davis (2014) shows that differing results of the literature on whether greater co-movement can be explained by greater financial integration needs to account for the opposite effects of cross-border bond and stock market integration. He coined the terms wealth and balance sheet effects. Second, Pyun and An (2016) show the reversal of wealth and balance effects conditional on the 2008 financial crisis from an US perspective.

I contribute to the literature in three ways. First, I study financial integration effects in a global bilateral country-pair setting. This is important because financial networks that exclude the U.S. gained importance over the last decade. I show that the reversal of wealth and balance sheet effects is a general phenomenon in times of high financial fragility. It took place on a global scale, even across country groups excluding the U.S.

Second, I combine data on bank system exposure and portfolio investment. Thus, I

theoretical literature on economic uncertainty and stress.

move beyond evidence on either international exposure of the banking system (Kalemli-Ozcan et al., 2013a) or portfolio investment (Imbs, 2004; Davis, 2014). While cross-border banking activities constitute the bulk of international finance (Lane and Milesi-Ferretti, 2007), contributions by Gabaix (2011) and Acemoglu et al. (2012) have shown that even small actors can shape aggregate outcomes. Therefore, it is important to consider both portfolio investment and bank loan integration. Focusing solely on portfolio investment might also explain the difficulty of previous studies to generalize results to a global country-pair sample (Pyun and An, 2016). I contribute to this literature by reporting empirical evidence that portfolio and loan integration effects are coherent across subsamples once controlling for country-level financial fragility.

Third, I provide panel data evidence accounting for simultaneity. Due to data availability most existing studies had to rely on cross-sections. Using a panel structure increases accuracy and allows accounting for time dependent effects common to all economies.

The rest of the paper is organized as follows. The next section discusses the theoretical underpinnings of wealth, balance sheet, and loan market integration effects. Then, I discuss the data and descriptive evidence in sections 2 and 3. Based on this first empirical evidence, I build an econometric framework in section 4 explaining the identification strategy and instrument choice. I specifically discuss exogeneity, time, and cross-country variation of instruments. Section 5 shows that *average effects on co-movement* on different asset types. Section 6 discusses time differences of effects and highlights that these differences can be explained with data on country-level financial fragility. I interpret these results as evidence for wealth and balance sheet effects and their reversal when financial fragility is high. Section 8 computes additional robustness checks. Section 9 concludes.

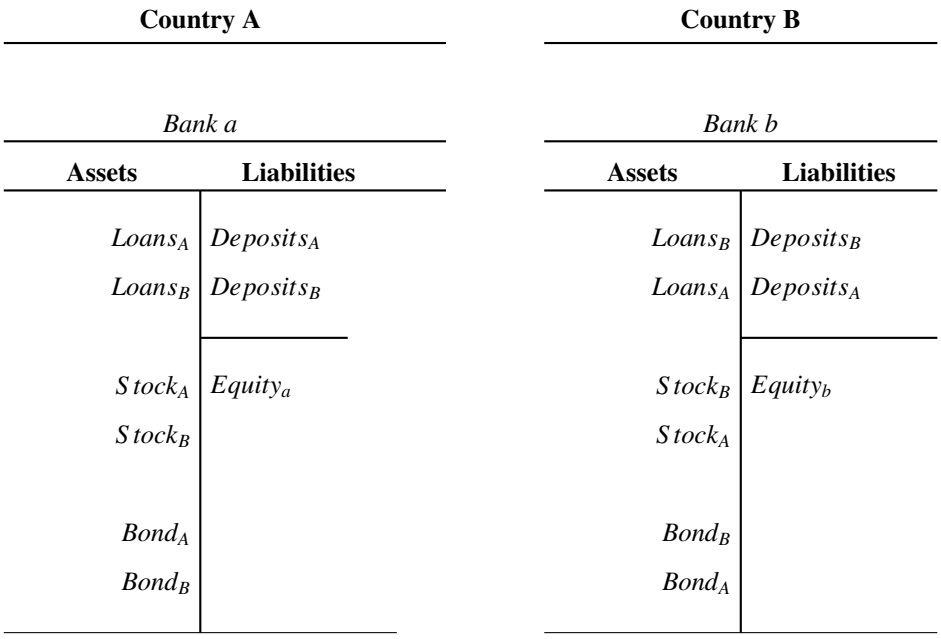
1. Balance Sheet Dynamics

This section explains the three theoretical mechanisms underlying the interpretation of the empirical evidence. Using a very simple framework based on two economies' balance sheets, I explain how greater stock, bond, and bank loan integration can lead to more or less output co-movement via lending adjustments.[3]

Let a (home) and b (foreign) denote two representative banks in countries A (home) and B (foreign). All physical capital loans in this two-country economy to firms and households are made by those two banks. Figure 1 shows the simplified balance sheets of these two banks. The asset side of both banks is composed of loans, and stock and bond holdings in both home and foreign economies. Stock and bond holdings are defined in the broadest way possible. Stocks represent an ownership interest in an entity and bond holdings are any security representing a creditor relationship with another entity. Banks finance this loan and financial security portfolio with home and foreign deposits. Subscripts A and B denote the country where the entity is held. *Equity*

[3]For simplicity, I restrict the analysis to bank balance sheet integration. Beyond depository-taking corporations, the CPIS data also covers central banks, general government, and other financial institutions such as mutual funds or insurers.

Figure 1: Balance sheet dynamics



denotes equity invested in bank a or b. I assume that the banks allocation decision is subject to home bias, e.g. the share of physical capital loans to domestic firms and households is greater than physical capital loans to foreign firms and households. Using this simple framework one can study the balance sheet dynamics of locally restricted and global shocks.

A locally restricted shock in country B leads to a loss in assets in bank b's balance sheet. Depending on the type of assets primarily affected capital market integration can lead to more or less output co-movement of countries A and B. Three different effects are notable. First, loan defaults in country B directly decrease the value of $Loans_B$. Compared to the initial situation the asset/debt ratio of the country B bank deteriorates. Bank b is constrained to reduce credit supply. The asset defaults also deteriorates the asset/debt ratio of the representative bank in country A, depending on the amount of physical capital loan defaults in B's economy. To decrease its asset/debt ratio, Bank a is constrained to pay off its assets in country B, resulting in less credit supply in country A. Thus, there is less credit provision in both countries which results in greater output co-movement. The shock in country A led to a contagion effect from A to B. Second, the local shock in country B lowers the value of $Bond_B$. Similarly, the loss in asset value in bank b's balance sheet means that this bank has to adjust its loans downward to keep the asset/debt ratio constant. The lower value of $Bond_B$ calls for similar adjustments in country A. Both countries experience a credit crunch and output co-movement increases. Third, the locally restricted shock in B lowers the value of $Stock_B$. Bank b has again to adjust the asset side of its balance sheet. However, due

to the higher liquidity of stocks bank A is not necessarily constrained by this event and is able to smooth consumption by efficient risk diversification. The loan adjustments are different in the representative economies which leads to less output co-movement across the country pair.

A global shock affecting both economies can again lead to more or less output co-movement. First, if both economies are affected by the shock and experience loan defaults their output co-movement increases. Second, if the shocks affect the value of both bond assets bank a might decide not to pay off its assets placed in the foreign country in case it is deemed to be a safe haven. In this case, both countries will face different credit provision leading to lower output co-movement. Third, a global shock in both economies lowers the value of both stock holdings and, thus, increases co-movement. Thus, a sharp decrease of capital flows to and from country B would lead to more output co-movement with country A.

2. Data

I use six main datasets to test the theoretical mechanisms outlined in the previous section: World Development Indicator data (WDI), the Coordinated Portfolio Investment Survey (CPIS), Bank of International Settlements Locational Statistics (BIS), Direction of Trade Statistics (DOTS), UN's National Accounts, and country-level indicators on financial crises.

2.1. World Development Indicator Data

Based on WDI GDP data in current U.S. Dollars, I compute the following year-to-year measure of co-movement.

$$SYNCH_{ijt} = |g_{it} - g_{jt}| \tag{1}$$

where g_{it} and g_{ij} indicate the log difference of annual GDP growth of countries i j at t. Thus, I measure co-movement as the average similarity in GDP growth rates across the country-pair. A similar measure has been used by Kalemli-Ozcan et al. (2013a) and many other researchers. A higher value of $SYNCH$ indicates less co-movement. Perfect co-movement is achieved at zero.

2.2. Coordinated Portfolio Investment Survey

The most suitable information available on bilateral debt and equity security holdings is the IMFs Coordinated Portfolio Investment Survey (CPIS). The CPIS indicates asset and liability stocks of bilateral portfolio assets of central banks, depository-taking corporations, general government, and other financial institutions such as mutual funds or insurers. It covers the 2001-2015 period and comprises 58 economies.[4] Similar to a measure of trade intensity I sum cross-border assets and liabilities and normalize by

[4] As most of the previous studies, I cut the number of distinct country-pairs in the sample to 58, the lowest available number in year 2002, to obtain a balanced country-pair panel.

the sum of the two countries' GDPs. This measure originates from Lane et al. (2003) and Kose et al. (2003).

$$Bond_{ijt} = \frac{(AssDebtSec_{ijt} + LibDebtSec_{ijt})}{(GDP_{it} + GDP_{jt})} \tag{2}$$

$$Stock_{ijt} = \frac{(AssEQ_{ijt} + LibEQ_{ijt})}{(GDP_{it} + GDP_{jt})} \tag{3}$$

2.3. Bank of International Settlements Locational Statistics

I retrieve detailed country-tables from the Locational Banking Statistics database of the BIS. BIS statistics table A6.2 reports for each country all cross-border positions by location of banking office. Then, I compute a loan measure based on bilateral claims in loans and deposits from country i to country j.

$$Loan_{ijt} = \frac{(Claims_{\underrightarrow{ijt}} + Claims_{\underrightarrow{jit}})}{(GDP_{it} + GDP_{jt})} \tag{4}$$

Since the data are bilateral and liabilities are not always fully reported, I use the sum of claims from country i to j and j to i which I normalize by the sum of GDP. This measure originates from Epstein et al. (2016).

