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FINANCIAL FRAGMENTATION AND ECONOMIC GROWTH IN EUROPE

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Abstract

Using industry data from Eurostat and applying the Rajan-Zingales methodology, we investigate the real growth effects of banking sector integration in the European Union. Our sample stretches from 2000 until 2012 and includes the phase of rapid financial integration before the global financial crisis as well as the following phase of financial fragmentation and bank deleveraging. We find evidence that banking sector integration had a more than four times stronger growth effect during the crisis than in normal times. Growth effects are also stronger in times of domestic bank deleveraging. We conclude that concerns of European policy makers about fragmentation in the European banking sector are justified and that future reintegration is an important building block of future growth perspectives in the European Union.

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1   Introduction

"While financial integration deepened significantly after the Euro was introduced, the global crisis caused that process to go into reverse. And we can see the importance of financial integration for the single currency all the more in its absence. In the periphery, financial fragmentation has led to high interest rates for firms and households, and disrupted monetary policy transmission. In the core, it has led to exceptionally low interest rates for savers and potentially distorted asset prices. Consequently, the whole of the Euro area would benefit from lasting financial reintegration - and indeed, addressing financial fragmentation has been one of the key tasks of euro area policy-makers, including the ECB, over the past years."

Mario Draghi (2014)

Banking sector integration is a key objective of the European Union (EU). After a substantial deepening of financial integration before the global financial crisis, the process started to reverse with the onset of the crisis. Under the pressure of regulators and national governments, banks started to shift their focus towards their "core markets." Consequently, the European banking sector is far more fragmented today than it had been before the crisis. European policy makers are concerned about this development because banking sector integration may affect European growth prospects, the transmission of the European Central Bank's (ECB) monetary policy, and financial stability (see the speech by Draghi, 2014).

This paper is the first attempt to investigate the real growth effects of the ongoing fragmentation process in European banking markets. Using data from 2000 to 2012, our dataset covers the period of integration before the global financial crisis and the following period of fragmentation. We allow for heterogeneous effects by distinguishing between crisis and non-crisis times, phases of domestic bank deleveraging and other times, as well as times of disintegration and integration. Our analysis suggests that financial fragmentation generates significant growth losses and emphasizes the need for financial reintegration in Europe. In particular, we find substantial growth effects of banking sector integration in EU member countries (measured by foreign bank assets over GDP) over our sample period. Interestingly, growth effects are more than four times bigger during times of crisis

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than in normal times. Similarly striking differences are found in phases of strong domestic bank deleveraging compared to other times, but less so in periods of financial disintegration. This seems to reflect the importance of foreign capital as an insurance mechanism against negative shocks to domestic bank lending in times of crisis and deleveraging.

We further analyze the impact of cross-border lending on industry growth differentials. For cross-border lending we find mixed results, whereas our main results on foreign bank assets prove to be robust to this modification. This suggests that especially the presence of foreign banks via branches and subsidiaries is important to reduce the negative effects of shocks to domestic bank lending, in particular during times of severe financial constraints. Results are also robust to measuring banking sector integration by foreign loans to non-financial corporations instead of foreign bank assets.

Using industry-level data from Eurostat, we apply the methodology of Rajan and Zingales (1998) and investigate production growth differentials on industry level. We assume that industries with a high dependence on external finance are more constrained in their growth potential by financial frictions than industries with an inherently lower need for external capital. Deeper banking sector integration may reduce these frictions and hence increase the differential of industry production growth between financially dependent and non-dependent industries. The main advantage over country-level approaches is a more credible identification. Since industry-specific growth can be considered exogenous to the development of banking sector integration, reverse causality is less of a concern than in country-level studies. Moreover, given the three-dimensional feature of our data set (country, industry, and time), the approach allows us to control broadly for unobserved heterogeneity by including the full set of two-dimensional fixed effects.

Our study intends to identify short-run growth effects of integration; therefore our analysis relies on annual data rather than long-run averages as in the original Rajan-Zingales analysis. Banking sector integration is measured by total assets of foreign banks over GDP. Hence, we focus on the overall amount of foreign bank assets rather than the composition of bank assets, in contrast to most other papers on banking sector integration, which analyze the growth effects of the *share* of foreign assets. During times of crisis, subsidiaries of foreign banks tend to adjust their lending differently than domestic banks.[1]

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[1]See De Haas and van Lelyveld (2010) for evidence that foreign subsidiaries reduce lending less than domestic banks during host country crises and De Haas and van Lelyveld (2014) for opposite evidence for the Great Recession in 2008-2009.

While this automatically leads to changes in the share of foreign banks in total bank assets during a crisis, it does not necessarily imply that the overall availability of capital changes in a particular direction.

Before the crisis the process of banking sector integration in Europe was seen as a key feature of the convergence process in which Eastern European transition as well as periphery countries could catch up to the core and at the same time finance current account deficits over a longer time horizon. Since the financial and sovereign debt crisis, however, this has changed completely. Since then, the European banking sector has experienced a process of sharp fragmentation. Banks began to reduce business in foreign countries by withdrawing capital and closing branches and subsidiaries. This disintegration process is widely documented in the literature. Giannetti and Laeven (2012) and Cetorelli and Goldberg (2011) show that during the crisis banks decreased their foreign lending more strongly than their home lending. A more differentiated picture is drawn by De Haas and van Horen (2013). Using loan level data, they find a substantial heterogeneity of the "flight home effect." Banks reduced their lending less if the market was geographically near, if they had more experience in the market, if they were present via a subsidiary and if they acted in cooperation with a domestic lender.[2]

Particularly in Europe, regulatory and political pressure appear to have reinforced the process of fragmentation. Motivated by the fact that internationally active banks had to be rescued by national governments, regulators and national authorities started to act protectionist.[3] Politicians conditioned the rescue packages in many cases on measures that reinforced fragmentation. For example, Commerzbank was rescued under the condition of shifting their focus on lending towards German small and medium firms. In the United Kingdom, banks could obtain cheap central bank funding under the condition of supporting local corporations. On supra-national level, the European Commission investigated the rescue of European banks with respect to their compliance with European state aid regulations. As in the case of German Landesbanken, they often asked for restructuring

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[2]Formal commitment also has a stabilizing effect, as shown by De Haas, Korniyenko, Pivovarsky, and Loukoianova (2012). They use commitment letters of the Vienna Initiative to demonstrate that banks that had committed to exposures in Central and Eastern Europe reduced their lending there substantially less during the crisis than in countries without such a commitment. Moreover, banks participating in the Vienna Initiative reduced overall lending less than other banks.

[3]See Rose and Wieladek (2014) for evidence that nationalized non-British banks decreased lending to and increased interest rates for UK firms. In contrast, nationalized British banks did not engage in financial protectionism.

measures implying a substantial reduction of foreign business (for an overview of the EU state aid practice, see Lannoo and Napoli, 2010).

Our paper adds to the literature on the growth effects of financial integration and on the disrupting effects of financial crises. The benefits and costs of financial integration are still debated in the literature.[4] This is consistent with theoretical work by Gourinchas and Jeanne (2006) and Coeurdacier, Rey, and Winant (2013) who show that if there are any positive growth effects at all, they are expected to be relatively small. Evidence of growth effects of banking sector integration is slightly more positive. By studying growth on industry level, Bruno and Hauswald (2014) find an overall positive growth effect of a higher share of foreign banks. Beck, Demirgüç-Kunt, and Maksimovic (2004) argue that a higher share of foreign banks reduces obstacles from banking sector concentration because smaller firms can more easily obtain external financing. Giannetti and Ongena (2012) find that foreign banks improve the access to credit and thereby reduce financial constraints for firms. However, there are also papers doubting the benefits of banking sector integration. Gormley (2010) investigates foreign bank entry in India and finds that foreign banks crowded out domestic banks, worsening access to credit for most firms. Similarly, Detragiache, Tressel, and Gupta (2008) argue theoretically that welfare might be reduced by foreign bank presence. According to their model, hard information can be better interpreted by foreign than by domestic banks. As a result, borrowers whose type can be revealed by hard information can obtain lower rates, while the others have to pay higher interest rates. Hence, the welfare effect of foreign banks remains ambiguous.

However, Europe seems to be different. Guiso, Jappelli, Padula, and Pagano (2004) document a significant "growth dividend" for countries in the EMU from improved financial market development through deeper financial integration. Similarly, Prasad, Rajan, and Subramanian (2007) and Abiad, Leigh, and Mody (2009) illustrate that in Europe the patterns of financial integration and economic growth are different from the rest of the world.[5] More specifically, Masten, Coricelli, and Masten (2008) find evidence that especially countries with a relatively high degree of financial development could benefit. According to their argument, countries have to build up significant capacity to absorb

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[4]For an excellent overview, see Kose, Prasad, Rogoff, and Wei (2009).

