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Abstract

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JEL Classification: G01, G21, G28

Keywords: interbank market, Trust, networks, Centrality, Community detection

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1. Introduction

The interbank market is an informal market where banks borrow from and lend to each other with internal limits established based on an institution's risk appetite. On the one hand, the interbank market plays crucial roles in domestic financial systems because first, central banks intervene in this market to guide policy interest rates, and second, efficient liquidity transfer can occur between surplus and needy banks through a well-functioning interbank market (Furfine, 2001; Acharya et al., 2012). Moreover, theoretical studies suggest that interbank markets allow risk sharing (Bhattacharya and Gale, 1987). Studies find that since the 2008 global financial crisis, efficient risk sharing through the interbank market might not occur during crises due to moral hazard and market frictions in the lending market. In particular, the financial problems of Bear Sterns investment bank and the failure of Lehman Brothers showed that interbank markets can be an important channel of contagion. Interbank exposure might present systemic risk to the stability of the financial system. The crisis events of 2007 resulted in a significant increase in market rates and a simultaneous decrease in transaction volume in the interbank market. According to Afonso et al. (2011), the situation in the interbank market can be explained by an increase in counterparty risk and precautionary liquidity hoarding in anticipation of future shortages.

On the other hand, despite the existence of many recent studies on interbank market risk and interconnections, we still know very little about how the interbank market works. We know that the interbank market allows banks to adjust their volume of assets and liabilities and to manage the interest and exchange rate risks that arise from customer businesses. Hence, there is great variation between banks in their use of the interbank market within each country's banking sector. Moreover, the average ratio of interbank activities to total bank positions seems to be quite stable over a long horizon (BIS, 1983). The difference, however, is the position of the interbank market across countries. The average ratio of loans to depository institutions to total assets of insured commercial banks in the United States (US) was 1.81% from 1934 to

2015,[1] while that for Germany was 20.61% from 1950 to 2015.[2] Figure 1 shows the average share of interbank lending and borrowing to total commercial bank assets for the US, Japan, France, Germany, and the United Kingdom (UK). During 2000-2009, the size of interbank lending as measured by the share of interbank lending to total assets was significantly higher in France and Germany than in Japan and the US. Similarly, the size of interbank deposits as measured by the share of interbank deposits to total liabilities was also significantly higher in France and Germany than in Japan and the US.

FIGURE 1A &1B

These data raise several important questions (the "puzzle") that have remained unexplored until now. Why is there such a difference in the size of the interbank market across countries? What determines the participation of banks in the interbank market? Our study attempts to shed light on these questions by investigating the role of country-specific trust in banking systems in determining interbank participation and its relationship with the interbank network structure. Using the European Central Bank's (ECB) confidential data on interbank bilateral large exposures for supervisory purposes, we are able to map and examine the network of the Euro Area (EA) interbank market and further explore how the role of trust relies on the network structure.[3] The European Union (EU) introduced the large exposure regime in 2014, requiring banks to report to authorities detailed information about their large exposures. To date, the

[1] The data are from the US FDIC for insured commercial banks, available at: https://www5.fdic.gov/sdi/main.asp?formname=standard

[2] The data are from Deutsche Bundesbank, available at: http://www.bundesbank.de/Navigation/EN/Statistics/Banks_and_other_financial_institutions/Banks/banks.html

[3] An exposure is defined as large when, before credit mitigations and exemptions are applied, its value is equal to or above EUR 300 million or 10% of an institution's eligible capital. For more details, please see Section 3.1.2.

large exposures sample captures 90% of EA banks' risk-weighted assets vis-à-vis credit institutions.

In the interbank market, banks have a powerful incentive to monitor each other, as interbank deposits and loans are uninsured and often uncollateralized (Furfine, 2001). Initially, the interbank market was an informal market for short-term placement of deposits (Bernard and Bisignano, 2000). Currently, the market is very international, and banks located throughout the world participate in domestic market and cross-border transactions. The main criteria for participation are that a bank establishes itself as creditworthy compared to other banks and is not constrained by domestic regulations. Transactions are arranged by banks' dealers over the phone, and a deal is confirmed by subsequent exchanges of confirmation between the banks. However, a dealer performs transactions within limits, which are set based on internal assessments of the risk of counterparties. In the case of a failure, interbank deposits are most likely to be lost, as they are not insured. Meanwhile, the likelihood that a bank will fail depends on its financial situation and the attitudes of the supervisory authority and governments toward bank failure. Rochet and Tirole (1996) however, highlight that peer monitoring can be weakened by government interventions.

In this study, we define trust as a bank's belief in its peers' honesty and good-faith commitments in the financial systems. Trust varies strongly across countries, and its level can be influenced by the historical stability of the banking sector. A number of studies have documented that individuals' trust can change quickly in response to economic and financial crisis and that the implications of these crises or shocks are persistent in the long run (e.g. Guiso, 2012; Ananyev and Guriev, 2019). Similarly, a long banking crisis and a significant number of bank failures are traumatic experiences for the banking sector and consequently for the interbank market. Therefore, the historical banking crises can capture the trust, such as beliefs and preferences in the banking system originating from history. To measure trust, we use the history of banking crises and failures as proxies.

Our investigation reveals two sets of main findings. Firstly, trust is crucial in determining the interbank market size. Higher trust helps banks obtain liquidity in this unsecured market by mitigating information asymmetries about counterparty credit risk and developing lending relationships. If a bank is located in a country that has experienced longer periods of banking crisis or more bank failures in the past, trust can be weaker and support less interbank activity given the counterparty credit risk, the possible adverse selection in this market as well as the risks in the current banking system. This effect is present when we control for law enforcement, legal origin, and other country-level characteristics.

To address the endogeneity concern that other country features, such as the structure of the financial system, might affect the functions of the banking system as well as the past crises (Allen et al., 2012), which could further influence interbank activities, we employ a propensity-score matching algorithm to define a treated group of banks located in countries with the longest duration of banking crises and a control group of banks with comparable sizes located in countries with the shortest crisis duration but similar financial structures. After matching, we find that the effect is still present, and the economic impact of crises is even stronger.

It is also possible that interbank borrowing is influenced by other unobservable factors correlated to trust. To address this concern, we employ instrumental variable (IV) analyses. The instrument we employ is the usage of deposit insurance schemes at the country level. Demirgüç-Kunt et al. (2014) show that countries with a larger number of banking crises and failures are more likely to introduce a safety net, i.e. deposit insurance, so that trust can possibly be restored. The exclusion condition is also very likely to be satisfied, as most interbank borrowing (deposit) is based on credit and therefore is not covered by deposit insurance (Furfine, 2001). The instrumental variable analysis confirms our finding that a lower level of trust in the banking system reduces interbank borrowing.

Secondly, we find that the influence of trust on interbank activities relies on interbank network structure, through examining the interbank networks in the Euro Area (EA). Focusing

on the EA interbank markets, we are able to isolate the possible influence from the monetary policies. We apply network methodology to study the network structure, calculating the local and global centralities and detecting the interbank borrowing and lending groups, i.e. interbank "communities". Formally, communities are groups of banks in which group members are more strongly connected to each other in terms of interbank borrowing and lending than to others outside the group.[4] Using the EA large exposure data, we map out the EA interbank market network and detect 13 communities in the EA interbank market.[5] We find that French banks on average have the highest global and local importance (measured by centralities) in the EA interbank network and have a higher volume of interbank borrowing and lending across countries. In contrast, German banks have a large number of direct connections mostly located in the same community, although connected neighbours tend not to be the most important global intermediaries in the network.

We find that the effect of network structure is twofold. On the one hand, the impact of trust is both statistically and economically stronger for core banks which are globally important intermediary banks measured by eigenvector centrality in the networks than for periphery banks. This is consistent with the literature documenting the spill-over effect from the intermediary banks through the interbank network to a large number of connected borrowing banks (Craig and Ma, 2021). On the other hand, being more exposed in a community can mitigate the negative effect of lacking trust in obtaining interbank funding. This suggests that when trust is low, being better connected within a community can be helpful in obtaining interbank borrowing. For robustness, we explore the interbank network with total exposures and that with only non-securities contracts, with only short-term exposures or with only

[4] The existing literature has identified core-periphery structures in interbank networks for different countries (e.g., Cocco et al., 2009; Craig and von Peter, 2014; Gabrieli and Georg, 2014). However, the communities of interbank borrowing and lending have been rarely explored.

[5] Figure 4 visualizes a complete network of large exposures for the EA interbank market. For a detailed description of the EA interbank market, please see Section 6.1.

uncollateralized exposures, and we find consistent results indicating that the effect of trust depends on the interbank network structure.

We also employ the event, the insolvency of an Italian bank, i.e. *Veneto Banca*, as a shock to trust in financial systems, and examine how the shock affects interbank market participation of Italian banks as well as the banks connected to *Veneto Banca* versus other banks. In June 2017, the ECB announced *Veneto Banca* was "failing or likely to fail". Following the distress event, *Intesa Sanpaolo*, the largest bank in Italy by capitalization, acquired the good assets and corresponding liabilities of *Veneto Banca* with the back-up of 5 billion euros of government guarantees. The distress event created a negative shock to the Italian banking system, and therefore the mutual trust via bilateral relationships in the banking system. We find after the shock, the interbank market participation of Italian banks as well as the banks directly connected to *Veneto Banca* in interbank networks significantly reduces, supporting our main finding that trust significantly affects interbank participation.

Our study contributes to the literature in the following three ways. Firstly, to the best of our knowledge, this is the first study presenting significant differences in banks' usage of the interbank market across countries. There have been numerous studies on lending relationships in the interbank market. For example, Afonso et al. (2013) show that there is substantial heterogeneity in the structure of trading relationships in the US overnight interbank lending market. Some banks rely on spot transactions, while most form stable, concentrated borrowing relationships to hedge liquidity needs. Borrowers with concentrated interbank relationships can be almost completely insulated from exogenous shocks. Cocco et al. (2009) use a unique dataset on the Portuguese interbank market and show that relationships are an important determinant of interbank market activities. Larger banks with more imbalance in their reserve deposits are more likely to borrow funds from other banks than are those with less imbalance. Bräuning and Fecht (2017) use German interbank payment data and support the view that established relationships matter for the availability of interbank credit and affect the

reallocation of liquidity through the interbank market. Jasova et al. (2021) show lender of last resort policy contributes to higher interconnectedness and the build-up of systemic risk in the banking system using the data of banks' holdings of bonds. However, none of these studies utilizes cross-country interbank market data or documents the differences in interbank market usage across countries. An important question is what determines interbank market participation. By using the compiled dataset of domestic banks from 96 countries and investigating the structure of the EA interbank market, we document that trust is an important determinant of interbank activities and that its influence relies on the interbank network structure, i.e. the core versus periphery positions as well as the communities of borrowing and lending.

Secondly, we contribute to the literature on interbank liquidity during crisis periods. Freixas and Jorge (2008) and Bruche and Suarez (2010) argue that during crises, interbank lending might decrease due to an increase in borrowers' counterparty risk, while Caballero and Krishnamurthy (2008), Acharya and Skeie (2011), and Allen et al. (2009) attribute this decrease to lenders' liquidity hoarding. Afonso et al. (2011), using the US overnight interbank market around Lehman's bankruptcy, show that counterparty credit risk plays a larger role than precautionary liquidity hoarding does. Using a sample of large settlement banks in the UK, Acharya and Merrouche (2013) report that after the crisis of 2007–2008, liquidity demand was precautionary in nature in that it rose on calendar days with a large amount of payment activity and for banks with greater credit risk. Moreover, Iyer and Peydro (2011), using the setting of the Indian banking system, find robust evidence that higher interbank exposure to failed banks leads to larger deposit withdrawals and that the interbank linkages among surviving banks further propagate the shocks. Iyer et al. (2014) employ a Portuguese loan-level dataset and find that banks relying more on interbank borrowing before the crisis cut their credit supply more than other banks did during the crisis.

Lastly, this study is related to a growing body of literature on networks. Das et al. (2019) explore the network for all commercial banks in the US during the Great Depression and use centrality measures to estimate systemic risks. Using a similar dataset, Mitchener and Richardson (2018) find that the interbank lending networks amplified the contraction in lending during the Great Depression. Brunetti et al. (2019) examine interbank behavior during and after the 2008 financial crisis and document that during the crisis, the correlation network based on publicly traded bank returns shows an increase in interconnectedness, while the physical network based on interbank lending transactions highlights a marked decrease in interconnectedness. Our paper examines the network structure of the EA interbank market and explores both the core-periphery structure and community features. Other than the literature on financial networks, recent studies also explore different types of economic networks using network topologies. For example, Hochberg et al. (2007) examine the network of venture capital and find that better-networked VC firms in terms of higher centrality experience significantly better fund performance. Ahern and Harford (2014) represent the economy as a network of industries connected through customer and supplier trade flows and show that stronger product-market connections lead to a greater incidence of cross-industry mergers.

The remainder of the paper is organized as follows. Section 2 presents the stylized facts on the significant differences in interbank activity across countries. Section 3 describes the data source, sample construction and summary statistics of the key variables. Section 4 discusses the network methodology and identification. Section 5 presents the regression analysis using international bank-level evidence on interbank borrowing. In Section 6, we describe the network structure of the EA interbank market and investigate the role of interbank network structure in influencing the effect of trust. Section 7 concludes the paper.

2. Stylized facts and the interbank market puzzle

This section provides a cross-country overview of interbank market activities. Figures 1A and 1B show the structure of bank assets and liabilities for five countries: the US, Japan, France,

Germany, and the UK, from 2000 to 2009.[6] On average, the ratio of interbank loans to total bank assets is 2.4% for the US during this period, followed by Japan with a ratio of 4.9% and the UK with a ratio of 13.2%. France and Germany have much higher interbank loan ratios of 28.7% and 22.5% respectively. On the liability side, US banks have the lowest ratio of interbank deposits at 2%, followed by Japan, with a ratio of 4.4%, and the UK, with a ratio of 9%. Again, France and Germany have much higher interbank deposit ratios, at 31.2% and 26.6% respectively.

In terms of other bank assets and liabilities, France and Germany also tend to have the highest ratios of loans to deposits among the five countries, at 116.9% and 105.6% respectively. The average ratio of loans to deposits for Japanese banks is 80.6%, the lowest among the five countries. In Japan, the ratio reflects a "balance-sheet recession" over the two decades, characterized by a change in household and company behavior towards paying down debt and increased savings, even as interest rates remain at record low levels. Consequently, the economy slowed down due to reduced household consumption and business investment.

Table A2 in the Internet Appendix shows the changes in the level of interbank deposits from 2000 to 2014.We observe a decline in interbank deposits relative to bank assets since the 2008 global financial crisis in all countries except Japan. The decline started in the UK and the US in 2007, and then in France and Germany in 2008. By contrast, in Japan, bank deposits slightly increased, but the level remained low compared to deposits held by banks in France or Germany. Interestingly, the decline in interbank loans was much lower, and in most countries, the levels of interbank loans to banks' total assets were comparable to those observed in the years prior to the crisis. An exception is the US, where interbank loans and deposits remain significantly lower than before the crisis.