2.4. Direction of Trade Statistics

I follow Frankel and Rose (1998) and use a standard measure of bilateral trade intensity. I normalize imports (CIF) and exports (FOB) by the sum of the two countries GDPs. Data on bilateral exports and imports originate from the IMF's Direction of Trade Statistics database.

$$T_{ijt} = \frac{(X_{ijt} + M_{ijt})}{(GDP_{it} + GDP_{jt})} \tag{5}$$

2.5. UN National Accounts

Following Imbs (2004), I compute an index of industrial specialization at International Standard Industrial Classification (ISIC) divisions for each country-pair.[5] The specialization index for each country i and j and each year t is computed as follows. Let $\frac{VA^d_{it}}{VA_{it}}$ denote the share of industry sub-division d value added in country i total value added. $\frac{VA^d_{jt}}{VA_{jt}}$ is the equivalent for all j. D is the number of divisions.

$$S_{ijt} = \frac{1}{D}\sum_{d=1}^{D} \left| \frac{VA^d_{it}}{VA_{it}} - \frac{VA^d_{jt}}{VA_{jt}} \right| \tag{6}$$

[5]The divisions are: *Agriculture, hunting, forestry, fishing (ISIC A-B)*, *Mining, Manufacturing, Utilities (ISIC C-E)*, *Manufacturing (ISIC D)*, *Construction (ISIC F)*, *Wholesale, retail trade, restaurants and hotels (ISIC G-H)*, *Transport, storage and communication (ISIC I)*, and *Other Activities (ISIC J-P)*.

I take the mean across the ISIC sectors of the absolute sectoral difference in specialization patterns per country-pair. I capture how co-movement depends on the bilateral country-pair's industry specialization patterns.

2.6. Financial Fragility

I use additional data on financial fragility, which I proxy with indicators of country-level financial crises. The current literature offers dichotomous and continuous measures.

All main specifications use data from Laeven and Valencia (2013). I update it to cover the total sample period of 2001-15.[6] I identify three different types of financial shocks: banking crises, currency crises and sovereign default. I add an aggregate 'financial crisis' dummy and set it to one if either of those crises occurred. If at least one bilateral counterpart in the pair is in crisis, I count the country-pair as affected. Laeven and Valencia (2013) define a country-year as in crisis when there is both significant distress in the banking system and policy-makers respond with significant interventions.[7] The data have shortcomings, but the indicators cover a maximum of different countries and are easy to update.

Second, the robustness checks repeat all estimations using continuous indicators originating from Romer and Romer (2017) and Gandrud and Hallerberg (2017).

3. Different Levels of Cross-border Financial Integration

Using the CPIS and BIS data, I document two sets of facts on geographical and asset type dependency of cross-border financial integration. First, I show that the global trend towards greater cross-border financial integration affected individual economies differently. Second, I present descriptive evidence that these differences translated into heterogenous responses of cross-border financial integration over the last decade.

3.1. Mapping Financial Integration

Cross-border financial market integration is heterogeneous in nature. There is an aggregate trend of the global financial cycle showing that cross-border capital flows increased rapidly until the GFC of 2008, then dropped, and slowly recovered ever since.[8] At the same time, there is evidence of largely different developments of flows. These differences have two dimensions. First, they are based on geography. Cross-border capital market integration increased among some country groups, such as the European economies, while it receded among others.[9] Second, there is a bond and stock market dimension. To further assess these two dimensions and convey a holistic picture of

[6] See appendix for details.

[7] 'Significant intervention' requires employment of at least three of the following six policies: deposit freezes/banking holidays, significant bank nationalizations, bank restructuring gross costs, extensive liquidity support, significant guarantees, and significant asset purchases.

[8] The existence of this global financial cycle has been recently established by the literature (Rey, 2013).

[9] See for instance Martin and Rey (2000) and Portes and Rey (2005) for theoretical and empirical explanations for different geographical developments.

the global financial system, figure 2 shows gross stock and bond holdings across G20 economies and the main financial centers.[10] Three features stand out. First, the gross amounts of stock and bond assets have increased substantially since 2001. Second, while the US is undoubtedly at the center of the financial system, an intra-European financial market center has emerged over the last 15 years. Starting in 2001 (Figure 2a), the US is at the center of world stock markets. Besides gross stock asset holdings from the UK to the US, Japan is the largest stockholder. From 2008 to 2015 the US keeps its central position but is increasingly challenged by Luxembourg which becomes the center of an emerging intra-European stock market. The more so, as stock holdings in Luxembourg suffer from strong under-reporting in CPIS.[11] Lane and Milesi-Ferretti (2007) illustrate this shift in stock markets in favor of other Euro area countries. This Eurozone bias has even been stronger in bond markets (2e, 2f and Lane (2006)), where intra-European cross-border gross bond holdings slowly complement the primary role of the US. Third, the tight network of financial flows portrayed conveys the need for a country pair world sample when assessing effects induced by cross-border financial integration. While the US is undoubtedly the global player in capital markets, other countries play an important secondary role. Taking a US centered perspective insufficiently accounts for global financial linkages.

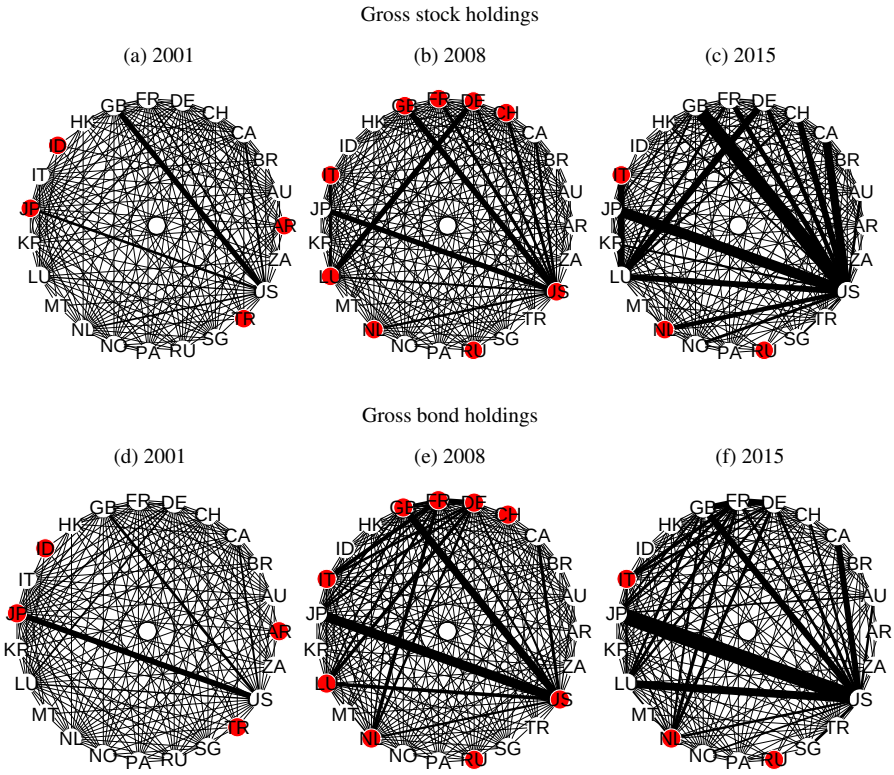
3.2. Timing Differences

These heterogenous patterns of cross-border holdings across countries also translated into different responses of wealth and balance sheet effects in times of financial fragility. Figure 3 provides additional descriptive evidence on timing of changes in financial integration indices by plotting the mean values of integration indices for different subsamples. There is a time sequencing difference between portfolio (stock and bond) and bank loan integration, which is particularly pronounced in figures 3a and 3b. Stock and bond market integration indices reverse one year earlier compared to loan integration. This suggests that changes in portfolio investment integration translate into credit supply effects which drive output co-movement. This time sequencing differences are in line with empirical and theoretical evidence that financial and real contagion happened through the lending channel (Huber, 2018; Jensen and Johannesen, 2017; Devereux and Yetman, 2010).

[10] Due to the bilateral nature of CPIS stocks, we cannot observe indirect asset flows, such as from Germany to the US via Luxembourg. However, plotting networks represents in part a remedy for this problem.

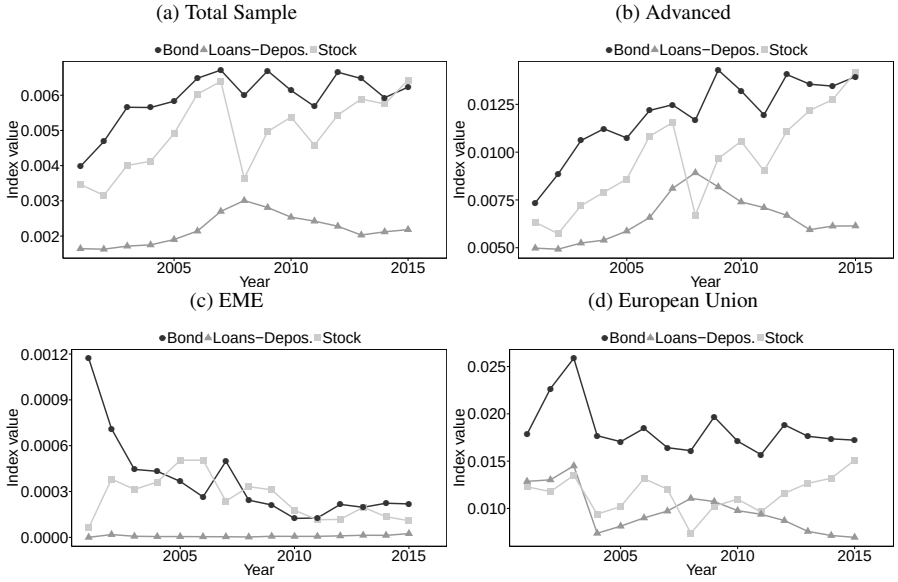
[11] Hobza and Zeugner (2014) report the "severe under-reporting of equity flows to Luxembourg" in the CPIS data. They reveal that in 2007 only 60% of the reported portfolio stock liabilities reported by Luxembourg were declared as assets by other countries. For Ireland this ratio drops to 33%.