[5]For evidence that the EMU experienced a substantial financial integration process, e.g., see Lane (2006), Lane and Milesi-Ferretti (2008), Schmitz and von Hagen (2011), and Kim, Moshirian, and Wu (2006). Spiegel (2009) tries to disentangle the channels through which banking sector integration strengthened. He finds a "pairwise" effect in the sense that integration deepened especially through banking relationships in which both banks are hosted in the EMU.

capital inflows. However, financial integration is unlikely to be the only source of the European success story (Imbs, 2009). Friedrich, Schnabel, and Zettelmeyer (2013) argue in favor of a complementary relationship between financial integration and political integration in Eastern Europe, which helped financial integration with Western Europe to realize its growth-enhancing potential by affecting investors' expectations.

In contrast to the question of growth effects through financial integration, evidence of a causal relationship of financial crises on economic growth is much clearer. Kroszner, Laeven, and Klingebiel (2007) and Dell'Ariccia, Detragiache, and Rajan (2008) provide robust evidence of significant negative growth effects of financial crises. However, both studies do not intend to figure out the channels of these adverse effects. Most closely related to our work is the paper by Eichengreen, Gullapalli, and Panizza (2011), which provides a synthesis of the literature on the growth effects of financial integration and crises. Applying the Rajan-Zingales methodology in a broad country sample, they estimate the growth effect of financial integration while controlling for the depth of the financial system and distinguishing between decades with and without crises. They confirm the generally positive impact of financial integration on growth, but they find that financial integration did not have any impact in times of crisis. Hence, they conclude that countries can benefit from financial integration during normal times, but not in times of crises.[6] However, Europe may again be different. Therefore, the recent crisis offers an interesting laboratory to re-examine the effect of financial integration in times of crisis within a European sample. Moreover, Eichengreen, Gullapalli, and Panizza (2011) focus on the long-run growth effects of financial integration by considering average industry production growth over a decade. Such an approach may not be able to capture growth effects during times of financial distress when integration can revert quickly. By estimating the model on a yearly basis, we are able to identify the short-run growth effects of financial integration.

This paper is organized as follows: Section 2 sets the stage by describing the measurement of banking sector integration and showing the evolution of these measures in Europe. Section 3 explains the methodology used in our analysis. Section 4 gives an overview of the data. Section 5 contains the main regression results for the growth effects of foreign banks. Section 6 contains two extensions: the consideration of cross-border lending as well

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[6]In contrast, Glick, Guo, and Hutchison (2006) argue that countries with more open capital accounts suffer less often from crises.

as lending to non-financial firms instead of total bank assets. Finally, Section 7 concludes.

2 Banking sector integration in Europe

2.1 Measuring financial integration

One possibility of measuring financial integration is using de jure measures, based on legal restrictions of international capital flows. Information is, for example, provided by the *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER), comprising a large list of indicators of legal capital controls. However, as Kose, Prasad, Rogoff, and Wei (2009) point out, these measures represent formal aspects, which may differ substantially from the administrative implementation of capital controls and from the actual size of cross-border capital flows. Hence, the authors argue in favor of aggregated transaction-based de facto measures, since they better indicate the actual degree of financial integration. Moreover, they conclude that quantity-based measures should be preferred over price-based measures because the cross-country comparison of equity and bond prices may suffer from distortions due to illiquidity and varying risk premia.[7] Furthermore, stock measures should be preferred over flow measures, which typically suffer from a high volatility and from larger measurement errors than stock measures.

The developments in European financial markets illustrate the superiority of using de facto measures, since de jure capital controls are no longer present in Europe and did not emerge in the crisis either. Nevertheless, financial markets are now far more fragmented than they had been right before the crisis. Hence, we are using de facto measures in our analysis. Specifically, we are using total assets of foreign banks relative to GDP as our main measure of banking sector integration.

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[7]Bekaert, Harvey, Lundblad, and Siegel (2013), however, argue that the cross-country differences between industry valuations give a good indication of equity market integration. Specifically, they argue that in a fully integrated market, discount rates and expected earnings growth differentials across industries should be similar across European countries. Applying this approach to the European Union they find evidence of increased integration since 1990 until the global financial crisis.

2.2 Patterns of integration and fragmentation in the European banking sector

Since the adoption of the euro, European banking sectors have steadily deepened their integration towards a single European banking market. Figure 1a depicts the evolution of total assets of foreign and domestic banks over GDP in the European Union. It shows that, relative to GDP, foreign bank assets doubled from 2000 to 2008 and increased much faster than domestic bank assets. Since 2008, however, banks have started to reduce their foreign presence by closing or selling foreign affiliates and by reducing assets, implying a decrease of assets of foreign banks until 2012. Domestic bank assets over GDP have remained relatively constant since 2008 and started to decrease only in 2011; a similar development is observed for total bank assets over GDP (Figure 1b). Hence, on aggregate level the bank deleveraging process seems to have been driven largely by a reduction in foreign bank assets.

[Figure 1]

Further, the mild reduction in domestic bank assets may be related to the ECB's liquidity support (especially the LTROs), which was often invested in sovereign bonds and helped to avoid balance sheet reductions (Acharya and Steffen, 2014). Figure 2 illustrates the development of the share of foreign assets in total bank assets and gives a similar impression as Figure 1a. Between 2000 and 2007, the share of foreign bank assets doubled, but it started to decrease with the onset of the crisis.

[Figure 2]

Table 1 provides a more detailed picture of banking sector integration in the European Union. It contains country-specific information about the mean size of European banking sectors (from 2000 to 2012) and the importance of domestic and foreign banks.

[Table 1]

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European countries appear to be quite heterogeneous with respect to the size of their banking sectors as well as the shares of foreign banks. Western European countries tend to have bigger banking sectors than Eastern European countries. Ireland has the largest banking sector with a mean size of seven times GDP (the peak is given by more than ten times GDP in 2009).[8] In contrast, Romania exhibits the smallest banking sector relative to GDP with a mean value of 60%. The share of foreign banks, however, is on average higher in Eastern European countries. Estonia has a the highest share of foreign bank assets (93.5%). Countries like the Czech Republic and Slovenia show similarly large values. The reason lies in a far-reaching privatization process as part of the transformation process from former Soviet republics to members of the European Union, in which Western banks acquired large parts of the banking sectors in Eastern Europe. In Western Europe, Finland has the highest foreign share with 49% of total assets. Sweden is the country with the lowest share of foreign banks (7.6% of total bank assets).

3   Methodology

We apply the approach of Rajan and Zingales (1998) and study differences between industry production growth rates in countries with different degrees of banking sector integration. Rajan and Zingales (1998) argued that industries are characterized by their inherent need for external capital to finance their capital expenditures beyond using internal financing. If banking sector integration reduces financial constraints for industrial firms, industries that rely heavily on external financing should benefit more in terms of production growth. Studying the effect of banking sector integration on growth on industry level has two main advantages. First, reverse causality issues are mitigated as it is unlikely that production growth of specific industries affects banking sector integration. This problem is further reduced by including the first lag of the integration variable. Second, we can include a full set of two-dimensional fixed effects, which allows to control broadly for unobserved heterogeneity. However, this also has a downside: The methodology does not allow for the identification of absolute growth effects because part of the effect of banking sector integration on economic growth is absorbed by the fixed effects. Hence, causal inference can only be drawn with respect to the effects of banking sector

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[8]In the European Union, Luxembourg has the biggest banking sector with mean total assets of about 30 times GDP. However, it is not included in the sample as will be explained in Section 4.

integration on production growth differentials between industries differing with respect to their dependence on external finance.

3.1 Empirical model

Our baseline equation is a modification of that by Rajan and Zingales (1998), using annual data instead of long-run averages and distinguishing between foreign and domestic assets:

$$
\begin{aligned}
\text{Production growth}_{i,j,t} = {} & \alpha_{i,j} + \beta_{j,t} + \gamma_{i,t} \\
& + \delta_0 \cdot \text{Industry share}_{i,j,t-1} \\
& + \delta_1 \cdot \text{Ex. dependence}_j \cdot \text{Total assets of foreign banks}_{i,t-1} \\
& + \delta_2 \cdot \text{Ex. dependence}_j \cdot \text{Total assets of domestic banks}_{i,t-1} \\
& + \epsilon_{i,j,t}.
\end{aligned}
$$

i denotes the country, j the industry, and t the year. Following Rajan and Zingales (1998), we include the lagged share of industry production as a fraction of GDP to account for catching-up effects of young industries. The coefficient of interest is δ_1, which captures the differential growth effect of banking sector integration. We control for the domestic provision of external finance via the interaction term of domestic bank assets over GDP and external dependence. Due to the three-dimensional structure of our dataset, we can include a large set of fixed effects to control for unobserved heterogeneity. Country-industry fixed effects, $\alpha_{i,j}$, control for all time-invariant factors varying on country-industry level, e.g., constant subsidies for a given industry in a given country. Industry-time fixed effects, $\beta_{j,t}$, capture industry-specific developments affecting all countries. One example might be a global industry shock like oil price changes. Finally, we include country-time fixed effects, $\gamma_{i,t}$, which capture factors that affect all industries in a specific country and year in the same way, e.g., country-specific business cycles, which influence demand in all industries. In all regressions standard errors are clustered on industry level.