[6] Figure A1 and Figure A2 in the Internet Appendix show the dynamic change in the structure of bank assets and liabilities from 2000 to 2009.

The simultaneous changes in interbank deposits and lending confirm that banks tend to hold significant interbank exposure on both sides of the balance sheet. This observation is in line with that of Bluhm et al. (2016), who find that banks lend to and borrow from other banks simultaneously and do so persistently. They term this property interbank intermediation to distinguish it from traditionally defined bank intermediation. Moreover, they show that this intermediation is derivative to banks' client book, comprising households and firms, which determine the build-up of interbank books.

Figure 2 presents the interbank loans and deposits to total assets for domestic banks across the EU member countries in 2016, showing significant differences in interbank market participation across countries. Among the EU member countries, Germany has a relatively large interbank market, where the average interbank loans and deposits reach 11.4% and 13.5% of total assets in 2016, respectively. In contrast, interbank loans in Finland amount to 0.7% of total assets while interbank deposits amount to 0.02% of total assets in Estonia in 2016. The average interbank loans and deposits for all EU banks remain strongly balanced and reach 5.7% of total assets.

FIGURE 2

The unbalanced structure of the balance sheet of the banks in some EU member countries might be attributed to foreign banks' activities. Figure 3 shows the interbank loans and assets of domestic and foreign subsidiaries and branches as well as the share of foreign ownership in each country. After we include the interbank activities of foreign banks, the interbank exposure on both sides of the balance sheet among the member countries is more balanced. However, Luxembourg and Malta are exceptions. Both countries are financial centers and have relatively high foreign ownership. When we account for the interbank activities of domestic and foreign banks, Luxembourg has the largest interbank market among the EU member countries. In 2016, the interbank loans and deposits in Luxembourg amount to 30.6% and 26.6% of total assets, respectively.

FIGURE 3

Overall, the data show large variations in interbank activities, even among relatively homogenous countries, such as the EU member states. However, across the member countries, interbank exposures remain simultaneous on both sides of banks' balance sheets. The existing literature, so far as we know, did not examine the large difference of interbank market size among countries as well as the determinants of the interbank participation, which we term as "the interbank market puzzle" in our study.

3. Data and summary statistics

3.1 Sample construction

We compile two datasets for analyses in this study. The first covers banks around the globe, with interbank borrowing information from banks' balance sheets. To isolate the possible impact of monetary policies and further investigate how the interbank network structure affects the role of trust, we compile the second dataset for banks in the Euro area, with the interbank bilateral exposure information from the ECB for supervisory purposes.

3.1.1 Interbank market participation: international data

The first dataset is constructed as follows. We obtain financial data on commercial, cooperative, and savings banks from the *Bankscope* database from 1995 to 2015. Our sample comprises only banks that operate as independent companies or with single locations and excludes multinational banks that make significant use of internal capital markets to fund and support their activities across countries (De Haas and van Lelyveld, 2010). We also exclude foreign banks in our study since their activities may be highly affected by institutional factors and economic conditions in their home countries. Allen et al. (2013) show that foreign subsidiaries' interbank deposit decisions are likely to be determined more by the current policy of the multinational bank than by countries' institutional factors. In addition, Adams-Kane et

al. (2017) show that foreign bank activities are strongly influenced by the current home country's economic conditions.

Therefore, we select for our sample only domestically owned banks operating domestically. We classify a bank as domestically owned when 50% or more of its shares are held by domestic entities. To establish bank ownership, we create a dataset on the evolution of ownership over the period 1995–2015. This dataset builds on the data compiled by Claessens and van Horen (2014), which comprise only approximately one-third of our sample. This process allows us to have a sample of 11,557 domestic commercial banks, savings banks, and cooperative banks from 166 countries. Then, we drop all countries that have fewer than five operating banks in our sample, thereby reducing the number of banks in the sample by 1.3%. The final sample contains 11,412 domestic banks from 96 countries.[7]

The information on systemic banking crises comes from two main sources. The first is Laeven and Valencia (2020), which identifies 151 crises around the globe over the period 1970–2017. The second is Metrick and Schmelzing (2021), which combines multiple sources and presents a new database of banking crises since 1257.[8]

The World Bank's Global Finance Database is used for information on country-level variables on financial system development (private credit to GDP) to measure the development of the banking system. The country-level variable on legal enforcement is from the Worldwide Governance Indicator (WGI) database constructed by Kaufmann et al. (2010). The database contains measures of legal enforcement for more than 200 countries. The information on

[7] We classify a bank as domestically owned when 50% or more of its shares are held by domestic entities. As Claessens and Van Horen's ownership database does not cover all banks, we update the missing information on bank ownership using hand-collected information from various sources. The information sources used to build the dataset primarily comprise *Bankscope*, supplemented by annual reports and national supervisory publications. For the sample distribution by country, please see Internet Appendix Table A3.

[8] Metrick and Schmelzing (2021) build the new database based on Reinhart and Rogoff (2009), Schularick and Taylor (2012), Laeven and Valencia (2020) and Baron, Verner, and Xiong (2021).

countries' legal origin is from Djankov et al. (2007), which we update using mainly the CIA Factbook.

We merge the abovementioned datasets. The banks' financial data in year *t* are matched with the country-level variables, such as financial structure and regulation, in year *t-1*. We end up with 74,572 bank-year observations. Additional information on the definitions and sources of variables is provided in Internet Appendix Table A1.

3.1.2 Interbank market participation: ECB data

Our second dataset comes from the ECB's confidential large exposures data, which traces the bilateral interbank exposures between banks. The large exposure regime, introduced in the EU in 2014, requires banks to report to prudential authorities detailed information about their largest exposures. An exposure to a single client or a connected group of clients is considered a large exposure when, before credit mitigations and exemptions are applied, it is valued at 10% or more of an institution's eligible capital. In addition, institutions are required to report information for exposures with a value above or equal to EUR 300 million. To date, this dataset captures more than 50% of EA credit institutions' exposures. For the goal of studying the interbank network, the large exposures sample captures 90% of EA banks' risk-weighted assets vis-à-vis credit institutions (Covi, Gorpe and Kok, 2021; Covi, Montagna and Torri, 2021). Note that these data capture not only the borrowing and lending of EA banks among themselves but also the borrowing of EA banks from non-EA banks. For example, in the fourth quarter of 2018, the large exposures sample covers borrowing and lending among 1,362 banks (793 EA banks and 569 non-EA banks). Overall, our interbank network of large exposures covers roughly 77% of EA banks' relationships with credit institutions. The missing part of the dataset (23%) stems from *Significant Institutions'* (SI) exposures towards *Less Significant Institutions* (LSIs). Often credit relationships between SIs, to which belongs also the group of banks defined as *Global Systemically Important Institution*s (GSIIs), and LSIs are below the SI's

large exposures reporting threshold since the borrowing capacity of LSIs is relatively small in terms of the reporting bank's exposure limit.

We then match the quarterly large exposures data over the fourth quarter of 2014 to the first quarter of 2019 with banks' financial information from *BankFocus*.[9] We also match these data with country-level variables from the WGI and the Global Finance Database. We end up with a sample of interbank network structure information from the fourth quarter of 2014 to the end of 2018 for the regression analyses.

3.2 Variables and descriptive statistics

3.2.1 Trust in the interbank market

The economic literature has recognized that trust has a positive effect on economic development (Knack and Keefer, 1997) and financial development (Guiso et al., 2004; 2008). In the finance literature, the concept of trust has received increasing interest following the crisis of 2008. Various studies explore the role of trust in financial intermediation (e.g., Duarte et al., 2012; Hasan et al., 2017; Levine et al., 2018). Harhoff and Korting (1998) document that trust in the bank-firm relationship is complex and cannot be explained by other variables, such as relationship duration or the extent of competition (lenders). In the literature, a popular proxy for trust is the World Values Survey (WVS). However, Glaeser et al. (2000) document that standard survey questions do not appear to measure trust; they argue that answers to survey questions are more closely related to the trustworthiness of respondents than to their propensity to trust others. More importantly, in our study, we are interested not in individuals' perceptions

[9] Because *Bankscope* has been discontinued since 2015, we use banks' financial information from *BankFocus* and match it with large exposures data for the period of 2014 to 2018.

but rather in banks' trust in interbank market participants within a country. Trust in individual people differs significantly from trust in an organization in the market.[10]

In our study, we define trust as a bank's belief in its peers' honesty and good-faith commitments within a country's interbank market. Our proxies for trust are the history of systemic banking crises and failures as we consider that a long banking crisis and a significant number of bank failures or banking crises are traumatic experiences for the banking sector and consequently for the interbank market.[11] It has also been documented in the literature that the impact of crises on trust is persistent and furthermore, that trust can hardly be fully restored to the pre-crisis level even during the post-crisis economic recovery (e.g. Ananyev and Guriev, 2019). Therefore, the history of banking crises captures the trust in the banking system rather than the risks associated with the banking system currently.

Our first proxy, *Crisis length,* is defined as the accumulated duration (number of years) of banking crises in the country until year *t* over the period 1970 to 2015. Following Laeven and Valencia (2020), we define a systemic banking crisis as a crisis producing significant signs of financial distress in the banking sector and triggering significant policy interventions to assist or intervene. The starting year of a systemic banking crisis is the year when both conditions are met. Meanwhile, the end of a crisis is defined as the year before both real GDP growth and

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[10] We also tried using the variables on individuals' trusts in banks created from the World Value Survey (WVS). In WVS questionnaire (https://www.worldvaluessurvey.org/WVSDocumentationWV7.jsp), one survey question relevant to banking is "*I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or not at all? Q78-Banks*". Based on the survey data, we calculated two trust variables using either the percentage of people who answered "*A great deal of confidence*" or the percentage of people who answered "*A great deal of confidence*" or "*quite a lot of confidence*". We did not find any significant results on the impact of people's perception on institutions' interbank participation.

[11] Similarly, Guiso (2012) examines people's trust and argues that financial crises have impacted enormously investors' beliefs and their preferences. After financial crises, trust in banks, bankers and brokers, as well as the stock market has collapsed to unprecedented levels.

real credit growth are positive for at least 2 consecutive years.[12] In our study, we focus on crises that result in output loss with value more than 10% of GDP. We presume that large systemic banking crises might lead to a decline in trust in the banking sector, including in the interbank market.

In our sample period 1970-2015, the distribution of banking crises across countries is as follows: 24 countries experienced no banking crisis, 29 countries had 1 to 3 years of banking crises, 31 countries had 4 to 6 years of crises, and 12 countries experienced more than (or equal to) 7 years of crises. Argentina and Ecuador are the two extreme countries that experienced a systemic banking crisis that persisted for 10 years. The duration (years) of banking crises allows us to consider both the frequency and severity of crises.

The second proxy, *Bank failure*, is defined as the total assets of failed banks until year *t* over the period 1970 to 2015.[13] We use the status of a bank to identify whether it has severe financial problems. If a bank is marked in the *Bankscope* database as "bankrupt", "active (receivership)", or "in liquidation", then we treat it as a bank failure. The way governments deal with insolvent banks, whose numbers vary significantly across countries, is a political decision. We presume that the methods used to resolve bank failures can strongly determine trust in counterparties and the financial system.

The distinctive differences in the resolution of banking crises across countries show the outcome of the savings and loan (S&L) crisis in the US in the 1980s and 1990s and the banking crisis in Switzerland in 1991–1996. In both cases, the banking crisis affected mainly regional banks and was related to real estate booms in earlier years. As a result of the S&L crisis, US federal agencies liquidated 1,043 institutions, and the total direct costs attributable to the

[12] In all cases, however, the duration of a crisis is truncated after 5 years, starting from the 1st year of the crisis. We keep using the methodology of Laeven and Valencia (2020) because in our opinion, the truncation of the duration of the crisis does not affect our results.

[13] We standardize the variable *Bank failure* in the country-year panel data for regression analysis.

closing of insolvent thrift institutions during 1986–1995 amounted to approximately 2.5% of the country's GDP in 1990 (Curry and Shibut, 2000). In Switzerland, banks incurred estimated losses of more than 16% of the country's GDP in 1990, but only a single bank had to be liquidated. In both cases, however, the number of regional banks (thrift banks) was reduced by more than 50% at the end of the banking crisis.

In the EU, too, the number of bank failures remained relatively small in comparison to that in the US during the global financial crisis of 2008. Nevertheless, based on the US experience, 19 Eurozone countries introduced a new institution, the Single Resolution Board, in 2016, to deal with failing institutions in the EU in a more unified way. Therefore, the way a government deals with insolvent banks strongly determines trust within the banking sector, as bank failures are long-lasting traumatic experiences within the banking sector.

The third proxy, *Crisis number 1900*, is defined as the number of crises until year *t*, over the period of 1900 to 2019. Metrick and Schmelzing (2021) covers the history of banking crises from 1257 to 2019. We choose 1900 as the cut-off year because, first, the recent history of banking crises might affect trust in financial systems in a stronger way; and second, the structure of financial systems in the recent century is closer to the current one. Although Metrick and Schmelzing (2021) capture the history of banking crises for a much longer horizon, the database does not give us the duration of each banking crisis so we only calculate the accumulated number of banking crises since 1900 without considering the severity of banking crises, and use it as an alternative proxy for trust.

3.2.2 Interbank deposits and bank-level control variables

Table A2 presents large differences across countries in interbank deposits and in interbank lending. We decide to investigate only interbank deposits for domestic banks around the globe, as these data enable us to identify banks that take deposits but not the source (i.e., domestic or foreign). By contrast, in the case of interbank lending, we know the identities of banks that

lend to other banks, but we do not know whether the bank is located in the same country or abroad from the balance sheet data. Hence, our main dependent variable, *Interbank borrowing*, is measured as deposits and borrowing from banks scaled by total assets in year *t.*[14] We hypothesize that trust in countries' financial systems and banks' counterparties are determinants of the differences in the interbank markets across countries.

Panel A of Table 1 provides detailed summary statistics for the dependent variable and the control variables for the panel of domestic banks around the globe. We Winsorize the bank variables at 1% and 99%. The dependent variable *Interbank borrowing* ranges from 0 to 1, with a mean value of 0.08 and standard deviation of 0.11. The mean value of interbank borrowing averaged by country for our sample is slightly higher at 0.07, indicating that more banks are located in countries with lower levels of interbank borrowing.

We consider an assortment of bank characteristics. The ratio of loans to deposits (*LtD*) shows a large variation among the banks in the sample. However, the mean value (0.93) indicates that in the average bank, deposits exceed loans, and consequently, these banks do not need to borrow in the interbank market. Thus, we can assume that the average bank locates its surplus funds either in the interbank market or in securities, mainly government bonds. Securities provide liquidity insurance because they can be used as collateral in the interbank market, which enables banks to pool liquidity and settle unexpected transaction flows resulting from distributional shocks without holding cash. Hence, a high ratio of total securities to total assets (*Securities*) might indicate financial stability.