Figure 2: Gross bond and stock asset holdings



Notes: This figure plots the amount of U.S. Dollar bond holdings across the G20 and main financial centers. Only the holdings among the first and second country-pair are taken into consideration for each country. The size of the links associated with each pair is proportional to the amount of U.S. Dollar holdings across the country-pair. Gray nodes experience a banking crisis based on Laeven and Valencia's (2013) database. The graphs are based on Davidson and Harel's (1996) algorithm.

Figure 3: Financial integration indices for different country groups.



Notes: This figure plots the time series of the mean financial indices in the Total, Advanced, Emerging Market Economies, and European Union sub-samples.

4. Econometric Framework

Armed with the first descriptive evidence showing large cross-country heterogeneity in cross-border financial integration, this section outlines the econometric framework used to estimate wealth, balance sheet, and loan effects.

4.1. Identification Strategy

This paper estimates the effect of cross-border financial integration on output co-movement. The baseline relationship is the following (7).

$$Synch_{ijt} = \alpha_0 + \alpha_1 FIN_{ijt} + \alpha_2 Crisis_{ijt}(FIN_{ijt}) + \alpha_3 Trade_{ijt} + \alpha_4 Spec_{ijt} \qquad (7)$$

Where $Synch_{ijt}$ is an index of GDP growth co-movement between countries i and j at t. FIN comprises indices of cross-border stock, bond, and loan integration. $Crisis_{ijt}$ is an indicator of financial fragility across the country-pair. $Trade$ and $Spec$ are indices of bilateral trade intensity and industry specialization.

There are three well known identification challenges. First, equation (7) does not distinguish between direct and indirect effects of variables. For instance, α_1 might report both the direct and indirect effect of financial integration on output. Thus, estimates of α_1 might suffer from upward bias. This is likely, because countries with greater financial integration also trade more. I address this first challenge by using

simultaneous equation estimation. Specifically, 3-Stage-Least-Squares (3SLS) estimation accounts for cross-equation correlation and yields more efficient estimates for simultaneous equation systems compared to 2SLS or OLS. Several other important contributions such as Imbs (2004, 2006), Davis (2014), and Pyun and An (2016) have used similar approaches.

Second, a shock global to all economies could simultaneously affect all economies. This could lead to false interpretations of signs on the role of financial integration on output co-movement. This could result in overestimating causal effects of financial market integration, even if the effect when accounting for global factors was zero. I overcome this second challenge by adding time year dummies that control for time trends common to all countries.

Once deciding on simultaneous equation estimation another challenge arises. To disentangle the direct and indirect channels I need one unique instrument per endogenous variable. Additionally, the rank condition states that for each equation in the system I need to exclude at least as many exogenous variables as I include endogenous variables (Hayashi, 2000).

Equation (8) states the full equation system.

$$
\begin{cases}
SYNCH_{ijt} = \alpha_0 + \alpha_1 Stock_{ijt} + \alpha_2 Stock_{ijt} * Crisis_{ijt} + \alpha_3 Bond_{ijt} + \alpha_4 Bond_{ijt} * Crisis_{ijt} \\
+\alpha_5 LD_{ijt} + \alpha_6 LD_{ijt} * Crisis_{ijt} + \alpha_7 T_{ijt} + \alpha_8 S_{ijt} + \epsilon_{ijt} \\
\\
Stock_{ijt} = \beta_0 + \beta_1 Crisis_{ijt} + \beta_2 Bond_{ijt} + \beta_3 LD_{ijt} + \beta_5 T_{ijt} + \beta_6 S_{ijt} + \beta_7 X_{i,j,t}^{Stock} + u_{ijt} \\
Bond_{ijt} = \gamma_0 + \gamma_1 Crisis_{ijt} + \gamma_2 Stock_{ijt} + \gamma_3 LD_{ijt} + \gamma_4 T_{ijt} + \gamma_5 S_{ijt} + \gamma_6 X_{ijt}^{Bond} + v_{ijt} \\
LD_{ijt} = \zeta_0 + \zeta_1 Crisis_{ijt} + \zeta_2 Stock_{ijt} + \zeta_3 Bond_{ijt} + \zeta_4 T_{ijt} + \zeta_5 S_{ijt} + \zeta_6 X_{ijt}^{LD} + v_{ijt} \\
T_{ijt} = \theta_0 + \theta_1 Crisis_{ijt} + \theta_2 Stock_{ijt} + \theta_3 Bond_{ijt} + \theta_4 LD_{ijt} + \theta_5 S_{ijt} + \theta_6 X_{i,j,t}^{T} + w_{ijt} \\
S_{ijt} = \lambda_0 + \lambda_1 Crisis_{ijt} + \lambda_2 Stock_{ijt} + \lambda_3 Bond_{ijt} + \lambda_4 LD_{ijt} + \lambda_5 T_{ijt} + \lambda_6 X_{ijt}^{S} + e_{ijt}
\end{cases}
\tag{8}
$$

Where $Stock_{ijt}$, $Bond_{ijt}$, LD_{ijt} are indicators of stock, bond and bank loan integration of countries i and j at t. $Crisis_{ijt}$ is a dummy indicator taking the value 1 if at least one country in the pair is in a financial crisis based on Laeven and Valencia (2013). $X_{ijt}^{Stock}, X_{ijt}^{Bond}, X_{ijt}^{LD}, X_{ijt}^{T}, X_{ijt}^{S}$ are vectors composed of exogenous variables, instruments, to identify the endogenous variables in our system. Coefficients α_1 to α_6 capture the direct effects of financial integration. Coefficients β, γ, ζ, θ, and λ capture the indirect effects. All specifications also include time dummies to account for time trends common to all countries.[12]

4.2. Instruments

To identify endogenous variables in system (8), I need instruments with cross-country and time variation. There is a rich literature proposing different instruments

[12] I do not include country-pair fixed effects as identification comes from variation in country-pair difference. Including country-pair fixed effects is also a question of what one wants to measure. Here I focus on local and global cyclical components of output co-movement driven by country-pair differences in financial integration.

for financial and real variables.

Since Porta et al. (1997) many studies have used the relationship between legal institutions and financial development. I follow this practice and use unique IVs for financial integration. Fernández et al. (2016) provide a whole set of indicators covering country-level legal restrictions for different financial capital control measures. I instrument the stock market variable by cross-border equity restrictions. Bond market integration is instrumented by an index on bond restrictions. Bank loan integration is instrumented by loan restrictions. Each of these variables are continuous on a scale from zero to one. I compute the average value across the country-pair.

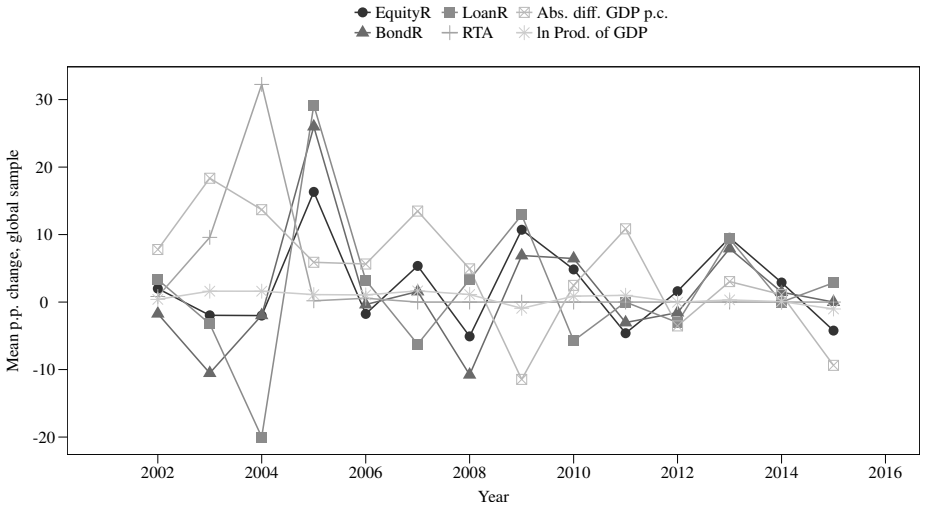
The unique IV for bilateral trade is a dummy on regional trade agreements. The underlying identifying assumption, common in the literature, is that regional trade agreements affect cross-border trade intensity independently of other drivers of output.

I instrument specialization with the respective economy's level of development. Imbs and Wacziarg (2003) have shown that development is a determinant of specialization pattterns. Rich economies are more diversified and, therefore, experience higher co-movement. Poor economies specialize in different primary products. I follow their argument and instrument specialization with the log product and absolute difference of bilateral per capita GDP.

Beyond these unique instruments, I also include three sets of common IV. These common IV capture main differences across country-pairs affecting endogenous variables. The first set of common instruments comprises variables from the trade-gravity literature. Portes and Rey (2005) show that these variables explain determinants of cross-border capital flows. Common instruments come from CEPII and include physical distance between countries i an j, common border, common official language and common legal origin. The second set of common IV considers exchange rate differences. Economies with a hard peg should experience greater co-movement in the short term. To reflect this, I use the 'fine' peg index by Ilzetzki et al. (2017). The 'fine classification' distinguishes between 15 different exchange rate arrangements. I instrument stock, bond, loan, and trade with the exchange rate IV. Again, I compute the average similarity across the country-pair. The third set comprises year dummies that account for global time trends affecting all economies similarily.