Our study is designed to estimate short-run effects of banking sector integration on industry production growth. In contrast to most other studies focussing on the composition of bank assets, we measure banking sector integration as total assets of foreign banks relative to GDP (rather than the fraction of foreign in total bank assets). This allows us

to identify the effect of additional foreign capital provided by the banking sector, holding domestic bank assets constant.

3.2   Definition of crises, deleveraging and disintegration

Our analysis distinguishes between crisis times and normal times, times of domestic bank deleveraging and other times, and banking sector disintegration and integration by defining three sets of dummy variables. All dummies are on a country-year basis. Table 2 shows their definitions.

[Table 2]

For the dummy variable *Crisis*, we use the country-specific beginning of the crisis from Laeven and Valencia (2013a) who provide a comprehensive database of banking crises from 1970 to 2011. The beginning is defined by two conditions. First, there have to be indicators of significant distress in the banking sector, such as bank liquidation, bank runs, and significant losses. Second, the government has to provide significant rescue measures (see Laeven and Valencia, 2013a). As shown in Table 3, there is substantial heterogeneity across countries. Some countries in our sample did not experience a crisis; examples are Estonia, Poland, and Finland. Since the database only provides information about the beginning of the crisis, we define the end as the first year when real GDP growth is positive and the unemployment rate is decreasing. We add the second condition because GDP growth rates are typically very sensitive to government spending. In the crisis, growth rates plummeted massively in 2009 but many countries experienced a positive GDP growth rate already in 2010 because of large fiscal stimuli. At the same time, many countries still experienced increasing rates of unemployment and had to provide significant rescue packages to the banking sector. Hence, we do not think that defining the end of the crisis based on GDP growth alone is appropriate. Table 3 gives an overview of the country-specific timing of the crisis.

[Table 3]

The dummy variable *Deleveraging* measures the extent to which domestic banks shrink their balance sheets. We define it as a binary variable, being equal to 1 if in country i the value of total assets of domestic banks over GDP in year t minus the value in year $t-1$ is below a certain threshold, and 0 otherwise. Our thresholds are based on the precentiles of the distribution of the annual changes of domestic bank assets over GDP. Our starting point is the 35th percentile, which is close to a change of zero, which is a natural benchmark for a deleveraging process (see Table 4). Moreover, we consider the 25th and the 15th percentile, which still provide us with a sufficient number of observations on both sides of the thresholds.

As counterpart of domestic bank deleveraging, we consider disintegration, which measures the shrinking of balance sheets by foreign banks. *Disintegration* is defined analogously to *Deleveraging*. Hence, it has a value of 1 if in country i the change of foreign bank assets over GDP in year t compared to year $t-1$ is smaller than a certain threshold. We use the same thresholds as before, namely the 35th (which is again close to 0), the 25th and the 15th percentile (see Table 4).

[Table 4]

4   Data

The analysis is based on industry-level data from EU countries. We drop small countries serving as financial centers, namely Malta, Cyprus, and Luxembourg, as is common in the literature. On the one hand, they do not provide a sufficient number of industry observations. On the other hand, they exhibit features of financial centers, which may distort our results because the values of banking sector integration can be extreme compared to the remaining countries. In addition, Croatia does not provide data on the assets of foreign branches and subsidiaries. Hence, our final sample consists of the remaining 24 EU member countries.

Industry production   Annual industry data are obtained from the Eurostat database *Structural Business Statistics*, which provides production data on an annual basis up to 2012 for countries of the European Union. Data are collected according to the European industry classification NACE Rev. 1.1 (until 2008) and NACE Rev. 2 (since 2008). In order to make results comparable to previous studies, we match the NACE industry classification using official correspondence tables from UNIDO to the 3- and 4-digit industry sectors originally studied in the work of Rajan and Zingales (1998). This procedure yields 35 industry sectors. Industry production values are deflated by the consumer price index.[9]

Macroeconomic variables, such as GDP and inflation rates are also obtained from the Eurostat database. All data are converted in euros based on the corresponding exchange rates for non-eurozone countries.

External dependence   The measure of external dependence is defined by Rajan and Zingales (1998) as

$$\text{External dependence} = \frac{\text{Capital expenditures} - \text{Cash-flow from operations}}{\text{Capital expenditures}}.$$

It is taken from Laeven and Valencia (2013b) who updated the initial values of Rajan and Zingales (1998) by using firm-level data from the US for the period of 1980-2006. Table 5 displays the industries and corresponding values for external dependence.

[Table 5]

Banking sector integration   We measure banking sector integration by de facto indicators, using total assets of branches and subsidiaries of foreign-owned EU banks over GDP, named *Foreign bank assets*, as reported by the ECB. *Domestic bank assets* are defined as the residual of total bank assets minus foreign bank assets. Hence, it also contains foreign non-EU banks. Data on assets of foreign non-EU banks are incomplete, hence using them would result in a large loss of observations. Since the share of assets of

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[9]A detailed description can be found in the Appendix.

foreign non-EU banks is typically very small, the residual provides a good approximation of domestic bank assets.

Table 6 shows the descriptive statistics for our sample. Due to large outliers, industry production growth rates are winsorized at the 0.5%-level; thereby the mean decreases from 0.4% to 0.1%.

[Table 6]

Figure 3a illustrates the distribution of real industry production growth rates for each year over all countries in the European Union. The evolution over time is very similar to that of real GDP growth rates shown in Figure 3b. However, the median of industry production growth exhibits a much higher volatility than that of GDP growth (note the different scales).

[Figure 3]

The mean over all industry-country-year observations of total assets of foreign branches and subsidiaries is 59.0% of GDP, whereas the mean of total assets of domestic banks is 187.9% of GDP.[10] Roughly one fifth of country-year observations fall into a crisis period and one third into a phase of financial disintegration or deleveraging of domestic banks (using a cutoff of zero for both variables), respectively (see Table 6). Appendix Table A.2 displays the correlation structure between the dummy variables. Overall the correlations are relatively small. Interestingly, the correlation between times of crisis and periods of domestic bank deleveraging is close to zero. Figure 4a illustrates that deleveraging and disintegration were also associated to the bursting of the dot-com bubble in 2001 (which did not lead to a banking crisis) and not just to the recent crisis, which may explain the low correlation.

Additional country-specific statistics are found in Table 3 and in Appendix Table A.1.

[Figure 4]

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[10]See Section 6 for a description of the variables Credit inflow and Domestic/Foreign credit to non-financial corporations.

5 Banking sector integration and industrial production growth in Europe

5.1 Banking sector integration over the cycle

We start our analysis by documenting the growth effect of foreign bank assets over the entire cycle (2000 until 2012) before distinguishing different subsamples.

We find a positive growth effect of banking sector integration in the European Union over the entire sample. The coefficient of the interaction term between the amount of foreign assets over GDP and industries' external dependence is statistically highly significant (see the first regression column in Table 7). This is in line with previous studies, which found that foreign bank presence has a positive growth effect (see, e.g., Bruno and Hauswald, 2014; Giannetti and Ongena, 2012).[11]

[Table 7]

The industry share enters with a negative and highly significant coefficient. This is in line with previous studies. In contrast, the coefficient of the interaction between total assets of domestically owned banks and external dependence is statistically insignificant.

To gauge the economic significance of the estimated effects, we calculate the *differential in real growth rates* by Rajan and Zingales (1998), as is common in the literature (Friedrich, Schnabel, and Zettelmeyer, 2013; Guiso, Jappelli, Padula, and Pagano, 2004; Masten, Coricelli, and Masten, 2008).

Consider first a country with a high amount of foreign bank assets over GDP (75th percentile of the distribution), corresponding to 0.820 (see Table 8). We can express the growth effect of integration in a given country as the growth differential between two

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[11]In general, this growth-enhancing effect of banking sector integration might be induced by better lending conditions for corporations. The analyses of Claessens, Demirgüç-Kunt, and Huizinga (2001) and Giannetti and Ongena (2009) point in this direction as they argue that foreign bank entry depresses margins and profitability for domestic banks, improves the capital allocation and mitigates frictions in the credit market.

industries differing in their need for external financing (more specifically, the industries at the 75th and 25th percentile of the distribution of external dependence):

$$
\begin{aligned}
\text{Growth differential}_{75\%-25\%} \text{ in country}_{75\%} =&\text{estim. coefficient} \\
&\cdot (\text{ex. dependence}_{75\%} - \text{ex. dependence}_{25\%}) \\
&\cdot \text{foreign bank assets}_{75\%} \\
=&0.116 \cdot (0.37 - 0.060) \cdot 0.820 = 0.0295
\end{aligned}
$$

Over the cycle, an industry with a high dependence on external financing grew on average by 2.95 percentage points (pp) per year faster than an industry with a relatively low dependence on external financing in a country with a relatively high degree of banking sector integration. For a country with a relatively low value of foreign bank assets (25th percentile), the difference between industry growth rates is 1.12 pp (growth differential$_{75\%-25\%}$ in country$_{25\%}$ = 0.0112). Hence, the cross-country difference between the growth differentials is 1.83 pp per year. This number is also given in the lower part of Table 7 (column 1).