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[14] In principle, interbank borrowing from *Bankscope* and *BankFocus* is unsecured, as repo/reverse repos and other secured forms of interbank transactions are reported separately. However, some banks may include secured forms of interbank transactions in their interbank deposits/borrowing without providing breakdowns. In such cases, we are not able to separate such items. But according to *BankFocus*, this situation is not expected to be common. Throughout the paper, we use the terms "interbank borrowing" and "interbank deposits" interchangeably, but it should be underlined that interbank borrowing includes both deposits and loans.

Similarly, banks with a solid capital base (*Equity*) and profitability (*ROA*) should signal stability and thus be positively related to interbank borrowing. Furfine (2001) reports that borrowing banks with higher profitability and capital ratios pay lower interest rates in the interbank market. He also finds that bank size is an important determinant of interbank market participation. One explanation is that larger banks are likely to be more creditworthy because they are subject to too-big-to fail policies. *Bank size* is defined as the natural logarithm of bank total assets.

Panel B of Table 1 presents the differences in the bank characteristics in two groups of countries, which are divided based on their systemic banking crisis experience in the past. We classify a crisis as "long" if its duration is 5 years or more. Next, we employ one-to-one propensity score matching based on a country's financial structure to define the group of banks in countries with "short" crisis duration.

TABLE 1

The comparative statistics show that banks in countries that have experienced longer periods of banking crises tend to have significantly lower levels of interbank borrowing, at the 1% level. Additionally, banks in countries with longer periods of crises have significantly lower liquidity mismatch measured by *LtD* and significantly higher equity ratios, meaning that banks in those countries choose to have more conservative policies. Overall, the summary statistics of the two samples indicate that there are significant differences in banks' structure between countries with different histories of bank crisis.

3.2.3 Other country characteristics

The literature has shown that legal institutions and enforcement might influence the development of the financial system. Levine (1998) finds that countries with German-based legal systems tend to have better-developed banks. Thus, he argues that the legal system materially influences banking development. We control for legal origins using the dummy variable *Common law*, which takes the value of one if the country has a common law legal

origin and zero otherwise. Panel A of Table 1 shows that the sample mean for the variable is 0.35, indicating that more banks are located in civil law countries in our sample.

Levine (1998) argues that enforcement of legal codes is as important as legal regulations themselves. We control for contract enforcement using the variable *Rule of law*. This variable is an estimated index on the extent to which agents have confidence in and abide by the rules of society and, in particular, the quality of contract enforcement, property rights, and the courts. The original index ranges from -2.5 (weak governance) to 2.5 (strong governance). In our sample, the index ranges from -1.89 to 2.12, with a sample mean of 1.27.

To capture the influence of trust on interbank activities, we also control for the impact of the risks of the banking system in the analysis, which is measured by Z-score of the banking system (*Bank Zscore*) in year *t-1*. Z-score is defined as the ratio of a bank's leverage (capital over assets) and the mean of its ROA to the volatility of its ROA deduced from the probability that the bank's losses exceed its capital and is then aggregated at the country level. This measure is often applied in the literature to estimate the individual probability of default of banks (Laeven and Levine, 2009) and measure banking system stability (Lee and Hsieh, 2014).

The structure and development of a country's financial system might determine the function of financial intermediaries and, consequently, the interbank market. We use three variables to capture the characteristics of a country's financial system. First, we use *Private credit*, defined as the ratio of banks' private credit by deposit money to the country's GDP, to measure the development of the banking system. Private credit excludes credit to the public sector and cross claims of one group of intermediaries on another. Consequently, private credit is a good measure of the amount of savings channelled through intermediaries to private borrowers. Second, we control for the size of central bank assets (*Central Bank*), following Demirgüç-Kunt and Huizinga (2000), which illustrates that in developing countries, the central bank plays a relatively large role in credit provision. Third, we control for stock market

development using the variable *Market cap*, defined as the ratio of stock market capitalization to the country's GDP.[15] Lastly, we consider the power of banks in a country by means of the combined market share using the assets of the three largest banks (*Concentration*). Existing evidence shows that concentrated banking systems are more stable and less likely to have crises (Beck et al., 2001; Schaeck et al., 2009). Hence, we expect that banking sector concentration is positively related to the size of the country's interbank market.

4. Methodology and identification

4.1 Empirical strategy

Interbank markets are informal markets that enable banks to manage, pool, and redistribute their funds and thereby provide lending and deposit facilities more efficiently. The amount borrowed and interest rate charged on interbank transactions reflects, partly, the credit risk of the borrowing institution (Broecker, 1990). This, however, does not explain the significant difference in the use of the interbank market across countries. We consider that an important factor in explaining the existing differences in the interbank market is the level of trust of banks in a country's market and in its peers. To test this hypothesis, we estimate the following baseline model, controlling for bank- and country-specific characteristics:

$$Interbank\ borrowing_{i,j,t} = \beta_0 + \beta_1 Bank_{i,j,t} + \beta_2 Country_{\ j,t} + \beta_3 Trust_{j,t} + \beta_4 Y_t + \varepsilon_{i,j,t} \quad (1)$$

where the indexes *I*, *j*, and *t* represent bank, country, and time, respectively. The vector of bank-specific variables, $Bank_{i,j,t}$, characterize bank performance and risk. In particular, we include proxies for funding structure, securities, equity performance, and bank size. The vector of

[15] We also consider the impact of the access to bond market, defined as the bond market capitalization to the country's GDP in the analysis. However, because of smaller coverage of countries for bond market data, we report the results in the Internet Appendix Table A4 for robustness.

country-specific variables, $Country_{j,t}$, characterize countries' legal system, and financial system structure as well as the risks of the banking system (Z-score of the banking system). The relationship between interbank borrowing and our proxies for trust, $Trust_{j,t,}$ is allowed to vary across countries and time. Furthermore, we include year fixed effects, $Y_{t,}$. We do not control for country fixed effects in the baseline regressions, as the variance of our key measures for trust, is relatively low within the country. Instead, we control for region fixed effects in some models to tackle the heterogeneity at the regional level.[16] Robust standard errors are clustered at the country-year level.

4.2 Network analysis methodology

Network analysis methodology, built on graph theory, has been increasingly exploited in the finance literature. Two central features of network structure are centrality and community. Centrality has been widely used (e.g., Hochberg et al., 2007; Larcker et al., 2013; Engelberg et al., 2013) and reflects both local and global importance, i.e., how each entity (node in the network) is connected to others and how "important" the position of each entity is in the entire network. In graph theory, a network is generally described by a square "adjacency" matrix, the elements of which reflect the strength of the connections among each entity (node) in the network. In our setting, the interbank network is a directed and weighted network. Therefore, the matrix representing the interbank network is asymmetric, indicating the flow of borrowing and lending. The nodes in the network are banks borrowing through the interbank market, and the edges are weighted by the borrowing volume. Figure 4 (the left panel) visualizes the interbank borrowing and lending network for the banks from different countries in the EA.

[16] The regional dummy variables we have in the model include regions for East Asia & Pacific, European & Central Asia, Latin America & Caribbean, Middle East & North Africa, North America, South Asia, and Sub-Saharan Africa.

In this study, we mainly use *Degree* centrality, *Eigenvector* centrality and *PageRank* to measure the importance of a bank's position in the interbank network. *Degree* centrality (both in-degree and out-degree) captures direct connections and therefore local importance, whereas *Eigenvector* centrality and *PageRank* extend beyond direct connections and show the global influence throughout the entire network. *Eigenvector* centrality is defined recursively as the importance (centrality) of a node relying on the importance (centrality) of its direct neighbors. *PageRank* is a variant of *Eigenvector*, resulting from an algorithm based on webgraph, and can reflect not only the number of direct links but also the link propensity and the centrality of neighbors (Jackson, 2008; Brunetti, et al., 2019).

Community membership is related to centrality, but a fundamentally different concept (see, e.g., Bubna et al., 2020). A community is essentially a group of nodes that have strong connections to each other. To perform community detection, we use *Modularity*, which reflects whether the linkage between two banks through interbank borrowing is strong or not. Through optimizing *Modularity*, we classify banks into different communities (clusters). We use communities and clusters interchangeably throughout the paper. As an illustration, Figure 4 (the right panel) plots the interbank network grouped by communities using different colors.

FIGURE 4

5. Trust and interbank participation: international evidence

5.1 Baseline results

The results in Table 2 suggest that trust in the banking system is important in explaining the level of interbank borrowing after considering the impact of bank and other country characteristics including the risks in the banking system. In columns (1) and (4), we use *Crisis length* as a proxy for trust in the banking system, in columns (2) and (5), we use *Bank failure*, and in column (3) and (6) we use *Crisis number 1900* instead. In the regressions in column (1) to (3), which we controlled only the year fixed effects, the coefficients for the trust variables

Crisis length, *Bank failure* and *Crisis number 1900* are negative and statistically significant at the 5% level, suggesting that higher trust in the interbank market is associated with higher usage of the interbank market. The results are also economically significant. In column (1), the coefficient for *Crisis length* suggests that one more year of crisis experience in history can reduce the interbank borrowing size by 4.6% (0.00353/0.0775). In column (2), the coefficient for *Bank failure* shows that more bank failures in the past can reduce the interbank market size. In terms of economic magnitude, a 1% increase in *Bank failure*, defined as the standardized value of total assets of failed banks, is associated with a 2.4% (0.00183/0.0775) decrease in the size of interbank borrowing. In column (3), the coefficient for *Crisis number 1900* suggests similar statistical and economic influence. One more crisis in the past since 1900 is associated with a 4.4% decrease in interbank borrowing (0.00342/0.0775). In columns (4) to (6), we further incorporate region fixed effects to control for regional heterogeneities. The coefficient for *Crisis length* becomes larger and more statistically significant, while the coefficients for *Bank failure* and *Crisis number 1900* become insignificant. We run pair-wise correlation and find *Bank failure* and *Crisis number 1990* are highly correlated with the regional dummies, with the correlation of 88.71% and 73.37%. In opposition, *Crisis length* is 49.36% correlated to regional dummies, suggesting that crisis experience in recent decades is less likely to be captured by time-invariant regional features.

The bank-specific variables are in line with our predictions. The coefficients for all bank-specific variables except ROA are statistically significant at the 1% level. The coefficients for *Size* are positive in all regressions. This is consistent with the findings of Cocco et al. (2009), who argue that large banks are more likely to be net borrowers whereas smaller banks tend to be net lenders in the interbank market. As expected, banks with funding needs, or higher loans-to-deposit ratios, are more likely to borrow in the interbank market. Surprisingly, however, the coefficients for equity ratio are negative in all regressions. This means that banks that obtain funding in the interbank market are more likely to have lower capitalization, which does not

imply higher risk, taking into account that the coefficients for *Securities* are positively related to interbank borrowing.

The country-specific variables indicate that both institutional factors and financial structure are important determinants of interbank market size, after controlling for the risks in the banking system, measured by the Z-score of the banking system (*Bank Zscore)* and the monetary policy, measured by the size of central bank balance sheet (*Central bank*). The coefficients for *Common law* are significant and positively related to interbank market borrowing. One explanation for this is that common law countries provide better institutional protection for interbank market participants.

Another explanation for this result could be that common law countries tend to have better developed financial systems (La Porta et al., 1998). The results, however, indicate that interbank market usage is lower in countries with strong market-based financial systems. The coefficients for *Mkt. cap.* are negative and significant in all specifications. Central bank assets are also negatively related to interbank borrowing and the coefficients are statistically significant. Moreover, Beck et al. (2013) find that an increase in competition has a larger impact on banks' risk-taking incentives in countries with better developed stock exchanges. Considering that the coefficients for concentration are positively and significantly related to the interbank market at the 1% level and the coefficients for Z-score of the banking systems are negatively and significantly related to the interbank market in all specifications, the analysis again confirms the importance of banking sector stability in explaining the levels of interbank market volume. Overall, our baseline results suggest that after controlling for the risks of banking system as well as other country/bank characteristics, trust in the banking system is important in interpreting the size of interbank borrowing.

TABLE 2

5.2 Robustness

5.2.1 Excluding the US and financial centers

We perform several additional tests to gauge the robustness of our results, which we report in Internet Appendix Table A4. First, we exclude US banks from our sample, as they account for 40.5% (4,620 out of 11,412 banks) of observations. Hence, the results of the study may be biased by the overrepresentation of the US banks in the sample. After excluding US banks, we have a total of 6,792 banks over 95 countries. The results in column (1) of Table A4 are highly consistent with the baseline results in Table 2. Our results, however, may also be influenced by major banks located in global financial centres. There has been some evidence showing that the interbank market is dominated by the offices of major banks located in the principal financial centres around the world (e.g., BIS, 1983). For international interbank markets, the main criteria for participation are that a borrowing bank establishes itself as creditworthy in the eyes of other banks and is not constrained by regulatory obstacles, such as exchange controls or supervisory limits. We therefore decide to exclude banks from the US, the UK, Singapore, and Hong Kong from the sample. We find that excluding the banks from those countries/regions does not change our main results, shown in column (2).

It's also possible that the bond market may provide an alternative source of funding and therefore influence the interbank market participation. In columns (3) to (5) we further control for the bond market capitalization scaled by GDP using the full sample, the sample excluding the US and the sample excluding the US and other financial centers, and we find that the results remain largely unchanged.

5.2.2 Matching and instrumental variable analysis

The analysis in the sections above shows that the usage of the interbank market might be influenced by the structure of the financial system. Claessens et al. (2001) document that recessions and financial disruptions are often costlier in emerging markets than in developed

countries, and it takes more time for emerging economies to recover. They attribute this difference to the fact that emerging countries have less developed financial systems. Meanwhile, Demirgüç-Kunt and Levine (1999) observe that countries' financial systems tend to become more market-oriented as they become richer. Therefore, we can assume that in countries with bank-based financial systems, which are often emerging economies, a banking crisis has, on average, a stronger negative effect on the usage of the interbank market. Consequently, the structure of the financial system, especially the role of banks in intermediation, can determine our results.

We use the difference-in-difference estimation technique to isolate this possibility and further explore the causality of bank failures and banking crises on the development pattern of the interbank market, controlling for the structure of the financial system. As traumatic experience has a strong impact on trust (Alesina and La Ferrara, 2002), we define a treatment group and a control group of banks based on the total duration of all banking crises in the past (*Crisis length*). In the regression, the variable *Treated* equals one if the bank is located in a country with the value of *Crisis length* longer than (or equal to) 5 years in total and zero otherwise. Next, we employ the propensity score-matching algorithm without replacement based on the structure and development of the financial system, *Private credit* and *Mkt. cap.*, to define the control group of banks. Table 3 presents the regression results on the effect of trust on interbank market size using the matched sample, with column (1) controlling for only year fixed effects and column (2) controlling for both year and region fixed effects. In both specifications, the coefficients for *Treated* are negative and significant at the 5% level. The results are economically important as they show in column (1) that banks, *ceteris paribus*, can reduce interbank borrowing by up to 25.8% (0.0200/0.0775) if they are located in a treated country rather than in a control country.