Identification works in two directions. First, there is time variation for the main instruments that ensures identification over the panel. Figure 4 plots the annual percentage point variation of the unique instruments across the total sample. Equity, bond, and loan restrictions have amplitudes of at least 21 percentage points. The regional trade agreement dummy has annual variation of up to 32 percentage points. Instruments for the specialization variable have similar amplitudes. Second, variables from the trade-gravity literature, common border etc., only have very little to no yearly variation. Yet, they provide cross-sectional within variation. I exploit this fact in the cross-sectional estimates of section 5.

Figure 4: Annual percentage point variation of instruments.



Notes: This figure plots the annual percentage point variation of instrumental variables for the total sample of 58 economies. *EquityR, BondR, LoanR* are equity, bond, and loan restriction indices from Fernández et al. (2016). *RTA* is a regional trade agreement dummy based on Head et al. (2010) and CEPII. *Abs. diff. GDP p.c.* is the absolute difference of per capita GDP across the country-pairs. *ln Prod. of GDP* is the log product of GDP per capita across the country-pairs.

5. Average Effects of Financial Integration

This section contains the first step of the empirical analysis. I show the different average effects of stock, bond, and loan integration on output co-movement across country-groups. I find opposing signs of stock and bond market integration for different country groups. Average effects of bank loan integration contributed to less co-movement across all specifications.

I estimate simultaneous equation systems with the following first stage relationship (9).

$$Synch_{ijt} = \alpha_0 + \alpha_1 FIN_{ijt} + \alpha_3 Trade_{ijt} + \alpha_4 Spec_{ijt} \tag{9}$$

FIN is again a composite of stock, bond, and loan market integration indices. I include the same set of instruments as in equation (8).

Table 1 reports the main result of this section in rows 1 to 3. With the exception of the total sample, estimates show that the signs of cross-border stock and bond market integration worked in opposite directions. Specifically, column 1 shows that net effects of stock and bond market integration lead to greater co-movement across the total sample. Columns 2 and 3 show estimates for advanced and emerging economies. The co-movement inducing effect of stock market integration can be fully attributed to a catch-up effect of emerging economies. These estimates are in line with Forbes and Warnock (2012) and Cerutti et al. (2015) who show that low levels of financial fragility

lead to greater capital inflows into emerging markets. Column 4 further restricts the sample to European Union economies. While the signs of bond and loan market effects are in line with the previous estimates in columns 1 and 2, stock market effects are slightly insignificant.[13]

The existing literature finds similar opposing effects of stock and bond market integration on output co-movement. For instance, Davis (2014) in a global cross-section and Pyun and An (2016) for the U.S. find that stock and bond market effects on output co-movement work in opposite directions.

The remaining results in table 1 support the view that greater bank loan integration lead to less output co-movement. Real drivers of co-movement worked in the directions predicted by the theory. Net trade effects consistently increased co-movement, while specialization patterns dampened output co-movement in all significant specifications.

Table 1: Average effects of cross-border financial integration on output co-movement for different samples, first stage results of 3SLS.

Dependent variable: GDP growth co-movement				
	(1) Total Sample	(2) Advanced	(3) EME	(4) EU
Stock	−0.0182**	0.0202***	−0.857***	0.00645
	(−3.20)	(7.40)	(−4.17)	(1.70)
Bond	−0.0388***	−0.0222***	0.552***	−0.0135***
	(−15.18)	(−14.82)	(3.40)	(−9.30)
Bank Loans and Deposits	0.0223***	0.00669**	3.118***	0.00854***
	(3.60)	(3.15)	(5.28)	(7.90)
Trade	0.00270	−0.00863***	−0.0377***	−0.00264
	(1.15)	(−3.80)	(−3.52)	(−1.76)
Specialization	0.00220*	−0.000200	−0.00445	0.000655
	(2.03)	(−0.17)	(−1.38)	(0.59)
Observations	20972	9713	1875	4258

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports the first stage estimates from 3SLS regressions for different subsamples. The outcome in all columns is an index of bilateral GDP growth co-movement. A positive (negative) parameter estimate means that the higher cross-border financial market integration the lower (higher) co-movement. The unique instruments for endogenous variables are average equity, bond, and loan restrictions across the country-pair. The unique instrument for trade is a regional trade agreement dummy. Specialization is instrumented with the absolute difference of per capita GDP and the log product of GDP per capita across the country-pair. Common instruments include physical distance, common border, common official language, common legal origin, exchange rate regime differences, and year dummies.

[13] I also estimated the effects for Eurozone economies. However, since the United Kingdom is the main European financial hub next to Luxembourg the results only change marginally compared to EU economies. Figure 2 shows the centrality of the United Kingdom for the European financial market.

6. Time and Financial Fragility Dependency

The previous section established that stock and bond market integration had opposite signs on output co-movement. It also highlighted geographic dependency of effects. In this section, I discuss two aspects of these results: time and crisis dependency. First, I present repeated cross-sectional evidence. Amplitudes and statistical significance of stock, bond and loan integration effects changed over time and across different subsamples. Next, I test whether different effects can be explained with data on financial fragility. I find that average effects of cross-border financial integration were conditional on crisis data measures. This is the first attempt at dissecting the different effects of stock, bond, and loan market integration conditional on financial turmoil. But reversal of signs in crisis times has already been the focus of the synchronization-literature (Kalemli-Ozcan et al., 2013a; Pyun and An, 2016).

6.1. Time Dependency

I use all main datasets to estimate annual cross-sections of the system in equation (8). The only change compared to the initial specification is that I strip away crisis and time year dummies. Hence, I can gauge individual time dependent effects. The first stage relationship thus becomes.

$$Synch_{ij} = \alpha_0 + \alpha_1 FIN_{ij} + \alpha_3 Trade_{ij} + \alpha_4 Spec_{ij} \tag{10}$$

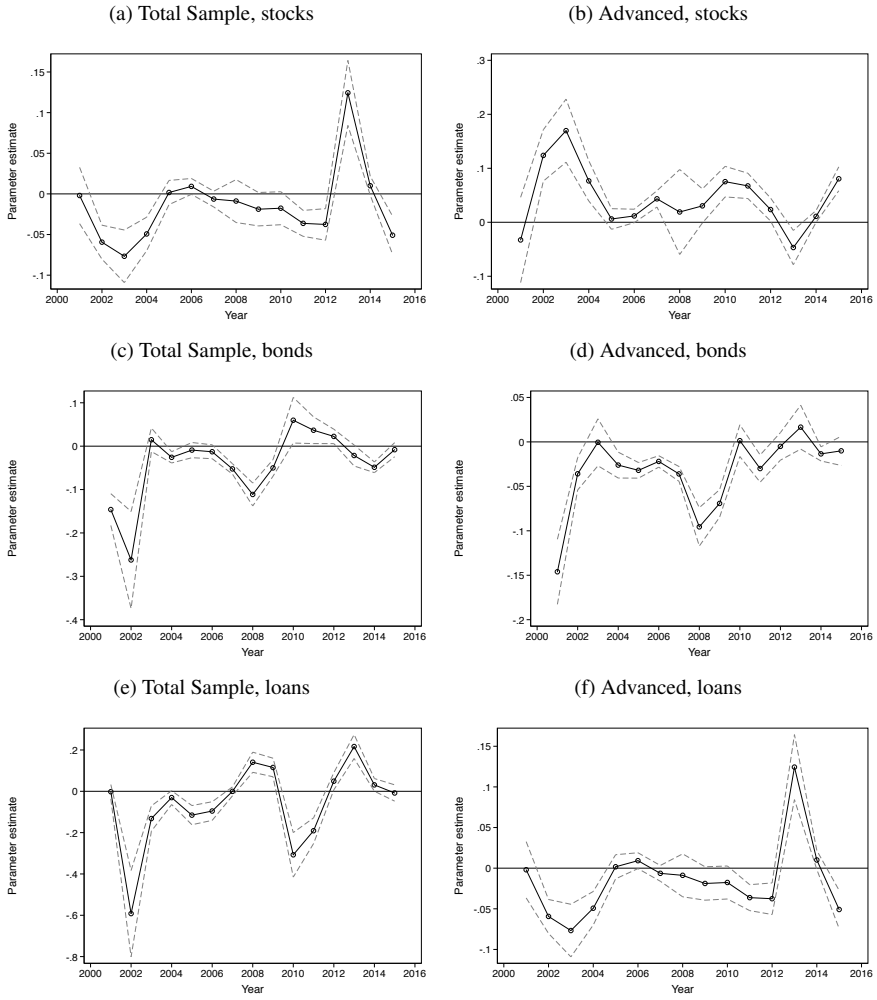
Equation (10) is in essence the cross-sectional identification strategy of Imbs (2004, 2006), and Davis (2014). As in equation (8) FIN_{ijt} is a composite of stock, bond, and loan market integraiton. $Trade$ and $Spec$ the measures of trade intensity and industrial specialization. Due to data limitations, I apply the simultaneous system to the total and advanced sub-sample only.[14]

Figure 5 plots the annual parameter estimates of the first stage. The results strengthen the argument that there were important cross-sectional differences in the way financial integration effects shaped output co-movement. There is also evidence that cross-border stock and bond market integration operated in opposite directions.

Specifically, the parameter estimates in figure 5 highlight two important facts. First, effects of cross-border financial integration changed over time. In both samples statistical significance and signs of repeated cross-section estimates vary over time. For instance, in figure 5c estimates on effects of bond market integration on output co-movement using the total sample were insignificant in 2002. Yet, for the 2003-08 period confidence bands had narrowed. From 2004-08 bond markets first induced greater co-movement. At the height of the 2008 financial crisis the effect started to reverse and then lost significance. Second, financial integration effects had a global component. But effects had different magnitudes across country groups. Among advanced economies the amplitude of estimates was smaller compared to the global sample. Timing of the variation in signs was similar for bond, stock and loan integration. Yet, the different signs of effects were distinct.