[Table 8]

5.2 Banking sector integration during the crisis

We expect that the strength of the relationship between banking sector integration and industry production growth differs during times of crisis and in normal times. In particular, during a crisis domestic banks reduce financing to the real sector, which translates into more severe financial constraints. This makes foreign financing more valuable in a crisis. The extent to which firms became financially constrained during the crisis is described in detail by Campello, Graham, and Harvey (2010). Using survey methods, they illustrate that many firms considered themselves as financially restricted. Duchin, Ozbas, and Sensoy (2010) provide evidence that corporate investment decreased significantly after the onset of the crisis. They argue that the first wave of investment reductions can be attributed to more severe financial constraints because of a negative shock to credit supply. In addition, the analyses of Kroszner, Laeven, and Klingebiel (2007) and Dell'Ariccia,

Detragiache, and Rajan (2008) suggest that during crises growth of industrial value added depends on the availability of external finance. According to their studies industries depending more strongly on external funding grew less during past crises. This is likely to play a role during the crisis in Europe, too, because corporate lending has experienced negative growth rates in many European countries since 2009. It suggests a tightening of financial conditions although it might also be induced by demand effects (see European Central Bank, 2013). We therefore expect a stronger effect of foreign bank assets on production growth during times of crisis.

Hypothesis 1. *Ceteris paribus, the effect of banking sector integration on industry production growth differentials is stronger during the crisis than in normal times.*

The last three columns of Table 7 provide the estimation results for Hypothesis 1: The first regression gives the results for normal times and the second regression for times of crisis. In the third regression we include the interactions of all variables with the crisis variable to obtain the difference between the two subsamples.

In all regressions the coefficient of the interaction term between total assets of foreign branches and subsidiaries and industries' external dependence is positive and highly statistically significant. However, in times of crises, the coefficient is more than four times larger than during normal times. The results of the third regression show that the difference between the coefficients of normal times and times of crisis is statistically significant. This result is economically important. While during normal times the differential in real growth rates was 1.5 pp per year, it increased during the crisis to 7.1 pp per year. Particularly the growth effect during times of crisis is remarkably high, suggesting an important role of foreign financing during times of domestic distress.

The coefficient of the interaction between total assets of domestically owned banks and external dependence is again statistically and economically insignificant both in normal times and crisis periods. The observed differences between the effects of foreign and domestic banks might be due to better lending decisions of foreign banks, which may be particularly important in times of crises. As Buch, Koch, and Koetter (2009) show, more successful banks are more likely to do cross-border business. Hence, foreign banks should be on average more successful than domestic banks, which might translate into higher industrial production growth.[12]

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[12]Koetter and Wedow (2010) directly investigate whether the quantity of loans or rather the quality

5.3 Banking sector integration in times of domestic bank deleveraging

In the financial crisis banks had to reduce the high leverage they had built up before, reinforcing the real effects of the crisis.[13] To reduce this procyclicality, the new regulatory framework Basel III contains a redefinition of eligible capital and requires higher core capital ratios, while allowing for a countercyclical adjustment. Banks reacted to these developments by increasing their capital, but at the same time started to shrink their balance sheets.[14] This process is not only seen as an adverse development. A report by the European Systemic Risk Board (2014) diagnoses an "overbanking" problem in Europe, which would indeed call for a shrinking of bank balance sheets.

Due to the impact of regulatory pressure, the shrinking of balance sheets and the reduction of credit provision are unlikely to be fully or even mainly driven by demand effects. Since there is evidence of real effects of lending shocks[15], we expect that additional capital provided by foreign banks should be particularly beneficial in terms of industrial production growth in times of strong domestic bank deleveraging.

Hypothesis 2. *Ceteris paribus, the effect of banking sector integration on industry production growth differentials is stronger in times of strong deleveraging of domestic banks than at other times.*

In Table 9 we report the growth effect of additional foreign bank assets conditional on the deleveraging of domestic banks. The estimation results confirm the relevance of foreign capital in mitigating financial constraints. First, we find a stronger growth effect of foreign bank assets in phases of domestic deleveraging than at other times under all three thresholds. Second, the stronger the asset reduction of domestic banks the stronger the growth effect. This supports our hypothesis. Intuitively, foreign banks provide an insurance to industrial firms against negative shocks to domestic bank lending. Not

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of loans matters for economic growth. Using stochastic frontier analysis to measure the quality, they investigate economic growth and loan supply in different German regions and find a significant growth effect of the quality and an insignificant effect of the quantity of loans.

[13]See Adrian and Shin (2010) for evidence of a strong procyclicality of bank leverage. Brunnermeier (2008) explains this behavior by reduced market liquidity and increasing margin requirements.

[14]For an overview of EU bank deleveraging, see Bologna, Caccavaio, and Miglietta (2014).

[15]See for example Peek and Rosengren (1997) for evidence of real effects of a lending shock stemming from foreign banks rather than domestic banks.

surprisingly, the larger the deleveraging shock, the higher the benefit of foreign bank presence. In phases of strong deleveraging ($\leq$ the 25th percentile, corresponding to a decrease in domestic bank assets over GDP by 1.1 pp) the growth effect is economically large with a differential of real growth rates of 7.5 pp per year. When using more extreme cutoffs, the effects become even larger.

[Table 9]

5.4   Banking sector integration in phases of disintegration

Previous studies on the relationship between banking sector integration and economic growth have typically assumed a symmetric growth effect in times of integration and disintegration. However, it is not obvious that firms are affected symmetrically when financial conditions change. There are two competing explanations for potential differences. On the one hand, banking sector integration may have a stronger impact on industrial production growth in times of financial disintegration. In times of integration, lax financial constraints may hardly affect firms' production decisions. In times of disintegration, however, constraints may become binding such that firms have to adjust their production and investment plans.[16] According to this argument, we expect foreign bank assets to have a stronger growth effect during times of financial disintegration. On the other hand, the effect may be weaker in times of disintegration if growth effects are largely driven by spill-over effects, e. g., of technological knowledge (see Kose, Prasad, Rogoff, and Wei, 2009). Since disintegration can only occur where banking sector integration took place before, technological spillover effects in times of integration may not fully disappear if disintegration occurs. According to this explanation, we would expect a larger coefficient of the interaction term of foreign bank assets with external dependence during the integration phase. However, the latter explanation is rather related to long-term growth and it seems likely that growth effects are overall stronger during phases of disintegration.

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[16]See Campello, Graham, and Harvey (2010) for the effects of financial constraints on investment activities during the crisis.

Hypothesis 3. *Ceteris paribus, the effect of banking sector integration on industry production growth differentials is stronger in times of disintegration than in times of integration.*

Columns (1) and (2) of Table 10 show indeed a stronger effect of banking sector integration on industrial growth in the presence of disintegration. The coefficient of the interaction between external dependence and foreign bank assets is significant and positive and implies a differential in real growth rates of about 4.7 pp per year. Columns (3) to (6), however, no longer provide a significant coefficient in times of disintegration and the coefficient even becomes negative for low cutoffs. This suggests that in sudden-stop episodes with a sharp reversal of capital flows, foreign capital reduces industry growth differentials (although not significantly). Overall the results are less clearcut than for the preceding hypotheses.

[Table 10]

6   Extensions and robustness

In this section we run additional regressions in order to check the robustness of our results. First, we analyze the role of cross-border lending and check whether the results on foreign assets are robust to controlling for credit inflows. Second, we focus on loans to non-financial corporations abstracting from other types of assets like interbank loans.

6.1   The role of cross-border lending

So far we have measured banking sector integration by foreign bank presence. One may wonder whether similar growth effects can be obtained for cross-border lending. This would imply that foreign bank presence could be substituted by credit inflows.

The literature suggests, however, that foreign banks located in the reference country may be better able to deal with financial frictions because the distance between lenders and borrowers matters for bank lending, in particular in lending relationships where soft

information is important (such as lending to small- and medium-sized companies). In an important paper, Degryse and Ongena (2005) demonstrate that the distance between lender and borrower shapes the specification of loan contracts. Agarwal (2010) provides evidence that distance plays an important role for banks in acquiring private information with consequences for the provision and pricing of credits. The economic relevance is demonstrated by DeYoung, Glennon, and Nigro (2008) who show that loan default of small businesses increases in the geographical distance. Bruno and Hauswald (2014) provide more direct evidence of lower growth effects of cross-border lending relative to lending via foreign branches and subsidiaries. While the growth effect of foreign bank presence is positive and significant in their paper, cross-border lending has a positive, but slightly insignificant coefficient. Therefore, we expect cross-border lending to have a smaller growth effect than credit provision via foreign affiliates because the geographical distance between borrower and lender is typically bigger in the case of cross-border lending.