TABLE 3

To further tackle the endogeneity concern that interbank borrowing might be influenced by other unobservable factors correlated to trust, we further employ IV analysis. The instrument we employ is the usage of a deposit insurance scheme at the country level. The data are collected from Demirgüç-Kunt et al. (2014). The existence of a deposit insurance scheme in country *i* of year *t-1* is matched with the interbank borrowing of banks located in country *i* in year *t*. It satisfies the relevance condition that countries with a larger number of banking crises and failures are more likely to introduce a safety net, i.e., deposit insurance, so that trust can possibly be restored. Demirgüç-Kunt et al. (2014) document that fourteen countries introduced explicit deposit insurance after 2008, and almost all countries with explicit deposit insurance that experienced a banking crisis increased the statutory coverage limit in their deposit insurance scheme. The exclusion condition is also very likely to be satisfied, as interbank borrowing (deposits) is based on credit and is not covered by deposit insurance. Hence, the instruments affect interbank borrowing only through trust and not through other unobserved factors. Table 4 reports the two-stage least-squares regression results. The first-stage results, in column (1) show that the instrument is significantly and positively associated with the trust measure, *Crisis length*. The second-stage results, in column (2), confirm our main results that lack of trust reduces interbank borrowing, at least at the 1% significance level. In summary, the additional tests above further confirm the robustness of our results on the importance of trust for interbank market activity.

TABLE 4

5.2.3 Isolating the impact of monetary policy: EA banks

In addition to their need for working balances, banks' demand for interbank funds is influenced by the required reserves that they have to hold at the central bank or other central bank monetary policies. Gray (2011) shows that the reserve requirements and the basis of their calculations vary strongly across countries, which in turn could influence our results. We

therefore rerun the regressions using only banks from the EA, which are subject to the same central bank policy. We use both the 11 original Eurozone countries and the 19 countries that are currently Eurozone members. Columns (1) and (2) in Table 5 show the results for those two subsamples, respectively. We find that the coefficients for the trust proxy are negatively correlated and statistically significant in both columns, meaning that our results are not influenced by central bank policies.

TABLE 5

Cocco et al. (2009) document that bank size is an important determinant of interbank market interest rates and lending relationships. On average, large (small) banks tend to be net borrowers (lenders) in the market. Iori et al. (2008) show that not all banks actively manage their minimum reserves, and smaller banks tend to keep their reserve account at the required level constantly throughout the maintenance period. The existing results thus indicate that banks' size may be an important determinant of interbank lending and borrowing. Therefore, we introduce a dummy variable, *Large*, defined as one for the upper quartile and zero for the lower quartile based on total bank assets, and interact it with the trust measure *Crisis length*. Column (3) in Table 5 shows that large banks tend to borrow more from the interbank market and that the effect of trust is more pronounced for larger banks, with the coefficient of the interaction being significantly negative.

6. Trust and the role of interbank network structure: EA interbank market

The existing literature has identified core-periphery structures in interbank networks in multiple countries (e.g., Cocco et al., 2009). Consequently, one concern would be that lack of trust in core banks, which act as interbank intermediaries, might have very different implications for how much the overall borrowing network declines (Craig and Ma, 2021). Examining the network structure of interbank market is crucial in understanding how trust

affects interbank activities. In this section, we use the EA interbank market to explore how the network structure may affect the role of trust in determining interbank borrowing.

6.1 Describing the Euro Area interbank network

Figure 4 plots the EA interbank borrowing and lending network in 2018Q4. The left panel groups the banks by country, with the node color reflecting banks' home country. Node size represents eigenvector centrality, thus suggesting how globally important a bank is in the entire EA interbank network. Edge color represents the country receiving the exposures. The algorithm of the layout is *Multigravity Force Atlas 2*, which pulls banks with higher eigenvector centrality values closer to the center of the graph. In the left panel of Figure 4, red nodes refer to German banks and black nodes refer to French banks. In the right panel of Figure 4, we use different colors for communities detected by *Modularity*, with all nodes positioned at the same places in the network as in the left panel. We detect 13 communities (Communities 0 to 12) in the EA interbank network. Table 6 reports the joint distribution of country and community group. Germany has the largest number of banks (249 banks in total) in the network, with 88% of them (218 banks) located in Community 3. Community 3 is also dominated by German banks (82%). A total of 83% (85 out of 103 banks in total) of the Italian banks are located in Community 6. French banks are distributed across different communities, indicating that French banks have higher volumes of cross-border borrowing and lending.

TABLE 6

Table 7 presents the mean value of network centralities and cluster coefficients for each country from the fourth quarter of 2014 to the fourth quarter of 2018, sorted by *Eigenvector* centrality. The statistics of the network measures show that in the EA interbank network, French banks on average have the highest local and global importance, suggesting that the French interbank market is more dominated by intermediary banks. German banks have much lower *Eigenvector* centrality, but still quite high values of *Degree* centrality compared to

Belgium and Ireland, which both rank ahead of Germany in terms of *Eigenvector*. This suggests that German banks have strong direct connections but that connected neighbors are not globally important players in the interbank network. This is also consistent with the fact that German banks are mostly located in one community (Community 3), as shown in Table 6, further suggesting that German banks borrow and lend significantly domestically. The cluster coefficients of bank nodes capture how complete the neighborhood of a bank node is.[17] The mean value of cluster coefficients suggests that German and Slovenian banks are the best connected within the communities, indicating a "small-world" effect whereby banks borrow and lend more within communities.

TABLE 7

6.2 Trust and the role of interbank network structure

We then explore how the role of trust in determining interbank participation relies on the network structure. First, instead of using interbank borrowing (deposits) from banks' balance sheets, we use interbank network centralities (*Log inwdeg*, *Log page rank* and *Log eigen*) to measure interbank market participation as the dependent variable in the regression specifications. For the measures of trust, we use *Crisis length* as the main variable. Table 8 reports the regression results for banks in the EA. In columns (1) to (3), we use the centrality measures calculated from the network of total exposures, which includes not only the borrowing and lending between EA banks but also non-EA banks' borrowing from EA banks. In columns (4) to (6), we use centrality measures calculated from the network of EA exposures, which covers only the borrowing and lending between EA banks. *Cluster* is defined as one if

[17] For example, if every bank node in the neighborhood of bank A is connected to every other node in the neighborhood of bank A, then the neighborhood of bank A is complete and has a clustering coefficient of 1; if no bank nodes in the neighborhood of bank A are connected, then the clustering coefficient is 0.

the cluster coefficient of a bank node is above the median and zero otherwise, capturing how banks are exposed to the interbank community. The results show that *Crisis length* enters with a negative sign in all the specifications but more significantly when using *Log page rank* and *Log eigen* as the dependent variable, suggesting that lack of trust tends to reduce interbank activities, but more significantly for the global interbank activities throughout the network. This also indicates a possible spill-over effect of lacking trust. Taking column (6) as an example, one more year experience of crisis in the past can reduce the interbank activities by 12.2% (=0.00447/0.0367). The significant and negative coefficients of *Cluster* in all the specifications show that being more exposed to a community is negatively associated with interbank participation, suggesting that higher exposure in a community can lead to more reliance in lending relationship in the community, but not throughout the network globally. In addition, the positive coefficients of *Size* suggest that larger banks tend to have higher centrality in the interbank network.

TABLE 8

Lack of trust in intermediary banks can spill over to affect their borrowers' access to interbank funding, meaning that trust can have different implications for core versus periphery banks. Therefore, we then investigate how the effect of trust relies on the core-periphery structure of the interbank network. We use *Eigenvector* centrality to identify core or periphery positions in the network. *Central* is defined as one if the eigenvector centrality is in the upper quartile and as zero if it is in the lower quartile; therefore, it measures whether a bank serves as an intermediary bank (located at a more central position throughout the entire network). The dependent variable is *Log inwdeg*, which measures interbank borrowing at the bank level. Similarly, we consider both the network of total exposures and the network of exposures only between EA banks. To capture how the network positions can affect the influence of trust, we interact the trust measure with *Central*. In all the specifications, we control for quarter fixed effects to capture time heterogeneity. The results, reported in Table 9, show that the impact of

trust is more significant and pronounced for banks in the core positions, with all the interaction terms (*Crisis length*×*Central*) entering with significant and negative coefficients. Taking column (2), one more year experience of banking crisis tends to reduce *Log inwdeg* by 5.8% (=0.0869/1.502). The effect of trust for periphery banks is not significant. Again, banks more exposed to the community are more likely to have lower interbank borrowing, while those located at more core positions are more likely to have higher interbank borrowing.

TABLE 9

Next, we examine how the other network feature, clustering, affects the role of trust. We introduce the interactions of the trust measure, *Crisis length*, with *Cluster*. Similarly, we consider both the network of total exposures and the network of exposures only between EA banks. Table 10 reports the results. The trust measure, *Crisis length*, enters with strong negative coefficients in most of the specifications, confirming our main results that lack of trust reduces interbank participation. More importantly, the interaction terms (*Crisis length*×*Cluster*) have positive coefficients, suggesting that higher exposure in a community tends to mitigate the negative effect of trust. This effect is more significant when using *Log page rank* and *Log eigen* as the dependent variable. Taking column (6) as an example, one more year of crisis in the past can reduce the interbank activities (measured by *Log eigen*) by 16.1% (=0.00591/0.0367) but being more exposed in a community can mitigate the effect by 9.8% (=0.00361/0.0367). This indicates that when trust is low in the interbank market, being more exposed in a community might provide an additional source of funding due to the lending relationships within a community.

TABLE 10

For robustness, we exclude exposures of securities contracts and long-term (longer than 30 days) exposures as well as collaterized exposures from the network and focus on non-securities exposures, short-term exposures and uncollateralized exposures, respectively. Table 11 reports

the results. We incorporate both interactions—trust with *Central* and trust with *Cluster*—into the regressions. The interaction of trust and *Central* (*Crisis length*×*Central*) enters with strong negative coefficients in all the specifications in column (1), (3) and (5), suggesting that the impact of trust is more significant and pronounced for intermediary and core banks. The interaction of trust and *Cluster* (*Crisis length*×*Cluster*) enters with strong positive coefficients significantly in column (2), but less significantly in column (4) and (6), indicating that for short-term and uncollateralized exposures, the effect of community activity is lower and less significant. These findings confirm our finding that lack of trust may have a stronger effect in core (intermediary) banks, while higher exposure in a community can provide additional interbank funding when trust is low, especially for non-securities exposures.

TABLE 11

6.3 Identification: the insolvency of Veneto Banca in Italy

Lastly, we utilize a shock to the trust in the financial system, the insolvency of an Italian bank, i.e. *Veneto Banca*, and examine how the shock affects interbank market participation of Italian banks as well as the banks connected *to Veneto Banca* versus other banks. On June 23, 2017, the European Central Bank announced *Veneto Banca* was "failing or likely to fail". The same situation was also experienced by another Italian Bank, *Banca Popolare di Vicenza*, which our dataset does not include. The total assets of *Veneto Banca* and *Banca Popolare di Vicenza* amounted respectively to roughly 28 and 32 billion euro in 2016.

Both banks' troubles started in early 2016, following the introduction into the Italian law of the Decree-Law N°3/2015 (December 2015), which implied that banks with total assets higher than 8 billion euro had to change their status from a cooperative limited partnership to company limited by shares. Both banks also required a recapitalization due to a CET1 ratio below ECB capital requirements. The stock market listing failed to attract the necessary capital increase, and thus *the Atlante Fund*, the newly created bail-out fund by the banking sector with

participation on a voluntary basis, stepped in to recapitalize both Italian banks and became the major shareholder. Nevertheless, the capital position of both banks kept on deteriorating due to the write-down on non-performing loans (NPLs) throughout 2016, thereby requiring additional capital increases. Following this set of distress events, *Intesa Sanpaolo*, the largest bank in Italy by capitalization, acquired the good assets and corresponding liabilities of *Veneto Banca* and of *Banca Popolare di Vicenza* for a symbolic price of 1€ (0.5€ for each bank). The transaction was backed up by 5 billion euro of government guarantees.

We believe that this set of distress events within the Italian banking sector, affecting directly *Veneto Banca*, is a quasi-perfect natural experiment capturing potential variations in the Italian banking system's mutual trust via bilateral relationships, that is, the network of loans and securities' exposures.

Table 12 reports the results of regression analyses. *Shock VB* is defined as one for 8 quarters after June 2017, and zero for 8 quarters before June 2017. *Treated VB* is defined as one for Italian banks, as well as the banks directly connected to *Veneto Banca* in the interbank networks, i.e. either borrowing from or lending to *Veneto Banca* within 2 years prior to June 2017. The insolvency case of *Veneto Banca* was a negative shock to the Italian banking system, hence banks from other countries are very likely to react to the shock against other Italian banks even though some of them might not be directly connected to *Veneto Banca* via interbank networks. Column (1) and (2) report the regression results using the full sample. The coefficients of the interaction term, *Shock VB * Treated VB*, are negative and statistically significant, suggesting that after a negative shock to Italian banking system, the interbank market participation of treated banks decreases significantly. The treatment dummy, *Treated VB*, enters with strong positive coefficients, suggesting that treated banks on average have higher interbank market participation, and hence are more important in the interbank networks. This is consistent with the expectation as core banks in the networks are more likely to be directly connected to *Veneto Banca*. To further address the potential influence of this issue, we then define a control group

of banks using one-to-one propensity score matching without replacement based on eigenvector centrality, which can reduce the difference in eigenvector centrality between the treated and control group of banks. Column (3) and (4) report the regression results using the matched sample. Our results still stay consistent after the insolvency case of *Veneto Banca*, which is a negative shock to Italian banking system. In particular, the interbank market participation of treated banks falls significantly. These results suggest that trust considerably affects interbank market participation.[18]

[TABLE 12]

7. Conclusion

The interbank market is an informal market that enables banks to manage and redistribute their funds and thus provide financial intermediation more efficiently. The bilateral nature of the interbank market does not differ across countries. In this study, we document, however, that banks' engagement in the interbank market differs strongly across countries, which has been rarely discussed in the existing literature. We investigate the role of trust in the banking sector in explaining such differences in interbank activities across countries. Specifically, we show

[18] We also investigate the communities of Italian banks in the EA interbank market before and after the insolvency of *Veneto Banca*. From 2015 to mid-2017, most Italian banks are detected either in a smaller "Italian community" where Italian banks dominate, or in a larger community with more banks where still over 40% of Italian banks are present. Figure A3 in the Internet Appendix reports the percentage of Italian banks in the smaller "Italian community" as well as that in the larger community. We find after the shock of *Veneto Banca*, Italian banks are switching from the smaller "Italian community" to the larger community. In the quarters from 2015 to mid-2017, about 40% to 55% Italian banks are detected in the larger community, while starting from 2018, over 70% Italian banks are located in the larger community. This evidence indicates that after the shock to the trust in the Italian banking system, Italian banks are building up more connections with banks from other countries to diversify risks. This is consistent with our finding that community can provide another layer of protection when trust is lower.

that a bank located in a country with a lower level of trust, proxied by longer banking crises or more bank failures in the past, makes less use of the interbank market to finance its activity.