[14] The number of annual observations for other subsamples (EME and EU) is not sufficient and, thus, the covariance matrix of errors is singular.

Figure 5: Annual effects of financial market integration on output co-movement: Parameter estimates from annual cross-sections.



Notes: The figures plot parameter estimates from cross-sectional 3SLS estimations à la Imbs (2004) and Davis (2014) for different subsamples and financial integration variables. The outcome in all figures is an index of bilateral GDP growth co-movement. The dashed lines show the 95 percent confidence bands. A positive (negative) coefficient means that the higher cross-border financial market integration the lower (higher) co-movement. The unique instruments for endogenous variables are average equity, bond, and loan restrictions across the country- pair. The unique instrument for trade is a regional trade agreement dummy. Specialization is instrumented with the absolute difference of per capita GDP and the log product of GDP per capita across the country-pairs. Common instruments include physical distance, common border, common official language, common legal origin, and exchange rate regime differences.

6.2. Crisis Dependency

Turning to the crisis dependency, I estimate the full simultaneous equation system (8). Table 2 reports the main results of this section for different subsamples. The point estimates show that financial fragility, proxied by financial crises data, reversed signs of all effects. Column 1 reports estimates for the total sample. In absence of crises the stock market effect was statistically insignificant. In presence of crises there was a significant co-movement inducing effect. This also explains the negative co-movement inducing net effect of stock market integration on output co-movement from table 1. It came from the fact that there was no output smoothing across the total sample via stock markets in absence of crises. Column 2 in table 2 reports statistically significant output smoothing effects of stock markets across advanced economies. Significance and directions of signs persisted across EME and EU economies in columns 3 and 4. Interaction with financial crises turned the stock market effect across all specifications.

Bond market effects first induced greater co-movement across advanced and EU economics in columns 2 and 4. The effect remained statistically significant for the total sample in column 1. Again, once interacted with the crisis variable, the effect turned across all subsamples.

Effects of cross-border bank loan integration varied across subsamples. In absence of financial crises they induced greater co-movement across advanced and emerging economies in columns 2 and 3, but were not significant for the total and EU samples in columns 1 and 4. Conditional on financial fragility the effects turned but were mostly insignificant.

Overall, stock market effects were strongest for EME economies, where standard deviation of the stock variable is largest. Bond market effects were strongest across the total sample, driven by holdings across advanced economies.

Table 2: Effect of cross-border financial integration on output co-movement conditional on financial fragility for different samples, first stage results of 3SLS.

Dependent variable: GDP growth co-movement				
	(1) Total Sample	(2) Advanced	(3) EME	(4) EU
Stock	0.0135	0.0519***	0.549**	0.0485***
	(1.35)	(9.21)	(2.85)	(4.26)
Crisis*Stock	−0.0234*	−0.0414***	−0.954**	−0.0461***
	(−2.26)	(−7.10)	(−3.00)	(−3.87)
Bond	−0.0693***	−0.0330***	0.0910	−0.00831**
	(−8.64)	(−9.08)	(0.64)	(−2.64)
Crisis*Bond	0.0496***	0.0201***	0.0739	0.00924***
	(5.91)	(6.01)	(0.24)	(3.53)
Bank Loans and Deposits	0.0112	−0.0112*	−2.299**	0.00151
	(0.78)	(−2.03)	(−3.00)	(0.45)
Crisis*Loans–Depos.	−0.00604	0.0131*	66.53*	0.00458
	(−0.42)	(2.45)	(2.32)	(1.34)
Trade	0.00284	−0.00554	−0.0430***	−0.0106***
	(1.12)	(−1.68)	(−4.17)	(−5.47)
Specialization	0.000585	−0.000968	−0.0102***	0.0173***
	(0.50)	(−0.61)	(−3.54)	(9.95)
Crisis (L. & V.)	0.000156***	0.000106***	0.000898***	0.000157***
	(6.59)	(3.49)	(8.54)	(4.13)
Observations	15590	7561	1234	2696

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports the first stage estimates from 3SLS regressions for different subsamples. The outcome in all columns is an index of bilateral GDP growth co-movement. A positive (negative) coefficient means that the higher cross-border financial market integration the lower (higher) co-movement. *Crisis* is an interaction term based on Laeven and Valencia (2013). The unique instruments for endogenous variables are average equity, bond, and loan restrictions across a country- pair. The unique instrument for trade is a regional trade agreement dummy. Specialization is instrumented with the absolute difference of per capita GDP and the log product of GDP per capita across the country-pair. Common instruments include physical distance, common border, common official language, common legal origin, exchange rate regime differences, and year dummies.

7. Discussion of the Results

With the estimates on net effects and their conditionality on financial fragility in hand, I turn to discussing two implications of the results. First, the opposing signs of stock and bond/loan integration on output co-movement suggest that stock markets can act as a buffer to bond and loan effects. Second, changing of signs when financial fragility is high points to a global reversal of wealth and balance sheet effects due to global shocks and flight to safety.

Table 3: Signs of effects based on different estimates.

Dependent variable: GDP growth co-movement						
	Baseline			Crisis interaction		
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Stock	Bond	Bank Loans	Stock	Bond	Bank Loans
Total	∼	−	∼	−	+	∼
Advanced	+	−	−	−	+	+
Emerging	+	∼	−	−	∼	+
EU	+	−	∼	−	+	∼

Notes: This table reports different signs of estimates on the relationship between cross-border financial integration and output co-movement with t statistics of $p < 0.005$. A plus (minus) sign indicates that the higher cross-border financial market integration the lower (higher) co-movement. *'Baseline'* corresponds to the effect without interaction term in panel data estimations of table (2). *'Crisis interaction'* refers to the signs of the interaction terms. '∼' indicates insignificant point estimates.

7.1. Attenuating Effects of Stock Market Integration

Table 3 gives an overview of the signs of effects in the paper. Estimates on stock, bond and loan market integration are consistent for all subsamples, when statistically significant. They turn when interacted with a financial fragility dummy.

Specifically, columns 1, 2, and 3 show the effect of stock, bond, and loan integration on co-movement in absence of financial fragility. While economies with greater bond and loan integration experienced more co-movement in normal times, stock markets attenuate the effect. The signs of stock and bond market effects are consistent with theoretical predictions on 'wealth' and 'balance sheet' effects of cross-border financial integration.

In the Real Business Cycle literature, wealth effects involve cross-border stock ownership. As shown by Baxter and Crucini (1995) and Davis (2014), they tend to decrease output co-movement because the country owning stocks abroad has a temporary advantage of 'taking leisure' while the other works. Thus, stocks held in economically dissimilar countries enable risk diversification. This translates into output smoothing and less co-movement.

Balance sheet effects involve bond market integration which is at the origin of 'financial multiplier' effects of leveraged intermediaries. Because banks earn interest and non-interest income through lending and trading, heightening financial fragility in one economy has cascading effects. First, to safeguard their trading portfolio, banks withdraw assets from risky economies. Second, banks adjust lending because they need to follow Basel II regulations and lower risk exposure. This sequencing of events drives co-movement across country-groups.

7.2. Global Reversal of Wealth and Balance Sheet Effects

Columns 4, 5 and 6 in table 3 show the reversal of wealth and balance sheet effects in times of high financial fragility. So far, there is empirical evidence for this

phenomenon from the U.S. perspective (Pyun and An, 2016). Since a global shock in stock markets makes all economies worse off, risk diversification becomes impossible. Therefore, output co-movement increases. The estimates in this paper show that while this effect works in the same direction across all subsamples, there are differences in magnitude. Emerging economies suffered most from the wealth effect reversal.

Balance sheet effects reverse because there is flight to safety in bond markets. In presence of high financial fragility, banks and investors have an interest in holding bonds in 'safe haven' economies. In case of the 2008 Great Financial Crisis, the U.S. was simultaneously the origin of the shock and a 'safe haven'. Yet, estimates imply that such reversals also take place in networks excluding the U.S. Table 3 shows a similar reversal across EU economies.

8. Robustness

This section tests all estimations for robustness. First, I alter the financial fragility indicator. Second, I change the co-movement indicator. Third, I use OLS and fixed effects estimations.

8.1. Altering the Financial Fragility Indicator

I alter the country-level indicator of financial fragility. I use Romer and Romer (2017) data for advanced economies. Gandrud and Hallerberg (2017) offer continuous indicators including emerging economies. These indicators are more precise, but they cover fewer countries and a shorter time period.

Both indices are based on text analyses. Gandrud and Hallerberg's (2017) data cover the period 2003-11 and 58 economies. They are the product of a kernel principal component analysis of Economist Intelligence Unit reports. Romer and Romer (2017) cover 24 OECD economies over the period 2001-12. This indicator is based on analyses of *OECD Economic Outlook* reports. When using these indicators I take the average value of the financial stress indicator across the country-pair scaled from 0 to 1.

To achieve comparability, for each subsample I use the indicator covering the longest time period. Appendix table 9 shows the results of the new specifications. For the total and emerging subsamples I use the Gandrud and Hallerberg (2017) measure. For all other specifications I use Romer and Romer (2017). The results are robust to these indicator and time period changes.