The data on cross-border lending are taken from the ECB, which provides information about credit provided to non-financial institutions (households and corporations) to the reference country by banks hosted in the rest of the eurozone. Equivalently to foreign and domestic bank assets we normalize these figures by GDP. This variable will be called *Credit inflow* in the following. Since the ECB does not distinguish between households and corporations, this measure overestimates the credit provision to corporations. Nevertheless, it should give a relatively good indication of the evolution of cross-border corporate lending. For country-specific information on cross-border lending, see Table 11.

[Table 11]

To investigate the role of cross-border banking, we rerun our main regressions adding an interaction term between external dependence and credit inflow. Table 12 displays the results from these regressions. Over the cycle we find a positive and significant coefficient on the interaction between cross-border lending and external dependence. The differential in real growth rates is 1.4 pp per year and therefore somewhat smaller than the growth effect from foreign bank assets (1.7 pp per year). Interestingly, the coefficient of the interaction between external dependence and foreign bank assets remains more or less unchanged relative to the baseline estimation (see Table 7).

When distinguishing between times of crisis and normal times, the significant positive growth effect of cross-border lending vanishes in both subsamples. This is surprising as we expected cross-border lending to play a role in mitigating financial constraints at least in times of crisis (see the last three columns in Table 12). Instead the coefficient is negative in both subsamples, so there is no stable and economically significant growth effect of cross-border lending. Interestingly, the coefficients of foreign bank assets and their statistical significance are similar to the baseline analysis (see Table 7).

[Table 12]

The results of these regressions show that cross-border lending has a less robust growth effect than the provision of credit via foreign branches and subsidiaries. The coefficients do not provide consistent evidence that in times of more severe financial constraints cross-border lending plays a positive role in buffering negative lending shocks, although the coefficients often go in the expected direction. Most importantly, the growth effects of foreign bank assets, i.e., of banks being present in the loans' destination country, do not change qualitatively by controlling for cross-border lending. Hence, our main results are robust to this modification. Taken together, the results suggest that cross-border lending is unlikely to generate comparable positive growth effects as foreign bank presence.

6.2   Loans to non-financial corporations

So far, our results were based on total assets by foreign and domestic banks. However, typically a large share of banks' balance sheets is not directly associated with lending to corporations. For example, interbank loans and mortgage lending to households constitute a substantial fraction of banks' balance sheets. We therefore repeat our baseline analysis using data on loans to non-financial corporations only. Again, we normalize these values by GDP.

Unfortunately, the precise data needed for this robustness check is not available. The ECB provides information about loans to non-financial corporations of the entire banking sector on a country-year basis for all countries in the European Union. However, the data source lacks the distinction of loans provided by foreign and domestic banks. We therefore

have to approximate the share of credit provided by foreign banks using the previously defined share of foreign banks based on total assets. This limitation of the data has to be kept in mind when interpreting the regression results. For country-specific information on foreign and domestic credit to non-financial corporations, see Table 11.

The results in Table 13 confirm the main conclusions from our baseline regressions. Over the cycle there is a strong and highly significant growth effect of banking sector integration. The higher the volume of loans by foreign banks, the higher the differential in industry production growth rates. The differential in real growth rates is 2.9 pp per year, about 1 pp per year higher than in the baseline regressions (Column 1). This supports the relevance of bank loans by foreign banks for production growth.

[Table 13]

Again there is a substantial difference between normal times and times of crisis. In times of financial distress, the growth effect of foreign bank credit is about two times higher than during normal times. The differential in real growth rates increases to about 4.9 pp per year. However, the difference is no longer statistically significant (Columns 2-4). Overall these regressions again support the results from the main regressions.

7   Conclusion

In this paper, we investigated the real growth effects of banking sector integration in times of financial fragmentation and bank deleveraging in the European Union. Our study is motivated by concerns of European policy makers that the broad fragmentation process in the European financial system since the crisis hampers European growth perspectives. Before the crisis, financial integration in the European Union deepened rapidly. Since the crisis, however, regulators and national governments have started to push banks into a re-nationalization of banking sectors and sharp deleveraging. Rescue packages were only granted if they were combined with restructuring plans often containing discouragements of cross-border business, and higher capital requirements forced banks to reduce their balance sheets and the provision of external financing to corporations.

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In our econometric analysis, we use industry production data provided by Eurostat from 2000 to 2012, containing the financial crisis as well as the European sovereign debt crisis, and apply the Rajan-Zingales methodology to a sample of 35 industries and 24 countries. Banking sector integration in the European Union is measured by total assets of branches and subsidiaries of foreign EU banks relative to GDP. Exploiting the three-dimensional structure of our dataset, we are able to include a large set of fixed effects to credibly identify the effect of banking sector integration on industrial production growth. The large heterogeneity of the banking sectors of the member countries of the European Union further strengthens the robustness of our analysis.

Our results show that the concerns regarding financial fragmentation are justified. Over the entire sample, banking sector integration has a substantial positive effect on industry growth differentials. This implies in turn that the observed process of fragmentation caused substantial losses in terms of industry production growth. We find a stronger growth effect during the crisis than in normal times, as well as in times of domestic bank deleveraging relative to other times. During the crisis the effect is more than four times bigger than during normal times, with a differential of real industry production growth rates of about 7.1 percentage points. Similarly large effects were prevalent in times of domestic bank deleveraging. The growth effects at other times are smaller but still substantial and statistically significant. Although we cannot make any statements about the overall effect of banking sector integration at the macroeconomic level, the estimated effects on industry growth differentials are certainly economically important. The results are also robust to focussing on foreign loans to non-financial corporations instead of foreign bank assets. Taken together these results provide strong evidence of the important role of integrated banking sectors in buffering the economic consequences of crises and in exploiting growth potentials in the European Union.

Our results including credit inflows provide evidence of a different role of cross-border lending as compared to lending in foreign countries via branches and subsidiaries. Lending via foreign affiliates generates significant effects on the differential between industrial production growth rates even when controlling for cross-border lending, while cross-border credit provision does not have a robust growth effect across periods. While the effect of foreign bank presence is particularly pronounced during times of crisis and domestic bank deleveraging, the same is not true for cross-border lending. We therefore conclude that obtaining soft information about borrowers by being geographically near is particularly beneficial in times when external financing is scarce. Furthermore, it demonstrates that

simply replacing bank presence in the destination countries by cross-border lending is not possible.

Throughout all of our analyses we do not find a robust positive growth effect of domestic bank assets. The substantial difference to the strong growth effect of foreign bank assets is remarkable and requires further investigation. It is in line with the current debate stressing that the size of the banking sector in general plays a minor role in promoting economic growth and points towards a potential "overbanking" problem, as was diagnosed by the European Systemic Risk Board (2014) for the European banking sector. This strand of the literature argues that the growth-enhancing role of a deeper financial sector holds only for relatively small financial sectors. If it exceeds some threshold (relative to the size of GDP), countries no longer benefit from a bigger financial sector. The statistically insignificant coefficients of total assets of domestically owned banks provide evidence in this direction.

Based on our results, we conclude that banking sector integration plays an important role for economic growth in the European Union, particularly in the current phase of fragmentation and deleveraging. Therefore, concerns of European politicians and officials of the ECB about the adverse growth effects of the ongoing disintegration process in the European banking sector seem to be legitimate. Further fragmentation of the European banking sector is likely to make financial constraints even more severe. Especially when domestic banks shrink their balance sheets, financial fragmentation has exceptionally strong negative growth effects. The ECB seems to be aware of the need for an appropriate management of the deleveraging process. The robust finding of strong negative growth effects of financial fragmentation calls for additional international efforts to overcome protectionist tendencies on national level. They also cast doubts on measures by the European Commission fostering financial disintegration. Finally, they emphasize the importance of projects fostering financial integration at the European level. The Banking Union and the planned Capital Markets Union may set the stage for a new era of European financial integration, which we believe is an important building block of future growth perspectives in the European Union.

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Appendix

Industry production data

Up to 2008, industry production data of the Eurostat database *Structural business statistics* are collected on 2-, 3-, and 4-digit levels of the European industry classification NACE Rev. 1.1 (corresponding to the international classification ISIC Rev. 3.1). Since 2008, the industry classification system in the European Union in use has been NACE Rev. 2 (corresponding to ISIC Rev. 4). In order to make results comparable to previous studies, we match the NACE industry classification using official correspondence tables from UNIDO to the 3- and 4-digit industry sectors originally studied in the work of Rajan and Zingales (1998). For sectors where a perfect matching was not possible, we match NACE-sectors to the most closely related sectors of ISIC Rev. 2. We are then left with 93 3-digit NACE Rev. 2 sectors. Note that the sector *Synthetic resins* (ISIC Rev. 2 code 3513) of the Rajan-Zingales study could not be matched to any single 3-digit NACE Rev. 2 sector and is therefore dropped from the analysis. The 93 3-digit NACE-sectors were then aggregated on the ISIC Rev. 2 level to 35 sectors, in order to obtain a sector classification as close as possible to previous studies with one observation per country, year, and ISIC Rev. 2 classification. Note that we drop all industries with a production value of less than 0.01% of GDP. These industries are so small that they only contain a very small number of firms.