More importantly, the impact of trust relies also on the network structure of the interbank market. Through mapping and investigating the EA interbank market using network methodology, we find that the influence of the network structure is twofold. First, the impact of trust is more significant and pronounced for banks in the core positions than those in the periphery positions in the network, suggesting a spill-over effect for intermediary banks in transmitting risks. Second, being more exposed in a community can mitigate the negative effect of lacking trust in obtaining interbank funding. Thus, exploring the network structure is crucial for understanding the role of trust in determining interbank participation.

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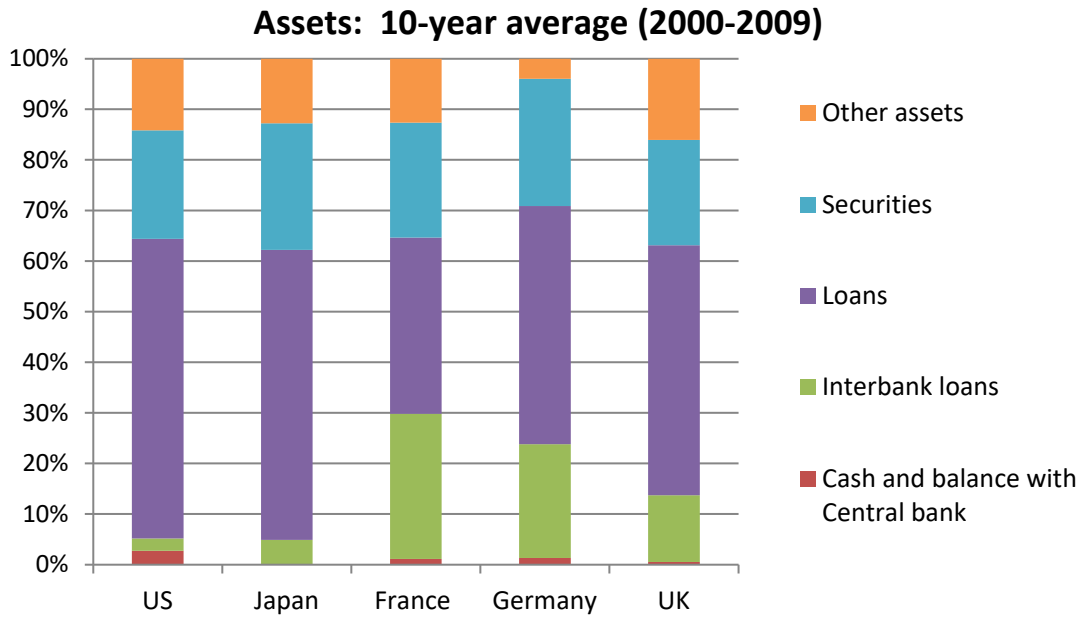

Figure 1A. Breakdown of 10-year-average bank assets: 2000-2009

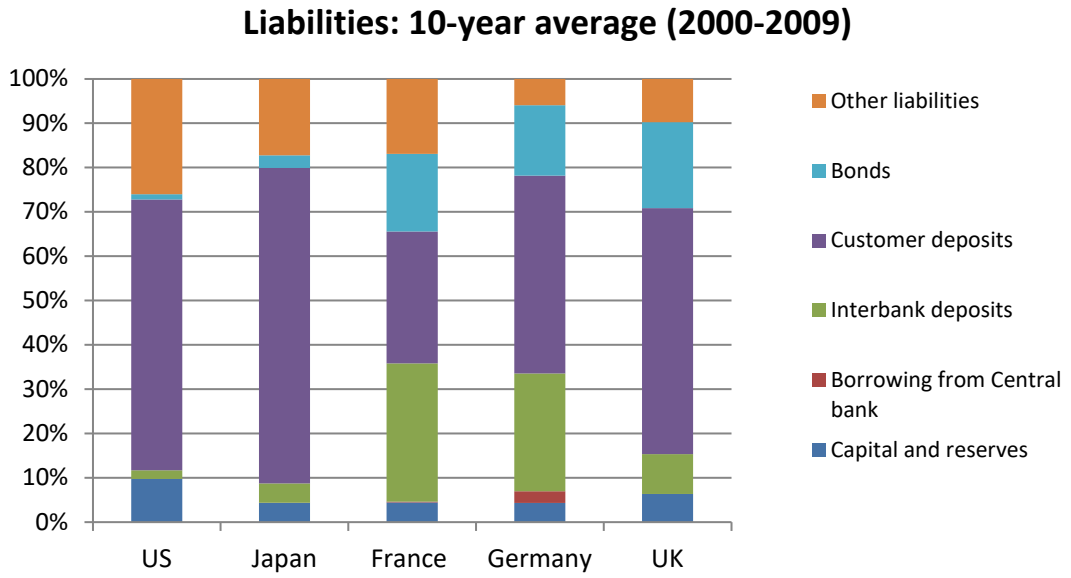

Figure 1B. Breakdown of 10-year-average bank liabilities: 2000-2009
Source: OECD Statistics; Japanese Banker Association

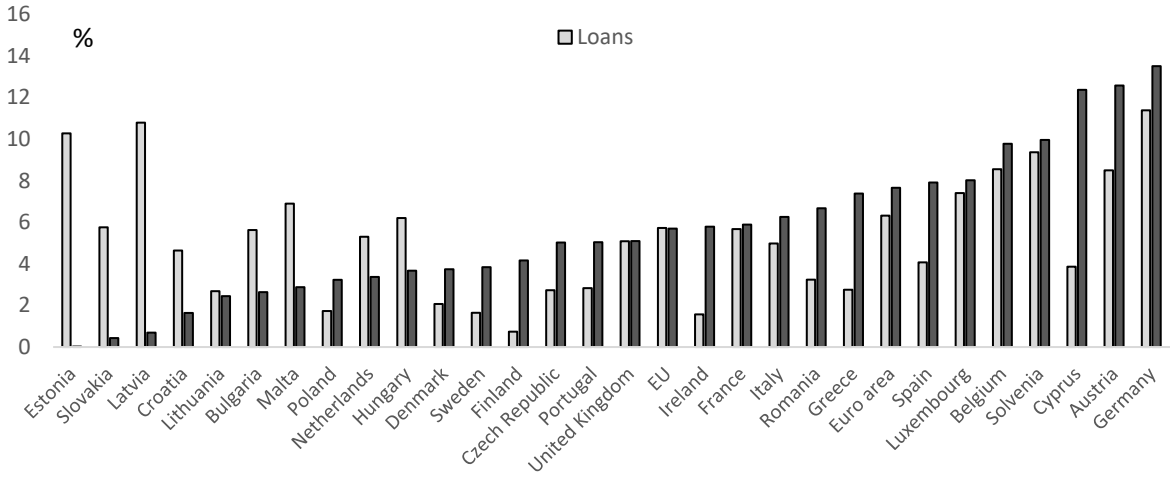

Figure 2. Interbank loans and deposits of domestic banks in the European Union countries in 2016

The figure shows the interbank loans and deposits as % of total assets of all domestic banking groups and stand-alone banks in 2016. The data for United Kingdom is for the year 2015. Source: ECB

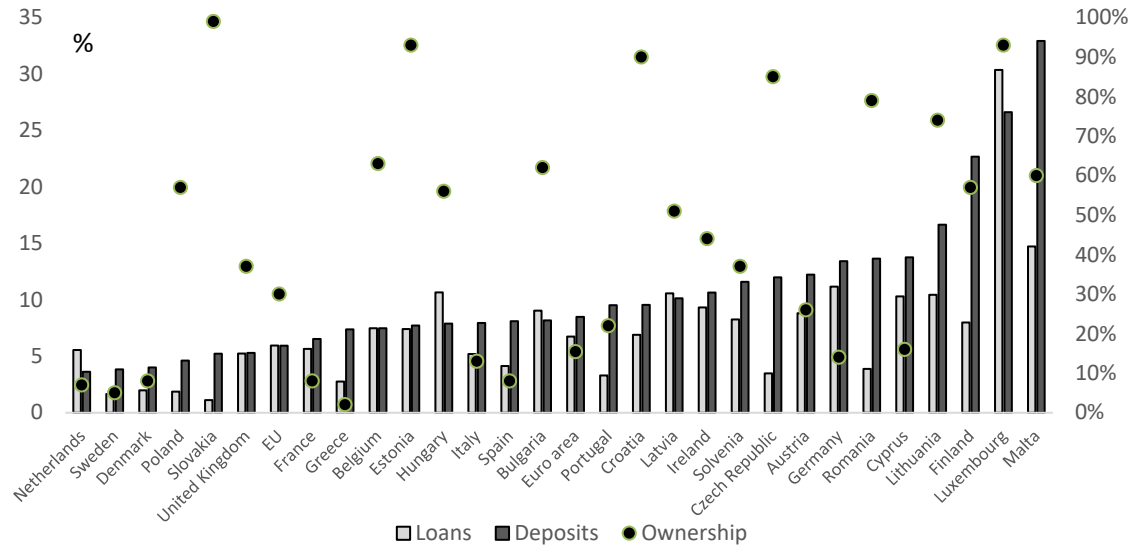

Figure 3. Interbank loans and deposits of domestic and foreign banks in the European Union countries in 2016.

The figure shows the interbank loans and deposits as % of total assets of domestic banking groups and stand-alone banks, foreign (EU and non-EU) controlled subsidiaries and foreign (EU and non-EU) controlled branches, in 2016 left-hand scale). The points present the share of foreign bank ownership as % of total assets (right-hand scale). The data for United Kingdom is for the year 2015. Source: ECB

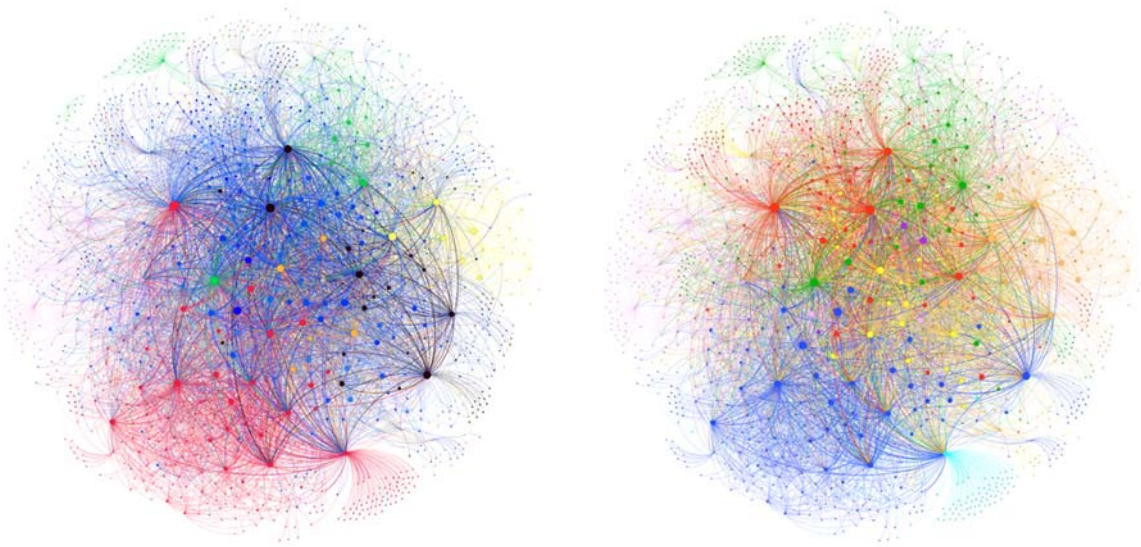

Figure 4. Euro Area interbank network

The left panel shows the Euro Area interbank network grouped and colored by country using the interbank borrowing and lending of EA banks in 2018Q4. Node size represents eigenvector centrality. Edge colour represents the country receiving the exposures. Node colour refers to different countries as below. Red: Germany; Blue: Non-EA Banks; Black: France; Green: Italy; Yellow: Spain; Orange: Netherlands; Pink: Austria. The algorithm of the layout in both graphs is *Multigravity Force Atlas 2*.

The right panel shows the Euro Area interbank network colored by community using the interbank borrowing and lending of EA banks in 2018Q4. Node size represents eigenvector centrality. Edge colour represents the country receiving the exposures. Node colour refers to communities detected using *Modularity*. There are 13 communities in the chart.

Table 1. Summary statistics

This table presents the summary statistics of the cross-country bank sample, as well as the difference in characteristics for banks located in countries with long or short periods of bank crises over the sample period.

Panel A Summary statistics: Bank-level full sample

	Obs	*Mean*	*Std. Dev.*	*Min*	*Max*
Interbank borrowing	74,572	0.0775	0.1107	0.0000	1.0000
LtD	74,572	0.9271	0.5621	0.0657	5.4421
Securities	74,572	0.2135	0.1494	0.0000	0.9903
Equity	74,572	0.0947	0.0534	0.0147	0.3309
ROA	74,572	0.0054	0.0103	-0.0606	0.0727
Bank Size	74,572	5.6665	1.4427	2.0175	11.2559
Crisis length	74,572	2.8842	2.4051	0.0000	10.0000
Bank failure	74,572	5.6841	7.4056	-0.1304	16.3184
Crisis number 1900	74,572	9.9604	3.6241	0.0000	14.0000
Common law	73,860	0.3517	0.4775	0.0000	1.0000
Rule of law	72,245	1.2728	0.7560	-1.8900	2.1200
Private credit	73,535	0.7884	0.3481	0.0115	2.6246
Market Cap.	72,803	0.7471	0.4832	0.0001	8.5733
Central Bank	73,556	0.0643	0.0737	0.0000	1.1358
Bank Z-score	74,195	2.9905	2.7138	-0.3123	11.4330
Concentration	69,682	0.5515	0.2084	0.2228	1.0000

Panel B Comparison of bank characteristics: longer vs shorter periods of banking crisis country

	Long	*Obs.*	*Short*	*Obs.*	*Diff*
Interbank borrowing	0.020	33,966	0.123	33,966	0.103***
	(0.000)		(0.001)		(0.001)
LtD	0.862	33,966	0.993	33,966	0.131***
	(0.003)		(0.003)		(0.004)
Securities	0.216	33,966	0.214	33,966	-0.002
	(0.000)		(0.001)		(0.001)
Equity	0.114	33,966	0.083	33,966	-0.031***
	(0.000)		(0.000)		(0.000)
ROA	0.006	33,966	0.004	33,966	-0.002*
	(0.000)		(0.000)		(0.000)