8.2. Altering the Co-Movement Measure

The measure of co-movement $Synch_{ijt}$ is computed as the average similarity in GDP growth rates across the country-pair. I consider an alternative measure of output co-movement, which has become standard in the literature. Following Morgan et al. (2004) I regress GDP growth on country (α_i) and year (α_t) fixed effects for all countries i.

$$g_{i,t} = \alpha_i + \alpha_t + \nu_{it} \tag{11}$$

Then, I repeat this exercise for all countries j. Following Morgan et al. (2004) the residuals ν_{it} and ν_{jt} represent how much output growth of country i and j deviates from average growth over the estimation. Next, I construct the alternate co-movement measure $Synch2$ as the absolute difference of the residuals across the country-pair and year.

$$Synch2_{ijt} = |\nu_{it} - \nu_{jt}| \tag{12}$$

This index measures output growth similarity between the country-pair in any given year. Appendix table 10 shows the results of this robustness check. While there is loss of statistical significance in particular for EME and European Union estimates in columns 3 and 4, the robustness checks confirm all results.

8.3. OLS and Fixed Effects

One particular feature of simultaneous equation models is that they render standard errors particularly small. Therefore, it may be argued that results are not statistically relevant. Further, 3SLS does not correct for destination-origin invariant variables and our results only hold in case we correctly instrumented the endogenous variables. To account for these possible shortcomings I test the results with simple OLS, and add different fixed effects successively using the first stage relationship of equation (7). Country specific factors to the origin i and destination j and time trends are caught by fixed effects. Thus, the specification becomes:

$$\begin{aligned} Synch_{ijt} = \alpha_t + \alpha_i + \alpha_j + \psi_1 Stock_{ijt} + \psi_2 Stock_{ijt} * Crisis_{ijt} + \psi_3 Bond_{ijt} + \\ \psi_4 Bond_{ijt} * Crisis_{ijt} + \psi_5 LD_{ijt} + \psi_6 LD_{ijt} * Crisis_{ijt} + \psi_7 T_{ijt} + \psi_8 S_{ijt} + \epsilon_{ijt} \end{aligned} \tag{13}$$

α_t, α_i, and α_j are year, origin, and destination fixed effects capturing time trends and all time-invariant origin/destination differences. Year fixed-effects α_t account for global trends of co-movement that might be reflected in the $Stock$, $Bond$, and LD variables if not controlled for. For instance, these could be a global trends to higher bilateral cross-border stock or bond market integration in the run-up of the 2008 financial crisis. Origin (α_i) and destination (α_j) fixed effects control for all time-invariant characteristics of countries i and j, such as trust, culture, or information asymmetries that might influence output co-movement patterns. This approach does however not account for possible endogeneity and also neglects the simultaneity in between independent variables.

Appendix tables 11, 12, 13, and 14 compare the estimates of simple OLS, OLS with different fixed effects, and the first-stage regression results from table 2 for all subsamples.

While there is loss of statistical significance, the results confirm estimates of the total, advanced, and European Union subsamples on all accounts. There is one exception. Results on the emerging subsample in table 13 show inconsistent signs on Bank Loans and Deposits and its interaction with a financial fragility variable. This does, however, not alter our main results in any way.

9. Conclusion

This paper presents new evidence on the effect of cross-border financial integration on output co-movement. I combine IMF data on cross-border portfolio investment integration with BIS data on bank loan integration. Employing a simultaneous equation system I disentangle the main direct and indirect drivers of co-movement.

Two key findings stand out. First, different assets have different net effects on output co-movement across country groups which are time and geography dependent. Second, these differences in net effects can be explained by country-level financial fragility. Interaction of financial market integration indices with measures of economic fragility shows that in particular stock and bond market effects are homogenous. In absence of financial fragility they contribute to less and more co-movement, respectively. In presence of financial stability the effects reverse. The estimates imply that stock market integration can act as a buffer to co-movement induced by bond and loan market integration.

This paper contributes to the discussion on the role of financial integration on business cycle synchronization. Pyun and An (2016) and Kalemli-Ozcan et al. (2013a) show that there was a reversal of capital market integration indices in times of economic turmoil. This paper's findings on portfolio and loan market integration effects extend their findings, showing that reversal of effects also took place in financial systems excluding the United States.

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10. Appendix

10.1. Extending Laeven and Valencia (2013)

The current version of the Laeven and Valencia (2013) data covers a large period (1970-2012). However, as multilateral data on portfolio capital flows is available from 2001-2015 I update the data by adding crisis dummies for the years 2013, 2014 and 2015. However, all results also hold when taking the original time period coverage from 2001-2012.

Sovereign Default

- 2014: Argentina
- 2015: Greece (Due to the Greek government-debt crisis, Greece failed to make a 1.6bn euro payment to the IMF)
- 2016: Ukraine

Currency Crises

Valencia and Laeven (2012) define a currency crisis as "*a nominal depreciation of the currency vis-à-vis the U.S. dollar of at least 30 percent that is also at least 10 percentage points higher than the rate of depreciation in the year before*". Applying this methodology, I add only one case for the 2013-2015 period.

- 2015: Bolivarian Republic of Venezuela (Venezuela experienced a 52.3 percentage point nominal depreciation of its currency vis-à-vis the U.S. dollar, 24.8 percentage points higher than the rate of depreciation in the year before)

Banking Crises

Valencia and Laeven (2012) define the end of a systemic banking crisis based on two conditions: *I define the end of a crisis as the year before both real GDP growth and real credit growth are positive for at least two consecutive years. In case the first two years record positive growth in real GDP and real credit, the crisis end date equals the starting date of the crisis. In computing end dates, I use bank credit to the private sector (in national currency) from IFS (line 22d). Bank credit series are deflated using CPI from WEO. GDP in constant prices (in national currency) also comes from the WEO. When credit data is not available, the end date is determined as the first year before GDP growth is positive for at least two years. In all cases, I truncate the duration of a crisis at 5 years, starting from the first year of the crisis.*

Their data covers 1960-2011. In 2011 25 countries experienced a systemic banking crisis.[15] Following Valencia and Laeven's (2012) methodology, I add the following cases:

[15] AT, BE, CH, DE, DK, ES, FR, GB, GR, HU, IE, IS, IT, KZ, LU, LV, MN, NG, NL, PT, RU, SE, SI, UA, US

- 2012: AT, BE, CY, DE, DK, ES, FR, GB, GR, HU, IE, IS, IT, KZ, LU NL, PT, RU, UA
- 2013: AT, BE, CY, DE, DK, ES, FR, GB, GR, HU, IE, IS, IT, KZ, NL, PT, RU, UA
- 2014: AT, BE, CY, ES, FR, GR, HU, IE, IS, IT, KZ, NL, PT, RU, UA
- 2015: AT, BE, CY, ES, GR, HU, IE, IS, IT, KZ, NL, PT, RU, UA

Table 4: List of main variables.

Variable	Explanation	Data Source
Synchronization (SYNCH)	$SYNCH_{ijt} = \|g_{it} - g_{jt}\|$, where g_{it} and g_{jt} indicate the log difference of yearly GDP growth of countries i and j at t. The index measures business cycle synchronization as the average similarity in GDP growth rates in between a country-pair.	World Bank's World Development Indicators, last accessed July 2018
Stock market integration (Stock)	$Stock_{ijt} = \frac{(AssEQ_{ijt}+LibEQ_{ijt})}{(GDP_{it}+GDP_{jt})}$, The sum of equity (stock) assets and liabilities in the two countries, normalized by the sum of the two countries' GDPs. Similar to a trade intensity measure, the higher $Stock$, the higher their cross-border financial integration in capital markets.	IMF's Coordinated Portfolio Investment Survey (CPIS), last accessed July 2018
Bond market integration (Bond)	$Bond_{ijt} = \frac{(AssDebtSec_{ijt}+LibDebtSec_{ijt})}{(GDP_{it}+GDP_{jt})}$ The sum of debt (bond) assets and liabilities in the two countries, normalized by the sum of the two countries' GDPs. The higher $Bond$, the higher their cross-border financial integration in capital markets.	IMF's Coordinated Portfolio Investment Survey (CPIS), last accessed July 2018
Loan and deposit integration (LD)	$Loan_{ijt} = \frac{Claims_{\rightarrow ijt}+Claims_{\rightarrow jit}}{(GDP_{it}+GDP_{jt})}$, The sum of bank loan and deposit claims across the two countries, normalized by the sum of the two countries' GDPs.	BIS Locational Statistics, last accessed September 2018
Trade Intensity (T)	$T_{ijt} = \frac{(X_{ijt}+M_{ijt})}{(GDP_{it}+GDP_{jt})}$, normalizing imports (CIF) and exports (FOB) by the sum of the two countries' GDPs indicates the bilateral trade intensity.	IMF's Direction of Trade Statistics (DOTS), last accessed January 2019
Specialization (S)	Let $\frac{VA^d_{it}}{VA_{it}}$ denote the share of industry sub-division d value added in country i total value added. $\frac{VA^d_{jt}}{VA_{jt}}$ is the average sector share of value added of manufacturing division d in all countries other than i. $S_{ijt} = \frac{1}{D}\sum_{d=1}^{D} \|\frac{VA^d_{it}}{VA_{it}} - \frac{VA^d_{jt}}{VA_{jt}}\|$ where D is the number of divisions. The index measures the absolute difference in specialization patterns across the country-pair	UNs National Accounts Main Aggregates Database, last accessed April 2017
Crisis (L.&V.)	Equals one if at least one country across the pair is affected. (dichotomous)	Laeven and Valencia (2013)
Crisis (R.&R.)	Average value across the country-pair scaled to 0–1. (continuous)	Romer and Romer (2017)
Crisis (G.&H.)	Average value across the country-pair scaled to 0–1. (continuous)	Gandrud and Hallerberg (2017)