[Table A.1]

[Table A.2]

30
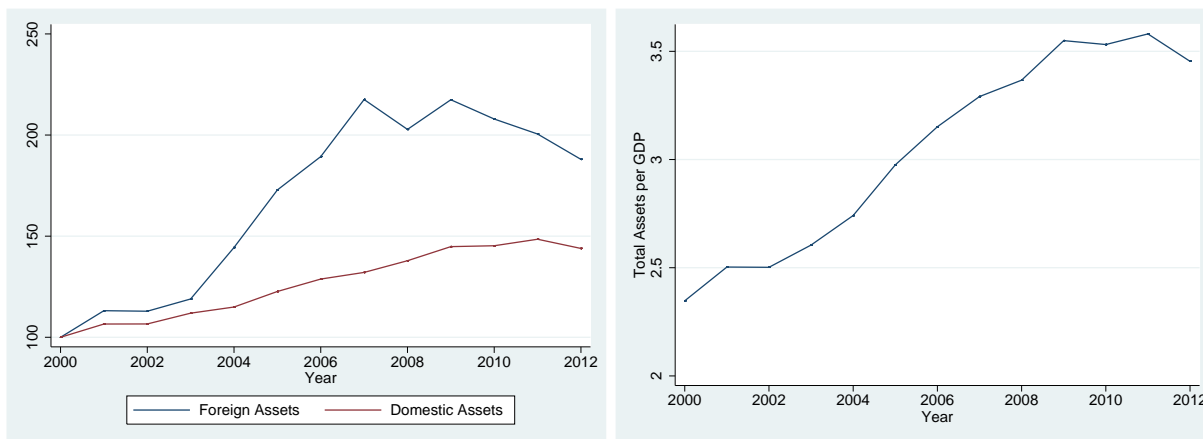
(a) Foreign and domestic bank assets / GDP   **(b)** Total bank assets / GDP

Figure 1: Total assets of foreign and domestic banks over GDP in the European Union (left chart, year 2000 = 100) and total bank assets over GDP (right chart).
Source: Own calculations.
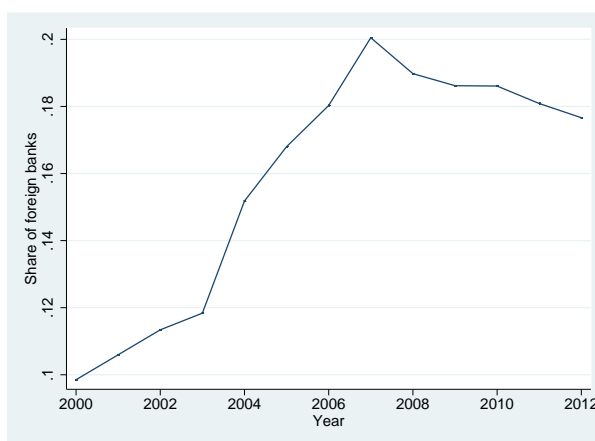
Figure 2: Share of foreign bank assets in total bank assets.
Source: Own calculations.
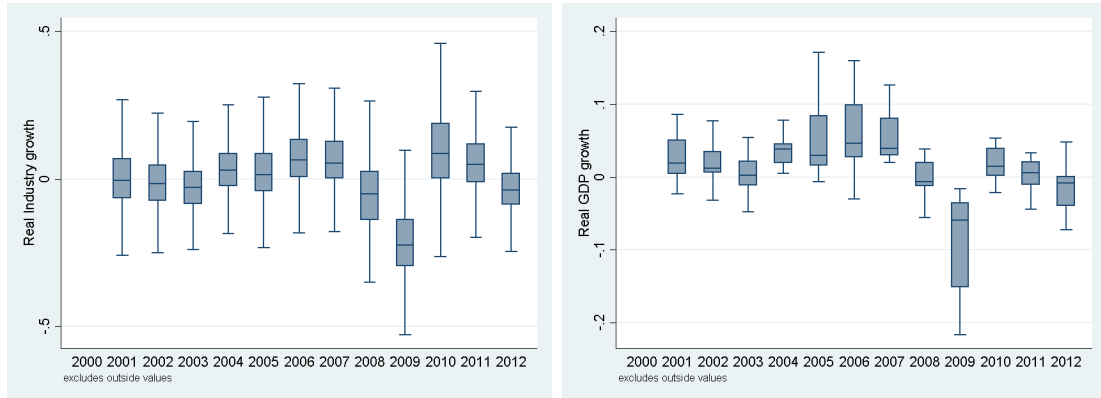
(a) Real industry production growth rates **(b)** Real GDP growth rates

Figure 3: Real industry production growth rates (left chart) and real GDP growth rates
(right chart) by year over all EU countries. Boxes denote the median and the 75th and
25th percentile, whiskers denote the closest observation to 1.5 times the interquartile
range above the 75th and below the 25th percentile.
Source: Own calculations.
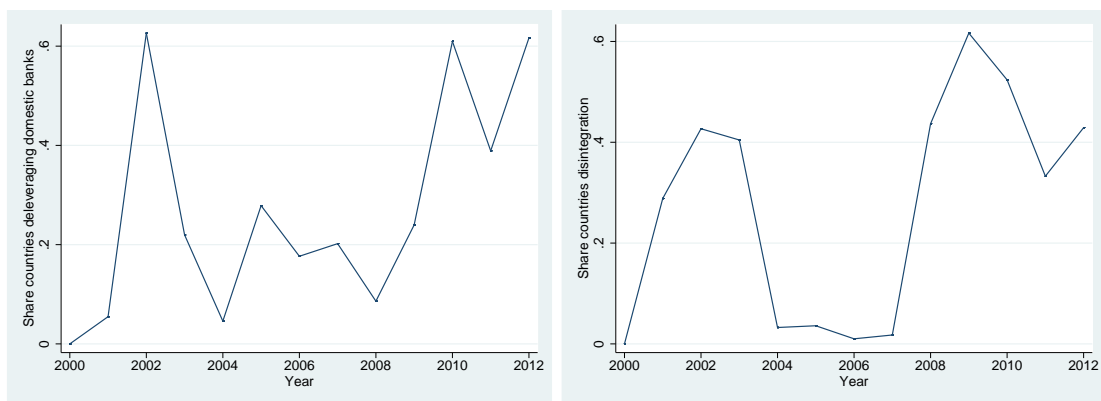
(a) Deleveraging (share of countries)   **(b)** Disintegration (share of countries)

Figure 4: Share of country-year observations with deleveraging of domestic banks as well
as disintegration using a cutoff of zero (see text for the construction of these variables).
Source: Own calculations.

Table 1: Banking sector integration in European countries

Country	Mean TA banking sector over GDP	Mean TA foreign banks over GDP	Mean TA domestic banks over GDP	Mean share foreign banks
Austria	3.054	0.517	2.537	0.169
Belgium	3.239	0.999	2.240	0.310
Bulgaria	0.986	0.764	0.222	0.775
Czech Republic	1.062	0.939	0.122	0.885
Denmark	3.829	0.662	3.167	0.174
Estonia	1.369	1.282	0.087	0.935
Finland	1.980	1.098	0.883	0.490
France	3.406	0.322	3.084	0.095
Germany	3.095	0.236	2.859	0.076
Greece	1.845	0.406	1.439	0.226
Hungary	1.115	0.584	0.530	0.524
Ireland	7.149	2.296	4.853	0.323
Italy	2.030	0.212	1.818	0.098
Latvia	1.475	0.772	0.702	0.518
Lithuania	0.849	0.677	0.172	0.795
Netherlands	3.476	0.353	3.123	0.102
Poland	0.784	0.467	0.317	0.596
Portugal	2.664	0.612	2.052	0.233
Romania	0.599	0.438	0.161	0.721
Slovakia	0.948	0.839	0.109	0.892
Slovenia	1.359	0.385	0.974	0.281
Spain	2.637	0.249	2.388	0.094
Sweden	2.474	0.190	2.284	0.076
United Kingdom	4.483	1.048	3.435	0.235

Notes: TA = total assets. Values denote averages over years 2000-2012.