Table 2. Trust and interbank borrowing: baseline results

This table reports the baseline results of the regressions examining the determinants of interbank borrowing using the full bank-level sample of 11,412 banks in 96 countries. The dependent variable is the size of interbank borrowing scaled by bank total assets. The key explanatory variable is trust, proxied by *Crisis length* (the number of years of crisis since 1970), *Bank Failure* (standardized value of total assets of failed banks), as well as *Crisis number 1900* (the number of banking crises since 1900). We control for both bank and country characteristics in the regressions. In column (1)-(3) year fixed effects are controlled, and in column (4)-(6) both year and region fixed effects are controlled. All the other variables are defined in Internet Appendix Table A1. Robust standard errors are clustered at the country-year level, and are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep Var.	*Interbank borrowing*					
	(1)	(2)	(3)	(4)	(5)	(6)
Trust measure						
Crisis length	-0.00353**			-0.00755***		
	(0.00156)			(0.00152)		
Bank Failure		-0.00183**			-0.00000204	
		(0.000836)			(0.00295)	
Crisis number 1900			-0.00342**			-0.00253
			(0.00141)			(0.00182)
Bank characteristics						
LtD	0.0681***	0.0696***	0.0684***	0.0709***	0.0717***	0.0715***
	(0.00788)	(0.00796)	(0.00811)	(0.00816)	(0.00826)	(0.00857)
Securities	0.0862***	0.0895***	0.0942***	0.0886***	0.0932***	0.0966***
	(0.00997)	(0.0103)	(0.00976)	(0.0105)	(0.0106)	(0.0100)
Equity	-0.194***	-0.208***	-0.220***	-0.173***	-0.205***	-0.213***
	(0.0323)	(0.0329)	(0.0335)	(0.0284)	(0.0311)	(0.0321)
ROA	0.0479	0.0269	0.0453	-0.0487	-0.0369	-0.0143
	(0.0939)	(0.0919)	(0.0948)	(0.0924)	(0.0912)	(0.0923)
Size	0.0101***	0.00952***	0.0104***	0.0104***	0.0101***	0.0103***
	(0.00121)	(0.00120)	(0.00128)	(0.00127)	(0.00125)	(0.00130)

Table 2 continued						
Country characteristics						
Common law	0.0344***	0.0531***	0.0456***	0.0543***	0.0557***	0.0596***
	(0.00919)	(0.00863)	(0.00976)	(0.0161)	(0.0168)	(0.0183)
Rule of law	0.0218***	0.0265***	0.0325***	0.0331***	0.0321***	0.0382***
	(0.00398)	(0.00499)	(0.00553)	(0.00608)	(0.00600)	(0.00690)
Private credit	0.0106	0.00942	0.0130	0.0135	0.0178	0.0151
	(0.0118)	(0.0120)	(0.0117)	(0.0122)	(0.0123)	(0.0131)
Mkt. cap.	-0.0479***	-0.0472***	-0.0455***	-0.0458***	-0.0479***	-0.0462***
	(0.00667)	(0.00713)	(0.00708)	(0.00633)	(0.00688)	(0.00703)
Central bank	-0.287***	-0.300***	-0.367***	-0.309***	-0.306***	-0.382***
	(0.0624)	(0.0605)	(0.0716)	(0.0765)	(0.0787)	(0.0948)
Bank Zscore	-0.00120***	-0.000989**	-0.00116***	-0.00124***	-0.00101**	-0.00107**
	(0.000430)	(0.000433)	(0.000442)	(0.000437)	(0.000425)	(0.000436)
Concentration	0.119***	0.107***	0.0936***	0.0933***	0.0943***	0.0841***
	(0.0259)	(0.0272)	(0.0287)	(0.0267)	(0.0269)	(0.0287)
Cons.	-0.0722***	-0.0698***	-0.0467*	-0.0816***	-0.0915***	-0.0601**
	(0.0205)	(0.0213)	(0.0249)	(0.0228)	(0.0231)	(0.0288)
Year FE	YES	YES	YES	YES	YES	YES
Region FE	NO	NO	NO	YES	YES	YES
# of obs.	66,854	66,854	66,042	66,854	66,854	66,042
Adj. R^2	0.440	0.439	0.448	0.454	0.447	0.453

Table 3. Trust and interbank borrowing: matched sample

This table reports the results of the regressions examining the role of trust in affecting interbank borrowing, using the bank-level sample of 6,792 banks over 95 countries (excl. US banks). The dependent variable is interbank borrowing scaled by bank total assets. *Treated* equals one if a bank is located country has no less than five banking crises in the years 1970-2015, and zero otherwise. The control sample is defined by one-to-one propensity-score-matching algorithm based on a country's financial structure (*Private credit* and *Mkt. cap*.). We control for both bank and country characteristics in the regressions. All the other variables are defined in Internet Appendix Table A1. Robust standard errors are clustered at the county-year level and are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Interbank borrowing*	
	(1)	(2)
Treated	-0.0200**	-0.0218**
	(0.00973)	(0.00921)
LtD	0.0642***	0.0660***
	(0.00785)	(0.00818)
Securities	0.0719***	0.0732***
	(0.0171)	(0.0173)
Equity	-0.172***	-0.166***
	(0.0420)	(0.0392)
ROA	-0.0506	-0.162
	(0.171)	(0.160)
Banksize	0.0144***	0.0149***
	(0.00140)	(0.00138)
Rule of law	0.0312***	0.0359***
	(0.00550)	(0.00665)
Private credit	-0.00745	0.00502
	(0.0118)	(0.0123)
Mkt. cap.	-0.0335***	-0.0348***
	(0.00820)	(0.00829)
Central bank	-0.348***	-0.343***
	(0.0751)	(0.0898)
Bank Zscore	-0.00199***	-0.00198***
	(0.000592)	(0.000591)
Concentration	0.0643**	0.0483
	(0.0324)	(0.0329)
Cons.	-0.0502*	-0.0751***
	(0.0257)	(0.0257)
Year FE	YES	YES
Region FE	NO	YES
# of obs.	38,333	38,333
Adj. R^2	0.288	0.301

Table 4. Instrumental variable analysis: deposit insurance scheme

This table reports the results of the regressions examining the role of trust in determining the interbank borrowing using instrumental variable analysis. Column (1) reports the results of the 1st stage, and column (2) reports the results of the 2nd stage. The instrumental variables are *ExDI*, defined as the existence of deposit insurance, developed from Demirgüç-Kunt , Kane and Laeven (2014). All the other variables are defined in the Internet Appendix Table A1. Robust standard errors are clustered at the country-year level and are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Crisis length*	*Interbank borrowing*
	(1)	(2)
ExDI	1.069***	-0.0394***
	(0.102)	(0.0124)
LtD	-0.496***	0.108***
	(0.0278)	(0.00903)
Securities	-1.208***	0.129***
	(0.0507)	(0.0101)
Equity	4.686***	-0.274***
	(0.185)	(0.0379)
ROA	2.544***	0.107
	(0.873)	(0.0962)
Banksize	0.0727***	0.00695***
	(0.00604)	(0.00100)
Common law	-0.456***	0.0303***
	(0.0245)	(0.00528)
Rule of law	-0.0822	0.0210*
	(0.0530)	(0.0119)
Private credit	-0.717***	0.0112
	(0.0608)	(0.0116)
Mkt. cap.	0.365***	-0.0476***
	(0.0311)	(0.00761)
Central bank	3.832***	-0.394***
	(0.242)	(0.0696)
Bank Zscore	-0.0335***	-0.00123***
	(0.00213)	(0.000440)
Concentration	0.437***	0.0610*
	(0.115)	(0.0344)
Cons.	0.316**	-0.0320
	(0.157)	(0.0296)
F-statistics	108.96**	
Year FE	YES	YES
# of obs.	64493	64493
Adj. R^2	0.720	0.499

Table 5. Trust and interbank borrowing: Euro Area banks and large/small banks

This table reports the results of the regressions examining the determinants of interbank borrowing using banks in the Euro Area. The dependent variable is the size of interbank borrowing scaled by bank total assets. The key explanatory variables are *Crisis length* as well as the interaction term of *Crisis length* and *Large* dummy. *Large* is defined as one for the upper quartile, and zero for the lower quantile based on bank total assets. We control for both bank and country characteristics in the regressions. All the other variables are defined in the Internet Appendix Table A1. Robust standard errors are clustered at the country-year level and are in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Interbank borrowing*		
	(1)	(2)	(3)
	EU11	EU19	EU19
Crisis length	-0.0158***	-0.0168***	-0.0117***
	(0.00376)	(0.00345)	(0.00273)
Large			0.0377***
			(0.00399)
Crisis length* Large			-0.00680***
			(0.00110)
LtD	0.133***	0.131***	0.137***
	(0.0129)	(0.0128)	(0.00994)
Securities	0.154***	0.144***	0.128***
	(0.0186)	(0.0185)	(0.0168)
Equity	-0.339***	-0.356***	-0.400***
	(0.0577)	(0.0573)	(0.0436)
ROA	-0.219	-0.273	-0.169
	(0.258)	(0.251)	(0.240)
Banksize	0.00794***	0.00856***	
	(0.00114)	(0.00118)	
Common law	-0.00824	-0.00580	-0.0425
	(0.0511)	(0.0508)	(0.0431)
Private credit	0.0659**	0.0658***	0.0467**
	(0.0261)	(0.0243)	(0.0194)
Mkt. cap.	0.0616***	0.0609***	0.0533***
	(0.0179)	(0.0177)	(0.0144)
Central bank	-1.738***	-1.507***	-1.451***
	(0.366)	(0.316)	(0.251)
Bank Zscore	-0.00131***	-0.00146***	-0.000545
	(0.000301)	(0.000317)	(0.000336)
Concentration	0.0664	0.102*	0.0597
	(0.0560)	(0.0569)	(0.0477)
Cons.	-0.101*	-0.123**	-0.0299
	(0.0569)	(0.0544)	(0.0447)
Year FE	YES	YES	YES
# of obs.	27,721	27,814	13,871
Adj. R^2	0.452	0.442	0.497

Table 6. Distribution of country and community of the EA interbank network

This table reports the joint distribution of country and community groups for the EA network in the fourth quarter of 2018. Communities are detected through optimization of *Modularity*.

Country	*Community*													
	0	1	2	3	4	5	6	7	8	9	10	11	12	Total
Austria	1	2	0	5	0	6	7	0	5	0	0	0	88	114
Belgium	0	0	3	0	3	0	1	0	10	0	0	0	0	17
Cyprus	0	0	1	0	0	2	1	0	0	1	0	0	0	5
Estonia	0	0	0	2	2	0	0	0	0	0	0	0	1	5
Finland	1	0	0	0	10	0	0	1	4	0	0	0	1	17
France	4	0	22	4	12	20	2	1	11	1	0	0	0	77
Germany	1	0	3	218	7	10	4	1	4	0	0	0	1	249
Greece	0	0	0	0	0	0	0	0	4	0	2	0	0	6
Ireland	1	0	4	0	1	2	1	7	7	0	0	0	1	24
Italy	1	0	1	1	0	3	85	2	0	0	0	10	0	103
Latvia	0	0	0	1	1	4	1	0	1	0	0	0	6	14
Lithuania	0	0	0	1	2	1	0	0	0	0	0	0	0	4
Luxembourg	3	0	3	2	11	6	3	2	6	0	0	0	1	37
Malta	0	0	0	0	0	1	0	0	3	0	0	0	0	4
Netherlands	2	0	1	1	8	8	6	6	20	0	0	0	0	52
NonEA	59	0	57	30	75	175	72	1	68	0	0	0	32	569
Portugal	11	0	1	0	1	0	0	0	0	0	0	0	0	13
Slovenia	0	0	0	1	0	0	4	0	0	0	0	0	0	5
Spain	38	0	1	0	0	1	2	1	3	0	0	0	1	47
Total	122	2	97	266	133	239	189	22	146	2	2	10	132	1,362

Table 7. Mean value of network measures in the EA interbank network

This table reports the mean value of network centralities (Eigenvector, Indegree, Outdegree, Weighted indegree, Weighted outdegree, Page rank) and cluster coefficient over 2014Q4 to 2018Q4 for each country in the EA interbank network.

Country	*Eigenvector*	*Indegree*	*Outdegree*	*Weighted indegree*	*Weighted outdegree*	*Page rank*	*Cluster coefficient*
France	0.139	26.869	56.364	34.095	25.165	0.0023	0.365
Belgium	0.040	11.061	20.602	3.739	14.477	0.0008	0.417
Ireland	0.037	2.351	9.090	2.146	4.425	0.0007	0.332
Germany	0.036	13.831	25.322	5.469	8.932	0.0014	0.480
Spain	0.024	9.907	14.884	2.950	6.374	0.0011	0.379
Netherlands	0.022	11.666	21.018	5.214	8.185	0.0008	0.322
Italy	0.014	7.452	13.764	1.963	4.880	0.0009	0.411
Finland	0.004	4.908	6.376	0.658	2.508	0.0007	0.295
Austria	0.003	4.775	9.479	1.192	1.864	0.0010	0.308
Portugal	0.002	2.511	6.669	0.277	0.814	0.0006	0.194
Greece	0.001	1.435	8.978	0.055	3.335	0.0005	0.388
Luxembourg	0.000	0.939	10.902	0.097	2.199	0.0005	0.258
Malta	0.000	0.719	6.475	0.054	0.417	0.0005	0.168
Estonia	0.000	0.290	2.301	0.028	0.366	0.0005	0.235
Slovenia	0.000	0.312	5.269	0.059	0.313	0.0005	0.455
Slovakia	0.000	0.306	3.375	0.007	0.083	0.0005	0.377
Lithuania	0.000	0.211	1.859	0.025	0.642	0.0005	0.223
Cyprus	0.000	0.155	5.549	0.006	0.664	0.0004	0.179
Latvia	0.000	0.234	4.133	0.005	0.323	0.0005	0.266

Table 8. Trust and interbank market participation in the Euro Area

This table reports the results of the regressions examining the determinants of interbank market participation, measured by the centralities of the interbank network. Dependent variables are *Log inwdeg*, *Log page rank*, and *Log eigen*, respectively. The key explanatory variables are *Crisis length*. *Cluster* is defined as one if the cluster coefficient is above its median, or zero otherwise. All the other variables are defined in the Internet Appendix Table A1. Robust standard errors are clustered at the country-year level and are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Log inwdeg*	*Log page rank*	*Log eigen*	*Log inwdeg*	*Log page rank*	*Log eigen*
	(1)	(2)	(3)	(4)	(5)	(6)
	Total exposures			Exposures within Euro area		
Crisis length	-0.0151	-0.0000743***	-0.00416***	-0.0221	-0.000292***	-0.00447***
	(0.0211)	(0.0000276)	(0.00150)	(0.0221)	(0.0000607)	(0.00154)
Cluster	-0.632***	-0.00117***	-0.0255***	-0.701***	-0.00176***	-0.0214***
	(0.0760)	(0.000243)	(0.00575)	(0.0953)	(0.000333)	(0.00513)
LtD	-0.148*	-0.000471***	-0.0226***	-0.209***	-0.00136***	-0.0266***
	(0.0742)	(0.000122)	(0.00355)	(0.0763)	(0.000192)	(0.00420)
Size	0.510***	0.000755***	0.0289***	0.500***	0.00175***	0.0297***
	(0.0353)	(0.0000858)	(0.00378)	(0.0345)	(0.000199)	(0.00394)
Private credit	-0.00702***	-0.0000122***	-0.000325***	-0.00824***	-0.0000232***	-0.000391***
	(0.00206)	(0.00000401)	(0.0000957)	(0.00219)	(0.00000655)	(0.000106)
Mkt. cap.	-0.00128	-0.0000168***	-0.0000467	-0.000477	-0.0000227***	-0.0000147
	(0.00186)	(0.00000364)	(0.000106)	(0.00182)	(0.00000565)	(0.000106)
Concentration	0.00439	-0.00000584	-0.0000851	0.00519	-0.0000160	-0.0000411
	(0.00382)	(0.00000626)	(0.000308)	(0.00397)	(0.0000134)	(0.000304)
Cons.	-6.635***	-0.00714***	-0.363***	-6.488***	-0.0195***	-0.379***
	(0.693)	(0.00134)	(0.0574)	(0.682)	(0.00319)	(0.0612)
Other bank controls	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
# of obs.	1,124	1,124	1,124	1,092	1,092	1,092
Adj. R^2	0.670	0.486	0.488	0.684	0.539	0.485