Table 5: List of instrumental variables

Variable	Explanation	Data Source
Population weighted distance (wt, km)	Population weighted distance across the country-pair	CEPII geographical data, based on Head et al. (2010)
Contiguity	Dummy taking the value 1 if the country-pair shares a common border	CEPII geographical data, based on Head et al. (2010)
Language	Dummy taking the value 1 if the country-pair shares a common official language	CEPII geographical data, based on Head et al. (2010)
Common legal origins	Dummy taking the value 1 if the country-pair shares common legal origins	CEPII geographical data, based on Head et al. (2010)
Equity restrictions	Average of the equity restriction indicator across the country-pair	Fernández et al. (2016)
Bond restrictions	Average index of bond restrictions indicator across the country-pair	Fernández et al. (2016)
Loan restrictions	Average index of loan restrictions indicator across the country-pair	Fernández et al. (2016)
Regional trade agreement	Dummy taking the value 1 if the country-pair has a regional trade agreement in place	CEPII geographical data, based on Head et al. (2010)
Peg	Index taking values 1-15 for different exchange rate regimes.	Ilzetzki et al. (2017) data on currency anchors
Log product of bilateral GDPs p.c.	$ln(GDPp.c._{i,t}) * ln(GDPp.c._{j,t})$	World Bank World Development Indicators, last accessed December 2016
Abs. difference of bilateral GDPs p.c.	$\lvert GDPp.c._{i,t} - GDPp.c._{j,t}\rvert$	World Bank World Development Indicators, last accessed December 2016

Table 6: Descriptive statistics

	Total Sample					Advanced				
	(1) N	(2) mean	(3) sd	(4) min	(5) max	(6) N	(7) mean	(8) sd	(9) min	(10) max
SYNCH	24,228	8.062	8.763	0.000572	124.1	11,504	6.156	5.674	0.000572	40.8
Stock	24,228	0.525	2.197	0	50	11,504	0.965	3.04	0	49.61
Bond	24,228	0.627	1.651	0	26.19	11,504	1.201	2.224	0	26.19
Loans and Deposits	24,228	0.423	1.625	0	25.33	11,504	0.818	2.278	0	25.33
Trade	24,228	0.368	0.92	5.19E-07	22.64	11,504	0.49	0.935	0.000307	11.03
Specialization	24,228	5.26	2.727	0.542	17.94	11,504	4.451	2.283	0.542	16.16
Crisis (G.&H.)	14,183	0.373	0.172	0	0.834	6,959	0.351	0.187	0	0.834
Crisis (R.&R.)	5,751	0.151	0.203	0	1	5,440	0.151	0.205	0	1
Crisis (L.&V.)	18,030	0.387	0.487	0	1	9,135	0.41	0.492	0	1
	Emerging					European Union				
	(1) N	(2) mean	(3) sd	(4) min	(5) max	(6) N	(7) mean	(8) sd	(9) min	(10) max
SYNCH	2,057	10.26	12.83	0.0101	124.1	5,735	4.258	4.322	0.00286	31.11
Stock	2,057	0.0269	0.12	0	1.631	5,735	1.15	3.564	0	49.61
Bond	2,057	0.0362	0.144	0	3.304	5,735	1.794	2.879	0	26.19
Loans and Deposits	2,057	0.00323	0.0205	0	0.385	5,735	1.105	2.489	0	19.89
Trade	2,057	0.278	0.583	1.54E-06	4.168	5,735	0.717	1.112	0.00122	11.03
Specialization	2,057	5.218	2.433	1.204	15.15	5,735	4.34	2.23	0.566	13.95
Crisis (G.&H.)	1,079	0.43	0.131	0.123	0.742	3,511	0.373	0.211	0.0159	0.834
Crisis (R.&R.)	Not applicable					2,466	0.149	0.204	0	0.762
Crisis (L.&V.)	1,272	0.233	0.423	0	1	3,818	0.517	0.5	0	1

Notes: Numbers are rounded to two decimal places and multiplied by 100 to increase readability.

Table 7: List of Advanced and Emerging economies, ISO2 Codes

Advanced		*Emerging*	
ISO2	Name	ISO2	Name
AT	Austria	AR	Argentina
AU	Australia	BG	Bulgaria
BE	Belgium	BR	Brazil
CA	Canada	BS	Bahamas
CH	Switzerland	CL	Chile
CY	Cyprus	CO	Colombia
CZ	Czech Republic	CR	Costa Rica
DE	Germany	EG	Egypt
DK	Denmark	HU	Hungary
EE	Estonia	ID	Indonesia
ES	Spain	KZ	Kazakhstan
FI	Finland	LB	Lebanon
FR	France	MU	Mauritius
GB	United Kingdom	MY	Malaysia
GR	Greece	PA	Panama
HK	Hong Kong	PH	Philippines
IE	Ireland	PL	Poland
IL	Israel	RO	Romania
IS	Iceland	RU	Russia
IT	Italy	TH	Thailand
JP	Japan	TR	Turkey
KR	South Korea	UA	Ukraine
LU	Luxembourg	UY	Uruguay
MT	Malta	VE	Venezuela
NL	Netherlands	VU	Vanuatu
NO	Norway	ZA	South Africa
NZ	New Zealand		
PT	Portugal		
SE	Sweden		
SG	Singapore		
SK	Slovak Republic		
US	United States		
Total	32	Total	26

Source: According to World Economic Outlook

Table 8: List of European Union and Eurozone economies, ISO2 Codes

European Union			*Of Which Eurozone*		
ISO2	Name	Accession	ISO2	Name	Accession
AT	Austria	1995	AT	Austria	1999
BE	Belgium	Founder	BE	Belgium	1999
BG	Bulgaria	2007	CY	Cyprus	2008
CY	Cyprus	2004	EE	Estonia	2011
CZ	Czech Republic	2004	FI	Finland	1999
DK	Denmark	1973	FR	France	1999
EE	Estonia	2004	DE	Germany	1999
FI	Finland	1995	GR	Greece	2001
FR	France	Founder	IE	Ireland	1999
DE	Germany	Founder	IT	Italy	1999
GR	Greece	1981	LU	Luxembourg	1999
HU	Hungary	2004	MT	Malta	2008
IE	Ireland	1973	NL	Netherlands	1999
IT	Italy	Founder	PT	Portugal	1999
LU	Luxembourg	Founder	SK	Slovak Republic	2009
MT	Malta	2004	ES	Spain	1999
NL	Netherlands	Founder			
PL	Poland	2004			
PT	Portugal	1986			
RO	Romania	2007			
SK	Slovak Republic	2004			
ES	Spain	1986			
SE	Sweden	1995			
GB	United Kingdom	1973			
Total	24		Total	16	

Source: According to World Economic Outlook. Four European Union countries are missing in the data: Croatia, Latvia, Lithuania, and Slovenia.

Table 9: Robustness: Effect of cross-border financial integration on output co-movement for different samples and crisis measures, first stage results of 3SLS.

Dependent variable: GDP growth co-movement				
	(1) Total Sample – G.&H.	(2) Advanced–R.&R.	(3) EME – G.&H.	(4) EU–R.&R.
Stock	−0.0364*	0.0386***	0.673	0.00134
	(−2.00)	(7.74)	(1.00)	(0.33)
Crisis*Stock	0.0724*	−0.0682***	−1.614	0.00508
	(2.04)	(−6.84)	(−1.06)	(0.68)
Bond	−0.0928***	−0.0244***	−0.985	−0.00632***
	(−5.44)	(−10.24)	(−1.80)	(−3.53)
Crisis*Bond	0.163***	0.0233***	2.532	−0.00454
	(4.49)	(4.03)	(1.81)	(−1.03)
Bank Loans and Deposits	0.0985***	−0.0117***	0.862	0.00763***
	(4.02)	(−3.85)	(0.29)	(5.06)
Crisis*Loans–Depos.	−0.187***	0.0354***	−1.660	−0.00261
	(−3.82)	(5.34)	(−0.25)	(−0.84)
Trade	−0.00813*	0.000520	−0.0205**	−0.00594***
	(−2.48)	(0.22)	(−3.23)	(−3.87)
Specialization	0.0105***	0.000668	0.00132	0.00859***
	(7.84)	(0.50)	(0.57)	(6.04)
Crisis (G. & H.)	0.000178		0.00145***	
	(1.65)		(4.14)	
Crisis (R. & R.)		0.000724***		0.000694***
		(11.00)		(8.95)
Observations	12354	4944	972	2134

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports additional first stage estimates from 3SLS regressions for different subsamples and crisis indicators. The outcome in all columns is an index of bilateral output co-movement. A positive (negative) coefficient means that the higher cross-border financial market integration the lower (higher) co-movement. G.&H. indicates a crisis interaction term based on Gandrud and Hallerberg (2017). R.&R. indicates usage of a similar measure by Romer and Romer (2017). The unique instruments for endogenous variables are average equity, bond, and loan restrictions across a country-pair. The unique instrument for trade is a regional trade agreement dummy. Specialization is instrumented with the absolute difference of p.c. GDP and the log product of GDP p.c. across the country-pairs. Common instruments include physical distance, common border, common official language, common legal origin, exchange rate regime differences, and time year dummies.

Table 10: Additional Robustness: Alternative measure of co-movement.