Table 2: Definition of financial crises, phases of disintegration and deleveraging

Variable	Value	Definition$_{i,t}$
Crisis$_{i,t}$	1	**Beginning of crisis:** Significant distress in banking sector and rescue measures by government (Laeven and Valencia, 2013a), **End of crisis:** Real GDP growth positive and decrease in unemployment rate
	0	otherwise
Deleveraging$_{i,t}$	1	Change in domestic bank assets / GDP from year $t-1$ to year $t \leq$ 35th percentile ($\leq$ 25th perc. / $\leq$ 15th perc.) of the distribution
	0	otherwise
Disintegration$_{i,t}$	1	Change in foreign bank assets / GDP from year $t-1$ to year $t \leq$ 35th percentile ($\leq$ 25th perc. / $\leq$ 15th perc.) of the distribution
	0	otherwise

Table 3: Country-specific summary statistics (1)

Country	Crisis	Number of years in crisis	Number of years with dom. delev.	Number of years with disint.
Austria	2008-2009	2	5	4
Belgium	2008-2010	3	6	4
Bulgaria	-	0	1	2
Czech Republic	-	0	4	3
Denmark	2008-2011	4	3	4
Estonia	-	0	0	2
Finland	-	0	3	2
France	2008-2010	3	3	5
Germany	2008-2009	2	6	2
Greece	2008-2012	5	3	3
Hungary	2008-2010	3	3	3
Ireland	2008-2012	5	3	5
Italy	2008-2012	5	2	3
Latvia	2008-2010	3	1	2
Lithuania	-	0	2	3
Netherlands	2008-2010	3	2	5
Poland	-	0	5	4
Portugal	2008-2012	5	2	4
Romania	-	0	2	3
Slovakia	-	0	5	3
Slovenia	2008-2012	5	2	2
Spain	2008-2012	5	0	2
Sweden	2008-2010	3	3	4
United Kingdom	2007-2011	5	4	5

Notes: The table contains the number of years that a country is in a financial crisis based on the definition in Table 2. Domestic deleveraging and disintegration are constructed here using a cutoff value of zero, Hence, domestic deleveraging is defined as a reduction of domestic bank assets / GDP from year $t-1$ to year t and disintegration as a reduction of foreign bank assets / GDP from year $t-1$ to year t.

Table 4: Percentiles of the change of Domestic bank assets and Foreign bank assets over GDP

Variable	10%	15%	20%	25%	30%	35%	40%	45%	50%
Δ Dom. bank assets / GDP	-0.116	-0.066	-0.034	-0.011	-0.003	0.006	0.020	0.026	0.041
Δ For. bank assets / GDP	-0.170	-0.084	-0.054	-0.019	-0.013	-0.005	0.003	0.009	0.014

Variable	55%	60%	65%	70%	75%	80%	85%	90%	Mean
Δ Dom. bank assets / GDP	0.060	0.081	0.105	0.121	0.157	0.216	0.263	0.362	0.072
Δ For. bank assets / GDP	0.020	0.029	0.035	0.044	0.057	0.073	0.096	0.162	-0.036

Notes: Percentiles for the change of foreign and domestic bank assets over GDP are on country-year-level and are unweighted by the number of industry-country-year observations.

Table 5: External dependence

Industrial Sector	ISIC Rev. 2	External dependence
Tobacco	314	-1.76
Leather	323	-0.98
Footwear	324	-0.56
Pottery	361	-0.52
Other chemicals	352	-0.07
Furniture	332	-0.07
Petroleum refineries	353	0.03
Apparel	322	0.05
Printing and publishing	342	0.06
Basic excluding fertilizers	3511	0.06
Beverages	313	0.06
Spinning	3211	0.08
Nonmetal products	369	0.09
Pulp, paper	3411	0.10
Synthetic resins	3513	0.10
Transportation equipment	384	0.13
Paper and products	341	0.13
Wood products	331	0.14
Food products	311	0.14
Textile	321	0.17
Metal products	381	0.19
Iron and steel	371	0.24
Plastic products	356	0.24
Glass	362	0.24
Petroleum and coal products	354	0.27
Ship	3841	0.30
Nonferrous metal	372	0.32
Rubber products	355	0.37
Motor vehicle	3843	0.38
Electric machinery	383	0.39
Machinery	382	0.50
Other industries	390	0.52
Office and computing	3825	0.66
Drugs	3522	0.78
Professional goods	385	0.85
Radio	3832	0.93

Notes: The table contains the external dependence ratios provided by Laeven and Valencia (2013b), constructed from data for the United States for the period 1980–2006.

Table 6: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Production growth (unwinsorized)	0.004	0.211	-1	6.324	5,414
Production growth (winsorized 0.5%)	0.001	0.162	-0.573	0.887	5,414
Industry share	0.016	0.021	0.0001	0.238	5,414
Foreign bank assets / GDP	0.590	0.482	0.042	3.715	5,414
Domestic bank assets / GDP	1.879	1.298	0.041	6.902	5,414
Credit inflow / GDP	0.073	0.066	0	0.576	4,386
Foreign bank credit to non-fin. corp. / GDP	0.110	0.080	0.013	0.472	4,507
Domestic bank credit to non-fin. corp. / GDP	0.284	0.199	0.009	0.805	4,507
External dependence	0.140	0.424	-1.76	0.93	5,414
Financial crisis	0.234	0.423	0	1	5,414
Deleveraging (cutoff = 0)	0.318	0.466	0	1	5,414
Disintegration (cutoff = 0)	0.338	0.473	0	1	5,414

Table 7: Estimation results for hypothesis *Normal times vs. times of crisis* measuring banking sector integration as **Foreign bank assets**

VARIABLES	Over the cycle Production growth	Normal times Production growth	Times of crisis Production growth	Difference Production growth
Industry share	-3.060***	-4.220***	-3.351**	4.220**
	(0.644)	(1.478)	(1.598)	(1.700)
Industry share in times of crisis				0.869
				(2.623)
Industry growth effect of foreign bank assets,	0.116***	0.0973***	0.451***	0.0973***
depending on external dependence	(0.0275)	(0.0272)	(0.185)	(0.0313)
Industry growth effect of foreign bank assets				0.354*
in times of crisis, depending on external dependence				(0.213)
Industry growth effect of domestic bank assets,	-0.0265	0.00289	-0.00954	0.00289
depending on external dependence	(0.0219)	(0.0227)	(0.0838)	(0.0262))
Industry growth effect of domestic bank assets				-0.0124
in times of crisis, depending on external dependence				(0.101)
Constant	0.127***	-0.0943***	-0.217*	0.0469*
	(0.0196)	(0.0319)	(0.110)	(0.0239)
Differential in real	1.83***	1.53***	7.10***	5.57*
growth rates foreign bank assets	(0.433)	(0.428)	(2.913)	(3.354)
Differential in real	-1.83	0.20	-0.66	-0.86
growth rates domestic bank assets	(1.515)	(1.571)	(5.800)	(6.988)
Observations	5,414	4,148	1,266	5,414
Number of industries	713	701	415	713
Country-time fixed effects	yes	yes	yes	yes
Industry-time fixed effects	yes	yes	yes	yes
Country-industry fixed effects	yes	yes	yes	yes

Standard errors clustered on industry-level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Distribution of variables for construction of the differential in real growth rates

Variable	10%	25%	50%	75%	90%
Foreign bank assets / GDP	0.190	0.312	0.532	0.820	1.314
Domestic bank assets / GDP	0.163	0.633	2.004	2.865	3.618
Credit Inflow / GDP	0.017	0.038	0.059	0.103	0.145
Foreign bank credit to non-fin. corp. / GDP	0.030	0.056	0.093	0.161	0.219
Domestic bank credit to non-fin. corp. / GDP	0.035	0.094	0.268	0.427	0.518
External dependence	-0.520	0.060	0.140	0.370	0.660

Notes: Percentiles for all variables are on country-year level except for external dependence, which is on industry level. Hence, all variables are unweighted by the number of industry-country-year observations.

Table 9: Estimation results for hypothesis *Deleveraging of domestic banks* measuring banking sector integration as **Foreign bank assets**

VARIABLES	Deleveraging ≤ 35th perc.	Deleveraging > 35th perc.	Deleveraging ≤ 25th perc.	Deleveraging > 25th perc.	Deleveraging ≤ 15th perc.	Deleveraging > 15th perc.
	Prod. growth	Prod. growth	Prod. growth	Prod. growth	Prod. growth	Prod. growth
Industry share	-3.738**	-2.418***	-5.790***	-2.542***	-7.460***	-2.851***
	(1.540)	(0.581)	(1.495)	(0.597)	(2.550)	(0.655)
Industry growth effect of for. bank	0.159	0.0700	0.479**	0.0751*	1.682**	0.0903**
assets, depending on ex. dep.	(0.206)	(0.0461)	(0.199)	(0.0396)	(0.803)	(0.0384)
Industry growth effect of dom. bank	-0.0659*	-0.0374	0.0160	-0.0330	0.437	-0.0226
assets, depending on ex. dep.	(0.0358)	(0.0560)	(0.0654)	(0.0480)	(0.362)	(0.0269)
Constant	0.0858	0.0440	1.039***	-0.0319	-0.0176	-0.517***
	(0.0525)	(0.0312)	(0.118)	(0.0331)	(0.198)	(0.0167)
Differential in real	2.50	1.10	7.54**	1.18*	26.49**	1.42**
growth rates foreign bank assets	(3.244)	(0.726)	(3.134)	(0.624)	(12.646)	(0.605)
Differential in real	-4.56*	-2.59	1.11	-2.28	30.24	-1.56
growth rates domestic bank assets	(2.477)	(3.875)	(4.525)	(3.321)	(25.048)	(1.861)
Observations	1,941	3,473	1,340	4,074	717	4,697
Number of industries	666	674	583	704	383	707
Country-time fixed effects	yes	yes	yes	yes	yes	yes
Industry-time fixed effects	yes	yes	yes	yes	yes	yes
Country-industry fixed effects	yes	yes	yes	yes	yes	yes