Table 9. Trust and interbank market participation in the Euro Area: the role of core vs. periphery positions

The table reports the results of the regressions examining the role of network position (core vs. periphery) in the interbank market in affecting the relationship between trust and interbank market participation. The dependent variable is *Log inwdeg*. The key explanatory variables are *Crisis length*. *Central* is defined as one if the eigenvector centrality is in the upper quartile, or as zero if in the lower quartile. All the other variables are defined in the Internet Appendix Table A1. Robust standard errors are clustered at the country-year level and are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Log inwdeg*	
	(1)	(2)
	Total exposures	Exposures within Euro area
Crisis length	-0.0165	0.0227
	(0.0200)	(0.0213)
Central	1.130***	1.222***
	(0.159)	(0.160)
Crisis length * Central	-0.0609***	-0.0869***
	(0.0226)	(0.0232)
Cluster	-0.482***	-0.589***
	(0.0720)	(0.0658)
LtD	-0.238***	-0.170***
	(0.0494)	(0.0519)
Size	0.450***	0.456***
	(0.0237)	(0.0235)
Private credit	-0.00541***	-0.00501***
	(0.00112)	(0.00103)
Mkt. cap.	-0.00417***	-0.00436***
	(0.00105)	(0.00106)
Concentration	0.00253	0.00592**
	(0.00276)	(0.00275)
Cons.	-6.232***	-6.602***
	(0.473)	(0.464)
Other bank controls	YES	YES
Quarter FE	YES	YES
# of obs.	714	697
Adj. R^2	0.742	0.733

Table 10. Trust and interbank market participation in the Euro Area: the role of clustering

The table reports the results of the regressions examining the role of interbank clustering in affecting the relationship between trust and interbank market participation. The dependent variable is *Log inwdeg, Log page rank, and Log eigen*, respectively. The key explanatory variables are *Crisis length*. *Cluster* is defined as one if the cluster coefficient is above its median, or zero otherwise. All the other variables are defined in the Internet Appendix Table A1. Robust standard errors are clustered at the country-year level and are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Log windeg*	*Log page rank*	*Log eigen*	*Log windeg*	*Log page rank*	*Log eigen*
	(1)	(2)	(3)	(4)	(5)	(6)
	Total exposures			Exposures within Euro area		
Crisis length	-0.0190	-0.000130***	-0.00683***	-0.0311**	-0.000369***	-0.00591***
	(0.0137)	(0.0000286)	(0.00139)	(0.0127)	(0.0000647)	(0.00128)
Cluster	-0.672***	-0.00176***	-0.0534***	-0.822***	-0.00280***	-0.0408***
	(0.106)	(0.000203)	(0.00763)	(0.110)	(0.000418)	(0.00733)
Crisis length * Cluster	0.00760	0.000111***	0.00530***	0.0226	0.000193***	0.00361***
	(0.0166)	(0.0000306)	(0.00125)	(0.0167)	(0.0000644)	(0.00115)
LtD	-0.146***	-0.000441***	-0.0212***	-0.207***	-0.00134***	-0.0262***
	(0.0441)	(0.0000845)	(0.00352)	(0.0430)	(0.000176)	(0.00373)
Size	0.510***	0.000757***	0.0290***	0.499***	0.00174***	0.0294***
	(0.0155)	(0.0000386)	(0.00192)	(0.0164)	(0.0000974)	(0.00201)
Private credit	-0.00707***	-0.0000129***	-0.000362***	-0.00832***	-0.0000239***	-0.000404***
	(0.000853)	(0.00000160)	(0.0000602)	(0.00102)	(0.00000337)	(0.0000734)
Mkt. cap.	-0.00127	-0.0000166***	-0.0000398	-0.000393	-0.0000219***	-0.00000127
	(0.000860)	(0.00000200)	(0.0000615)	(0.000908)	(0.00000341)	(0.0000667)
Concentration	0.00434**	-0.00000662	-0.000122	0.00513**	-0.0000165*	-0.0000502
	(0.00197)	(0.00000408)	(0.000168)	(0.00212)	(0.00000939)	(0.000180)
Cons.	-6.615***	-0.00684***	-0.349***	-6.417***	-0.0189***	-0.368***
	(0.321)	(0.000636)	(0.0273)	(0.337)	(0.00143)	(0.0297)
Other bank controls	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
# of obs.	1,124	1,124	1,124	1,092	1,092	1,092
Adj. R^2	0.670	0.489	0.494	0.684	0.542	0.487

Table 11. Trust and interbank market participation in the Euro Area: non-securities, short-term and uncollateralized exposures

This table examines the robustness of the results using the non-securities exposures, short-term exposures (exposures less than 30 days) or uncollateralized exposures. The dependent variable is *Log windeg*. The key explanatory variables are the trust measures (*Crisis length*), as well as their interactions with *Central* and *Cluster*. Robust standard errors are clustered at the country-year level and are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Log windeg*					
	Non-securities exposure		Short-term exposure		Uncollateralized exposure	
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis length	-0.00881	-0.0361**	-0.0205**	-0.0283***	0.00461	-0.0119
	(0.0202)	(0.0180)	(0.00927)	(0.00885)	(0.0103)	(0.0110)
Central	1.452***		0.393***		0.254***	
	(0.156)		(0.0672)		(0.0719)	
Cluster	-0.546***	-0.785***	-0.233***	-0.313***	-0.469***	-0.471***
	(0.0704)	(0.137)	(0.0328)	(0.0797)	(0.0315)	(0.0727)
Crisis length * Central	-0.0740***		-0.0222**		-0.0243**	
	(0.0238)		(0.00960)		(0.0117)	
Crisis length * Cluster		0.0455**		0.0108		0.00290
		(0.0215)		(0.0115)		(0.0125)
LtD	-0.0141	0.00434	-0.185***	-0.186***	-0.133***	-0.122***
	(0.0516)	(0.0434)	(0.0325)	(0.0328)	(0.0243)	(0.0244)
Size	0.358***	0.485***	0.263***	0.292***	0.365***	0.386***
	(0.0271)	(0.0209)	(0.0126)	(0.0124)	(0.0143)	(0.0121)
Private credit	-0.00387***	-0.00611***	-0.00339***	-0.00418***	-0.00260***	-0.00297***
	(0.00125)	(0.00108)	(0.000567)	(0.000586)	(0.000622)	(0.000611)
Mkt. cap.	-0.00482***	-0.00282***	-0.00249***	-0.00243***	0.00195***	0.00157**
	(0.00140)	(0.00107)	(0.000607)	(0.000630)	(0.000644)	(0.000628)
Concentration	-0.00224	0.000902	-0.00165	-0.000886	0.00415***	0.00409***
	(0.00311)	(0.00244)	(0.00138)	(0.00138)	(0.00135)	(0.00138)
Cons.	-4.740***	-6.224***	-3.406***	-3.641***	-5.507***	-5.646***
	(0.555)	(0.425)	(0.226)	(0.225)	(0.256)	(0.237)
Other bank controls	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
# of obs.	558	798	1,008	1,008	1,075	1,075
Adj. R^2	0.690	0.598	0.579	0.561	0.715	0.712

Table 12. A shock to trust: the insolvency of an Italian bank

The table reports the results using the insolvency of an Italian bank (*Veneto Banca*) as a shock to trust in the financial system for identification. The dependent variable is *Log page rank* or *Log eigen*. The key explanatory variables are *Shock VB* and *Treated VB*. *Shock VB* is defined as one for 8 quarters after June 2017, and zero for 8 quarters before June 2017. *Treated VB* is defined as one for either Italian banks or banks connected to *Veneto Banca*, i.e. either borrowing from or lending to *Veneto Banca* via interbank markets within the 2 years (8 quarters) before the shock in June 2017. All the other variables are defined in the Internet Appendix Table A1. Column (1) and (2) use full sample for regressions, and column (3) and (4) use a subsample including treated banks as well as a control group of banks matched by *eigenvector centrality*. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Dep. Var	*Log page rank*	*Log eigen*	*Log page rank*	*Log eigen*
	(1)	(2)	(3)	(4)
	Full sample		Matched sample	
Shock VB* Treated VB	-0.00106***	-0.0333*	-0.000954***	-0.0337*
	(0.000330)	(0.0196)	(0.000361)	(0.0183)
Treated VB	0.00204***	0.104***	0.00183***	0.0765***
	(0.000278)	(0.0141)	(0.000307)	(0.0133)
LtD	-0.000580***	-0.0239***	-0.000738***	-0.0501***
	(0.0000742)	(0.00307)	(0.000177)	(0.00858)
Size	0.000554***	0.0199***	0.000731***	0.0329***
	(0.0000278)	(0.00100)	(0.0000433)	(0.00213)
Cluster	-0.00104***	-0.0245***	-0.00103***	-0.0287***
	(0.0000770)	(0.00244)	(0.000155)	(0.00734)
Cons.	-0.00668***	-0.275***	-0.00921***	-0.459***
	(0.000479)	(0.0173)	(0.000843)	(0.0427)
Other bank controls	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES
# of obs.	1,285	1,285	343	343
Adj. R^2	0.476	0.546	0.712	0.709

Internet Appendix for
"Trust and the Interbank Market Puzzle"

Franklin Allen, Giovanni Covi, Xian Gu, Oskar Kowalewski, Mattia Montagna

In this Internet Appendix, we report the following tables and additional analyses omitted from the main paper.

- In Figure A1 and A2, we report the structure of bank assets (and bank liabilities) for five countries (the US, Japan, France, Germany and the UK) from 2000-2009.
- In Figure A3, we plot the percentage of Italian banks in different communities in the EA interbank networks from 2015-2018.

- In Table A1, we list the definitions for the variables that we use in the analyses.
- In Table A2, we report the levels of interbank deposits and loans for five countries (the US, Japan, France, Germany and the UK) from 2000-2014.
- In Table A3, we list the number of banks and the interbank deposit ratio (interbank deposits/total assets) for the 96 countries in our sample.
- In Table A4, we report the regression results examining the determinants of interbank borrowing using samples excluding the banks in the US and other financial centres (the UK, Hong Kong, and Singapore) and further controlling for the bond market capitalization.

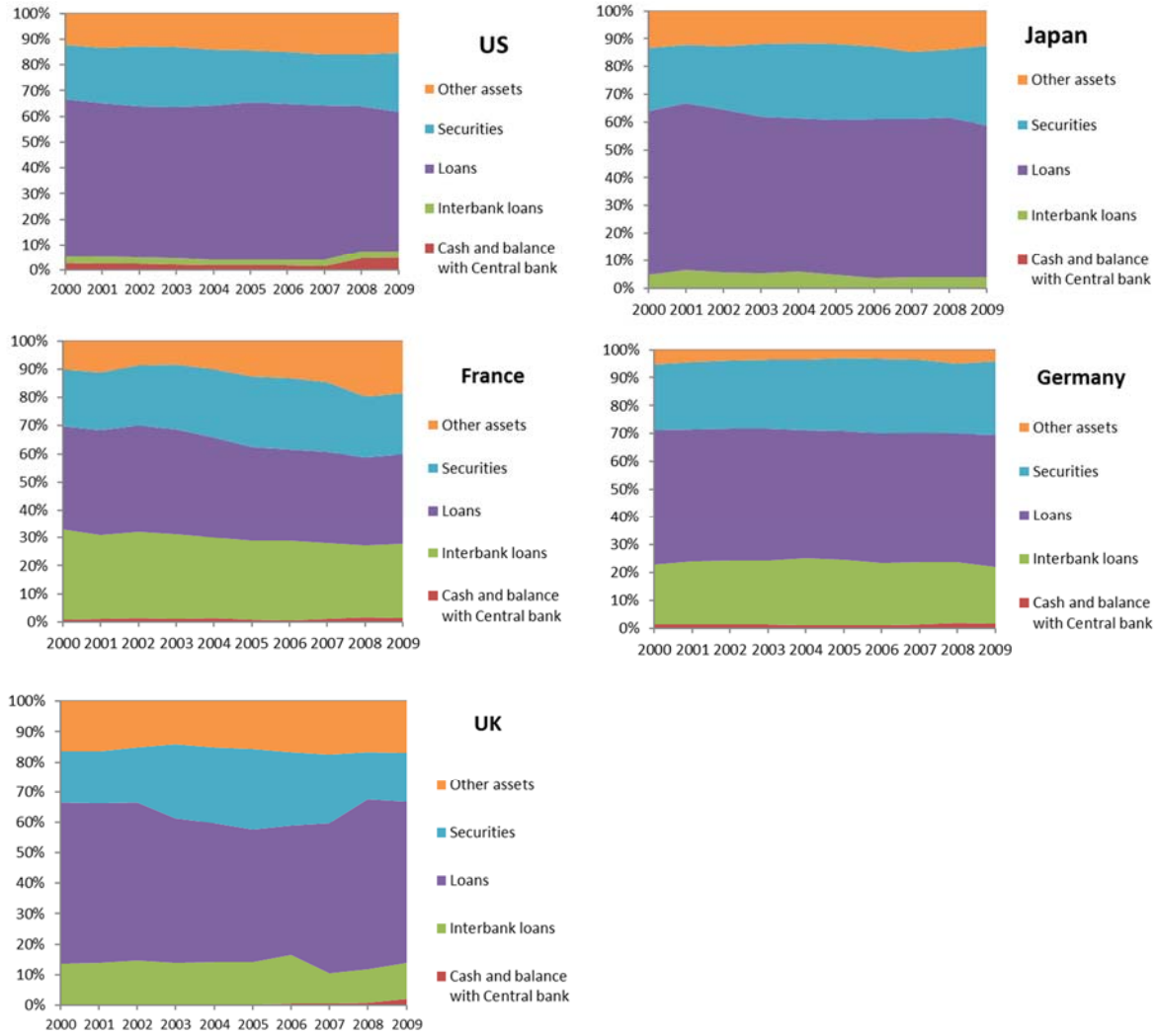

Figure A1. Structure of Bank Assets

This figure plots the structure of bank assets for five countries – the US, Japan, France, Germany and the UK from 2000-2009. The US and Japan have much lower interbank loan ratio (interbank loan/total bank assets), averaging 2.44% and 4.28%, respectively. The UK, Germany, and France have higher interbank loan ratios, averaging 13.20%, 22.48% and 28.68%, respectively. Source: OECD Statistics; Japanese Banker Association