Dependent variable: Output growth similarity based on absolute difference of fixed effect residuals				
	(1) Total Sample	(2) Advanced	(3) EME	(4) EU
Stock	1.652	4.945***	32.34*	5.620***
	(1.92)	(8.82)	(2.21)	(4.69)
Crisis*Stock	−1.934*	−3.758***	−76.27**	−5.443***
	(−2.16)	(−6.48)	(−3.12)	(−4.35)
Bond	−5.218***	−3.060***	−0.104	−0.272
	(−7.53)	(−8.46)	(−0.01)	(−0.82)
Crisis*Bond	3.291***	1.775***	9.685	0.627*
	(4.54)	(5.33)	(0.41)	(2.29)
Bank Loans and Deposits	−0.976	−1.484**	−124.9*	0.176
	(−0.78)	(−2.70)	(−2.14)	(0.50)
Crisis*Loans–Depos.	1.293	1.593**	4423.8*	0.500
	(1.04)	(2.99)	(1.99)	(1.39)
Trade	0.465*	−0.363	−2.521**	−1.557***
	(2.11)	(−1.11)	(−3.23)	(−7.58)
Specialization	−0.158	−0.169	−0.267	2.063***
	(−1.56)	(−1.08)	(−1.22)	(11.36)
Crisis (L. & V.)	0.00607**	0.00551	0.0635***	0.0253***
	(2.96)	(1.81)	(7.96)	(6.36)
Observations	15590	7561	1234	2696

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports additional first stage estimates from 3SLS regressions for different subsamples using an alternative measure of co-movement. The outcome in all columns is an index of bilateral output co-movement based on country-pair GDP residuals. A positive (negative) coefficient means that the higher cross-border financial market integration the lower (higher) co-movement. The unique instruments for endogenous variables are average equity, bond, and loan restrictions across a country-pair. The unique instrument for trade is a regional trade agreement dummy. Specialization is instrumented with the absolute difference of p.c. GDP and the log product of GDP p.c. across the country-pairs. Common instruments include physical distance, common border, common official language, common legal origin, exchange rate regime differences, and time year dummies.

Table 11: Additional Robustness: Comparison of different estimations of cross-border financial integration on output co-movement for the total sample.

Dependent variable: GDP growth co-movement					
	Total Sample				
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) 3SLS
Stock	0.00146*	0.00197***	0.00163**	0.00161**	0.0135
	(2.45)	(3.43)	(2.83)	(2.79)	(1.35)
Crisis*Stock	−0.00179*	−0.00217**	−0.00105	−0.000840	−0.0234*
	(−2.15)	(−2.70)	(−1.28)	(−1.02)	(−2.26)
Bond	−0.00700***	−0.00782***	−0.00406***	−0.00425***	−0.0693***
	(−7.77)	(−8.98)	(−4.23)	(−4.39)	(−8.64)
Crisis*Bond	−0.00114	0.000384	0.00104	0.00214	0.0496***
	(−0.97)	(0.34)	(0.85)	(1.73)	(5.91)
Bank Loans and Deposits	−0.00138*	−0.00172**	−0.00104	−0.000963	0.0112
	(−2.02)	(−2.58)	(−1.57)	(−1.46)	(0.78)
Crisis*Bank Loans and Deposits	0.00207*	0.00230*	0.00190*	0.00141	−0.00604
	(2.16)	(2.47)	(2.04)	(1.51)	(−0.42)
Trade	−0.00656***	−0.00630***	−0.00246***	−0.00249***	0.00284
	(−9.44)	(−9.37)	(−3.49)	(−3.54)	(1.12)
Specialization	0.00223***	0.00239***	0.00277***	0.00280***	0.000585
	(9.43)	(10.44)	(8.36)	(8.46)	(0.50)
Crisis (L. & V.)	0.000236***	0.000209***	0.000202***	0.000200***	0.000156***
	(16.30)	(15.83)	(16.54)	(16.39)	(6.59)
N	18030	18030	18030	18030	15590
R2	0.046	0.047	0.026	0.025	
Year Fixed Effects	*No*	*Yes*	*No*	*Yes*	*Yes*
Origin Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*
Destination Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports additional OLS and fixed effects estimates and compares them with the first-stage 3SLS regressions for the total sample from table 2.

Table 12: Additional Robustness: Comparison of different estimations of cross-border financial integration on output co-movement for advanced economies.

Dependent variable: GDP growth co-movement					
	Advanced economies				
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) 3SLS
Stock	0.00138***	0.00148***	0.00111**	0.00110**	0.0519***
	(3.51)	(3.87)	(2.90)	(2.88)	(9.21)
Crisis*Stock	−0.00181***	−0.00183***	−0.00125*	−0.00122*	−0.0414***
	(−3.36)	(−3.50)	(−2.30)	(−2.25)	(−7.10)
Bond	−0.00496***	−0.00500***	−0.00335***	−0.00332***	−0.0330***
	(−8.11)	(−8.49)	(−5.02)	(−4.94)	(−9.08)
Crisis*Bond	0.000342	0.000667	0.00213*	0.00219**	0.0201***
	(0.44)	(0.88)	(2.54)	(2.60)	(6.01)
Bank Loans and Deposits	−0.00113*	−0.00115**	−0.000217	−0.000221	−0.0112*
	(−2.52)	(−2.64)	(−0.49)	(−0.50)	(−2.03)
Crisis*Bank Loans and Deposits	0.00321***	0.00294***	0.00166**	0.00163**	0.0131*
	(5.19)	(4.89)	(2.70)	(2.65)	(2.45)
Trade	−0.00565***	−0.00571***	−0.00409***	−0.00413***	−0.00554
	(−8.24)	(−8.58)	(−5.94)	(−5.99)	(−1.68)
Specialization	0.00250***	0.00238***	0.000342	0.000348	−0.000968
	(9.32)	(9.16)	(0.92)	(0.93)	(−0.61)
Crisis (L.&V)	0.0000886***	0.000000868	0.0000517***	0.0000507***	0.000106***
	(6.55)	(0.07)	(4.91)	(4.81)	(3.49)
N	9135	9135	9135	9135	7561
R2	0.057	0.053	0.015	0.015	
Year Fixed Effects	*No*	*Yes*	*No*	*Yes*	*Yes*
Origin Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*
Destination Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports additional OLS and fixed effects estimates and compares them with the first-stage 3SLS regressions for the advanced sample from table 2.

Table 13: Additional Robustness: Comparaison of different estimations of cross-border financial integration on output co-movement for emerging economies.

Dependent variable: GDP growth co-movement					
	EME economies				
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) 3SLS
Stock	−0.0226	−0.0354	−0.0198	−0.0177	0.549**
	(−0.79)	(−1.44)	(−0.74)	(−0.65)	(2.85)
Crisis*Stock	−0.765**	−1.022***	−0.0440	−0.316	−0.954**
	(−3.07)	(−5.20)	(−0.25)	(−1.83)	(−3.00)
Bond	−0.00501	−0.0110	−0.0114	−0.0127	0.0910
	(−0.11)	(−0.28)	(−0.27)	(−0.30)	(0.64)
Crisis*Bond	0.155	−1.138***	−0.706***	−0.231	0.0739
	(0.58)	(−6.37)	(−3.80)	(−1.23)	(0.24)
Bank Loans and Deposits	−0.00476	−0.0374	−0.0859	−0.0926	−2.299**
	(−0.02)	(−0.23)	(−0.51)	(−0.54)	(−3.00)
Crisis*Bank Loans and Deposits	87.71**	−88.10***	−34.66***	−35.73***	66.53*
	(3.10)	(−8.80)	(−6.81)	(−7.08)	(2.32)
Trade	−0.0142*	−0.00788	−0.00149	−0.00166	−0.0430***
	(−2.43)	(−1.58)	(−0.22)	(−0.25)	(−4.17)
Specialization	0.00213	0.000905	0.000780	0.000643	−0.0102***
	(1.34)	(0.67)	(0.38)	(0.31)	(−3.54)
Crisis (L. & V.)	0.000823***	−0.000533***	0.000204*	0.000203*	0.000898***
	(8.89)	(−4.20)	(2.54)	(2.52)	(8.54)
N	1272	1272	1272	1272	1234
R2	0.094	0.184	0.095	0.087	
Year Fixed Effects	*No*	*Yes*	*No*	*Yes*	*Yes*
Origin Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*
Destination Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports additional OLS and fixed effects estimates and compares them with the first-stage 3SLS regressions for the emerging economies sample from table 2.

Table 14: Additional Robustness: Comparaison of different estimations of cross-border financial integration on output co-movement for European Union economies.

Dependent variable: GDP growth co-movement					
	European Union economies				
	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) 3SLS
Stock	0.00113**	0.000893*	0.00134**	0.00119**	0.0485***
	(2.64)	(2.12)	(3.15)	(2.79)	(4.26)
Crisis*Stock	−0.00149**	−0.00105*	−0.00114*	−0.000995	−0.0461***
	(−2.87)	(−2.05)	(−2.14)	(−1.87)	(−3.87)
Bond	−0.00469***	−0.00412***	−0.00153*	−0.000393	−0.00831**
	(−7.77)	(−6.88)	(−2.17)	(−0.53)	(−2.64)
Crisis*Bond	0.00232**	0.00195**	0.00130	0.000177	0.00924***
	(3.21)	(2.72)	(1.59)	(0.21)	(3.53)
Bank Loans and Deposits	0.00160***	0.00146**	0.000157	0.000148	0.00151
	(3.33)	(3.12)	(0.32)	(0.30)	(0.45)
Crisis*Bank Loans and Deposits	0.00230***	0.00187**	0.000953	0.000955	0.00458
	(3.90)	(3.24)	(1.57)	(1.58)	(1.34)
Trade	−0.00358***	−0.00348***	−0.00228***	−0.00247***	−0.0106***
	(−5.67)	(−5.65)	(−3.34)	(−3.63)	(−5.47)
Specialization	0.00351***	0.00337***	0.00179***	0.00171***	0.0173***
	(11.08)	(10.86)	(4.46)	(4.26)	(9.95)
Crisis (L. & V.)	−0.00000204	−0.0000144	−0.0000109	0.0000142	0.000157***
	(−0.13)	(−1.16)	(−0.96)	(1.26)	(4.13)
N	3818	3818	3818	3818	2696
R2	0.091	0.079	0.017	0.015	
Year Fixed Effects	*No*	*Yes*	*No*	*Yes*	*Yes*
Origin Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*
Destination Fixed Effects	*No*	*No*	*Yes*	*Yes*	*No*

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: This table reports additional OLS and fixed effects estimates and compares them with the first-stage 3SLS regressions for the European Union sample from table 2.