Standard errors clustered on industry-level in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Estimation results for hypothesis *Integration vs. Disintegration* measuring banking sector integration as **Foreign bank assets**

VARIABLES	Disintegration ≤ 35th perc.	Disintegration > 35th perc.	Disintegration ≤ 25th perc.	Disintegration > 25th perc.	Disintegration ≤ 15th perc.	Disintegration > 15th perc.
	Prod. growth	Prod. growth	Prod. growth	Prod. growth	Prod. growth	Prod. growth
Industry share	-3.210**	-4.747***	-4.420***	-4.476***	-8.258	-4.619***
	(1.352)	(1.079)	(1.359)	(1.241)	(6.424)	(1.486)
Industry growth effect of for. bank	0.295*	0.0601	0.0155	0.0674	-1.778	0.0776*
assets, depending on ex. dep.	(0.153)	(0.0552)	(0.311)	(0.0586)	(1.242)	(0.0451)
Industry growth effect of dom. bank	0.0628	-0.0534*	0.222	-0.0598*	0.911	-0.0470**
assets, depending on ex. dep.	(0.0639)	(0.0296)	(0.295)	(0.0312)	(0.583)	(0.0231)
Constant	0.370***	0.164***	0.287	-0.0248	0.316	0.124***
	(0.0862)	(0.0292)	(0.317)	(0.0231)	(0.209)	(0.0288)
Differential in real	4.65*	0.95	0.24	1.06	-28.00	1.22*
growth rates foreign bank assets	(2.409)	(0.869)	(4.898)	(0.923)	(19.559)	(0.710)
Differential in real	4.35	-3.69*	15.36	-4.14*	63.03	-3.25*
growth rates domestic bank assets	(4.421)	(2.048)	(20.412)	(2.159)	(40.339)	(1.598)
Observations	1,659	3,755	1,019	4,395	474	4,940
Number of industries	635	693	498	695	299	696
Country-time fixed effects	yes	yes	yes	yes	yes	yes
Industry-time fixed effects	yes	yes	yes	yes	yes	yes
Country-industry fixed effects	yes	yes	yes	yes	yes	yes

Standard errors clustered on industry-level in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 11: Additional measures of banking sector integration

Country	Mean credit inflow over GDP	Mean foreign credit to non-fin. corp. over GDP	Mean domestic credit to non-fin. corp. over GDP
Austria	0.055	0.094	0.438
Belgium	0.108	0.106	0.209
Bulgaria	0.135	0.299	0.086
Czech Republic	0.069	0.170	0.022
Denmark	0.087	0.018	0.088
Estonia	0.053	0.415	0.028
Finland	0.029	0.175	0.122
France	0.033	0.037	0.362
Germany	0.046	0.0315	0.328
Greece	0.074	0.093	0.329
Hungary	0.087	0.140	0.127
Ireland	0.362	0.234	0.500
Italy	0.015	0.059	0.458
Latvia	0.040	0.228	0.206
Lithuania	0.009	0.202	0.066
Netherlands	0.132	0.0547	0.480
Poland	0.045	0.090	0.061
Portugal	0.056	0.142	0.495
Romania	0.052	0.122	0.045
Slovakia	0.062	0.210	0.026
Slovenia	0.189	0.150	0.379
Spain	0.043	0.074	0.675
Sweden	0.049	0.037	0.452
United Kingdom	0.114	0.068	0.220

Notes: Values denote averages over years 2000-2012.

Table 12: Estimation results measuring banking sector integration as **Foreign bank assets** and **Credit inflow**

VARIABLES	Over the cycle Production growth	Normal times Production growth	Times of crisis Production growth	Difference Production growth
Industry share	-3.985***	-4.984***	-3.341**	-4.984***
	(0.725)	(1.425)	(1.551)	(1.698)
Industry share in times of crisis				1.644
				(2.438)
Industry growth effect of foreign bank assets,	0.108**	0.113***	0.452**	0.113**
depending on external dependence	(0.0399)	(0.0374)	(0.201)	(0.0445)
Industry growth effect of foreign bank assets				0.339
in times of crisis, depending on external dependence				(0.246)
Industry growth effect of domestic bank assets,	-0.0453	0.00996	-0.00946	0.00996
depending on external dependence	(0.0287)	(0.0335)	(0.0832)	(0.0399)
Industry growth effect of domestic bank assets				-0.0194
in times of crisis, depending on external dependence				(0.0981)
Industry growth effect of credit inflow,	0.680**	-0.238	-0.0245	-0.238
depending on external dependence	(0.317)	(0.952)	(1.392)	(1.134)
Industry growth effect of credit inflow				0.213
in times of crisis, depending on external dependence				(2.301)
Constant	0.0838***	-0.0166	-0.171*	0.0418*
	(0.0188)	(0.0431)	(0.101)	(0.0242)
Differential in real	1.70**	1.78***	7.12**	5.34
growth rates foreign bank assets	(0.628)	(0.589)	(3.165)	(3.874)
Differential in real	-3.13	0.69	-0.65	-1.34
growth rates domestic bank assets	(1.99)	(2.318)	(5.757)	(6.788)
Differential in real	1.37**	-0.48	-0.05	0.43
growth rates credit inflow	(0.639)	(1.918)	(2.805)	(4.637)
Observations	4,386	3,120	1,266	4,386
Number of industries	706	679	415	706
Country-time fixed effects	yes	yes	yes	yes
Industry-time fixed effects	yes	yes	yes	yes
Country-industry fixed effects	yes	yes	yes	yes

Standard errors clustered on industry-level in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 13: Estimation results measuring banking sector integration as **Foreign bank credit to non-financial corporations**

VARIABLES	Over the cycle Production growth	Normal times Production growth	Times of crisis Production growth	Difference Production growth
Industry share	-3.784***	-5.334***	-3.612**	-5.334***
	(0.868)	(1.486)	(1.561)	(1.755)
Industry share in times of crisis				1.721
				(2.597)
Industry growth effect of foreign bank credit to non-MFI,	0.891***	0.859***	1.507*	0.859***
depending on external dependence	(0.240)	(0.222)	(0.856)	(0.262)
Industry growth effect of foreign bank credit to non-MFI				0.649
in times of crisis, depending on external dependence				(0.933)
Industry growth effect of domestic bank credit to non-MFI	-0.314***	0.00681	-2.661***	0.00681
depending on external dependence	(0.102)	(0.227)	(0.640)	(0.268)
Industry growth effect of domestic bank credit to non-MFI				-2.668***
in times of crisis, depending on external dependence				(0.724)
Constant	0.0618*	-0.243***	0.249***	0.0342
	(0.0339)	(0.0493)	(0.0591)	(0.0250)
Differential in real	2.90***	2.80***	4.91*	2.11
growth rates foreign credit to non-MFI	(0.781)	(0.723)	(2.786)	(3.037)
Differential in real	-3.24***	0.07	-27.47***	-27.54***
growth rates domestic credit to non-MFI	(1.053)	(2.343)	(6.607)	(7.474)
Observations	4,574	3,308	1,266	4,574
Number of industries	703	678	415	703

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.1: Country-specific summary statistics (2)

Country	Mean industry growth	Mean GDP	Mean GDP growth
Austria	0.0178	248,964.10	0.0121
Belgium	0.0067	304,360.60	0.0113
Bulgaria	0.0301	23,753.91	0.0350
Czech Republic	0.0239	109,052.30	0.0526
Denmark	-0.0306	205,547.30	0.0088
Estonia	0.0298	10,920.68	0.0491
Finland	0.00042	157,881.60	0.0127
France	-0.0197	1,726,604.00	0.0098
Germany	-0.0061	2,269,810.00	0.0051
Greece	0.0386	186,066.50	-0.0018
Hungary	0.0045	79,090.56	0.0042
Ireland	-0.0185	152,842.00	0.0171
Italy	-0.0096	1,410,333.00	-0.0009
Latvia	0.0607	13,406.28	0.0380
Lithuania	-0.0107	20,384.68	0.0559
Netherlands	-0.0040	520,437.10	0.0084
Poland	0.0520	263,343.60	0.0357
Portugal	-0.0100	153,383.10	-0.0034
Romania	0.0366	87,384.24	0.0036
Slovakia	0.0496	44,698.15	0.0616
Slovenia	-0.0190	29,620.18	0.0033
Spain	-0.0207	883,222.90	0.0139
Sweden	0.0139	304,457.90	0.0203
United Kingdom	-0.0444	1,717,795.00	-0.0057

Table A.2: Correlation coefficients

Variable	Crisis	Disintegration	Deleveraging
Crisis	1		
Disintegration	0.2051	1	
Deleveraging	-0.0010	0.1694	1

Notes: For the variables *Disintegration* and *Deleveraging* cutoffs of 0 are used in this table.