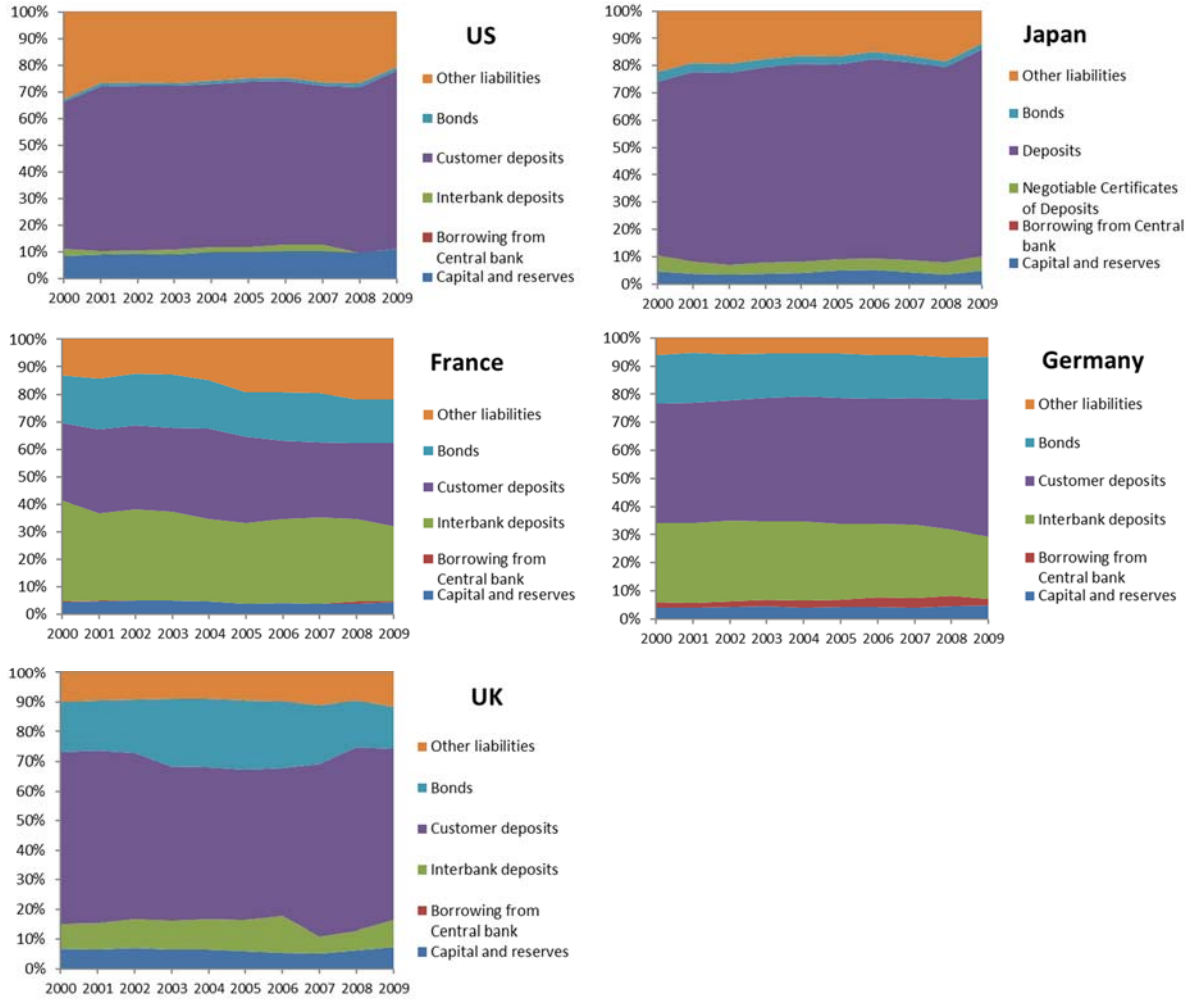

Figure A2. Structure of Bank Liabilities

This figure plots the structure of bank liabilities for five countries – the US, Japan, France, Germany and the UK. The US and Japan have lower interbank deposit ratio (interbank deposit/total liabilities), averaging 1.95% and 4.41%, respectively. The UK, Germany and France have higher interbank deposit ratios, averaging at 9.02%, 26.61% and 31.19%, respectively.

Source: OECD Statistics; Japanese Banker Association

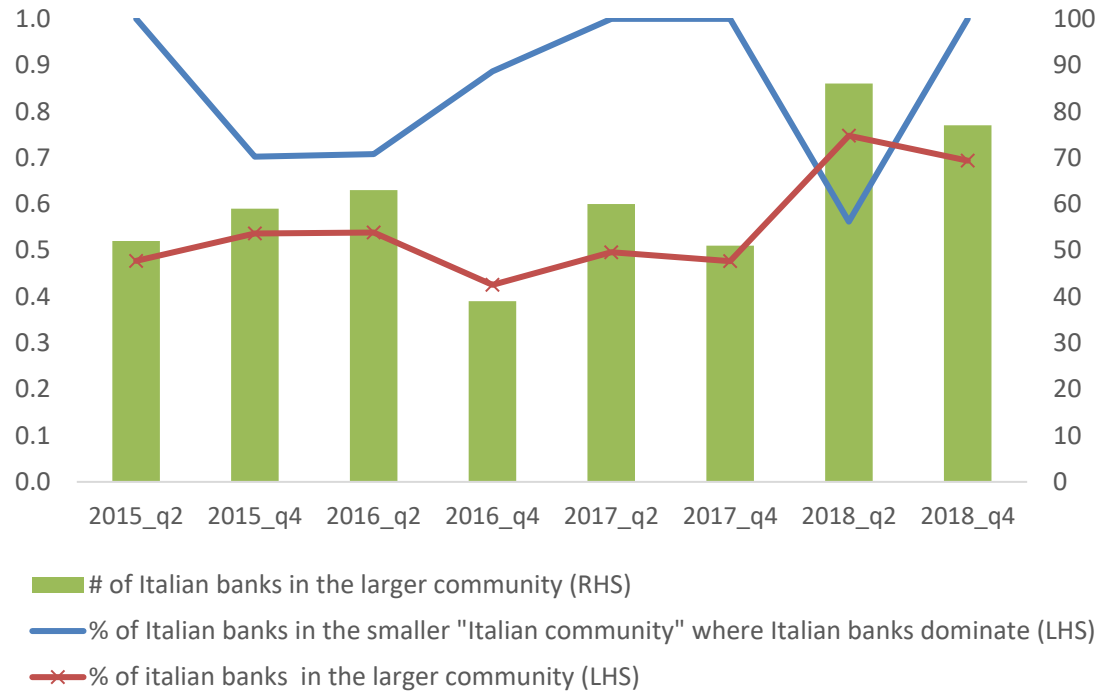

Figure A3. Communities of Italian banks in the EA interbank networks
This figure plots the percentage of Italian banks in the smaller "Italian community" where Italian banks dominate (number of Italian banks/total number of banks in the "Italian community") as well as the percentage of Italian banks in the larger community with more banks but still over 40% Italian banks (number of Italian banks/total number of banks in the larger community), over the period of 2015 to 2018. Since 2018, more Italian banks are switching to the larger community.

Table A1. Variable definitions

Variable	Definitions	Source
Measures of trust in the banking system		
Crisis length	The number of banking crises occurred in each country till year *t*	Laeven and Valencia (2020)
Bank failure	The standardized value of total assets of failed banks in each country till year *t*	BankScope/BankFocus
Crisis number 1900	The number of banking crises since 1900	Metrick and Schmelzing (2021)
Bank level variables		
Balance sheet data		
Interbank borrowing	Borrowing and deposits from banks divided by total assets	BankScope/BankFocus
LtD	Bank's gross nonfinancial loans divided by nonfinancial deposits	
Securities	Securities to total assets	
Equity	Equity to total assets	
ROA	Return on assets	
Banksize	Natural logarithm of bank's total assets	
Network measures		
Log inwdeg	Natural logarithm of weighted in-degree	European Central Bank, and own calculation
Log page rank	Natural logarithm of page rank centrality	
Log eigen	Natural logarithm of eigenvector centrality	
Central	Equals to 1 if the eigenvector centrality is in the upper quartile, to 0 if the eigenvector centrality is in the lower quartile	
Cluster	Equals to 1 if the cluster coefficient is above median, or 0 otherwise.	
Country level variables		
Common law	Equals to 1 if the legal origin of the country is common law.	Djankov et al. (2007)
Rule of law	The index of rule of law	Worldwide Governance Indicator Database (2016)
Private credit	Private credit by deposit money banks divided by GDP	World Bank, Global Finance Database (2016)
Market cap.	Stock market capitalization divided by GDP	
Concentration	Assets of three largest commercial banks as a share of total commercial banking assets.	
Central Bank	Central bank total assets divided by GDP	
Bank z-score	Ratio of return on assets plus capital-asset-ratio to the standard deviation of return on assets, aggregated at the country level	

Table A2. Comparative statistics: ratios of interbank deposits and loans

The table presents the comparative statistics of the ratios of interbank deposits and interbank loans for the five countries - the US, the UK, Japan, Germany and France from 2000 to 2014. We calculate interbank deposits as borrowing or deposits from banks and interbank loans as funds due to banks.

Country	Germany		France		UK		Japan		US	
	Interbank deposits	*Interbank loans*	*Interbank deposits*	*Interbank loans*	*Interbank deposits*	*Interbank loans*	*Interbank deposits*	*Interbank loans*	*Interbank deposits*	*Interbank loans*
2000	29.17%	25.52%	36.09%	32.00%	8.02%	13.22%	3.00%	3.94%	6.88%	4.43%
2001	28.94%	26.42%	34.84%	32.27%	8.52%	13.74%	2.56%	3.75%	7.05%	4.87%
2002	28.87%	27.80%	35.49%	32.62%	9.73%	14.38%	2.38%	5.21%	6.71%	5.01%
2003	28.29%	27.89%	34.08%	30.55%	9.54%	13.74%	1.97%	4.48%	5.91%	4.21%
2004	28.31%	28.48%	34.75%	30.70%	10.30%	13.94%	1.91%	4.25%	5.48%	4.13%
2005	28.45%	29.29%	34.85%	30.50%	10.44%	13.95%	1.81%	4.62%	4.66%	3.46%
2006	28.48%	29.94%	34.83%	29.37%	12.44%	16.06%	1.76%	3.86%	4.60%	3.81%
2007	29.21%	31.57%	36.01%	30.38%	5.68%	10.12%	2.78%	2.68%	4.84%	4.25%
2008	28.96%	32.14%	35.49%	29.53%	6.50%	10.97%	2.57%	3.04%	3.37%	2.63%
2009	26.56%	29.65%	33.32%	28.72%	9.05%	11.92%	3.97%	2.98%	2.46%	1.86%
2010	23.44%	26.12%	31.28%	28.18%	7.93%	8.04%	3.31%	2.96%	2.15%	1.57%
2011	21.83%	26.59%	32.07%	30.97%	8.87%	8.93%	4.90%	4.34%	1.17%	0.93%
2012	21.84%	26.46%	31.70%	30.45%	9.67%	9.76%	4.43%	3.76%	1.29%	0.98%
2013	21.64%	26.84%	30.84%	30.31%	11.27%	11.03%	3.38%	4.81%	1.06%	0.78%
2014	21.76%	26.21%	30.62%	30.03%	8.08%	7.86%	3.76%	10.45%	0.83%	0.55%
Average	26.38%	28.06%	33.75%	30.44%	9.07%	11.84%	2.97%	4.34%	3.90%	2.90%

Source: ECB; Bank of England; Japanese Bank Association; FRB.

Table A3. The Interbank Borrowing Size by Country
This table shows the number of banks and the interbank deposit ratio (interbank deposits/total assets) for the countries in our sample. When constructing the sample, we drop those countries with less than five banks in the original dataset.

Country name	Bank number	Interbank borrowing
Argentina	63	4.54%
Australia	8	10.40%
Austria	184	28.07%
Azerbaijan	12	18.20%
Bahamas	15	13.97%
Bangladesh	7	5.35%
Belarus	9	10.63%
Belgium	44	17.98%
Bolivia	8	16.98%
Bosnia and Herzegovina	7	2.51%
Brazil	60	3.12%
Bulgaria	8	5.50%
Canada	27	2.09%
Cayman Islands	7	1.35%
China	150	10.74%
Colombia	32	6.26%
Costa Rica	42	12.26%
Cote d'Ivoire	5	23.93%
Croatia	31	1.91%
Curacao	7	6.91%
Cyprus	8	3.36%
Czech Republic	10	34.20%
Denmark	80	17.03%
Dominican Republic	38	1.53%
Ecuador	33	0.48%
Egypt, Arab Rep.	5	4.20%
El Salvador	5	0.00%
Ethiopia	6	2.31%
Finland	35	5.15%
France	174	23.37%
Germany	1,879	18.14%
Ghana	5	3.98%
Greece	26	9.66%
Guatemala	27	9.61%
Honduras	10	4.40%
Hong Kong SAR, China	6	8.74%
Hungary	6	16.99%
Iceland	29	11.88%
India	32	6.00%
Indonesia	58	3.62%
Ireland	7	41.81%
Israel	5	14.16%
Italy	1,007	13.02%

Japan	464	1.55%
Kazakhstan	9	10.76%
Kenya	24	5.00%
Korea, Rep.	6	0.41%
Lao PDR	5	10.18%
Latvia	5	24.74%
Lebanon	38	4.31%
Libya	6	1.61%
Luxembourg	41	26.94%
Macedonia, FYR	5	3.49%
Malaysia	18	7.47%
Mali	5	15.27%
Mauritania	6	2.65%
Mexico	19	29.32%
Moldova	11	5.24%
Mongolia	10	11.03%
Morocco	7	8.82%
Nepal	5	0.17%
Netherlands	23	22.01%
New Zealand	6	4.61%
Nicaragua	9	21.99%
Nigeria	39	5.05%
Norway	65	10.23%
Oman	5	9.23%
Pakistan	10	12.63%
Panama	28	5.14%
Paraguay	19	9.22%
Peru	10	10.62%
Philippines	23	1.58%
Poland	26	9.20%
Portugal	98	42.20%
Russian Federation	447	9.84%
San Marino	6	2.18%
Senegal	6	13.32%
Serbia	17	4.32%
Singapore	8	12.49%
Slovak Republic	6	12.46%
South Africa	16	22.84%
Spain	203	15.69%
Sweden	90	8.22%
Switzerland	380	10.40%
Tajikistan	6	12.37%
Tanzania	7	6.83%
Thailand	11	2.23%
Turkey	33	4.13%
Ukraine	152	21.52%
United Kingdom	30	14.16%
United States	4,621	0.55%
Uruguay	12	11.33%

Uzbekistan	17	7.37%
Venezuela, RB	49	6.38%
Vietnam	26	22.20%
Yemen, Rep.	7	2.76%

Table A4. Trust and interbank borrowing: Samples excl. banks in the US and financial centres

This table reports the results of the regressions examining the impact of trust on interbank borrowing excluding US banks and banks in financial centres (the UK, Hong Kong and Singapore), as well as further controlling for the size of the bond markets. The dependent variable is the size of interbank borrowing scaled by bank total assets. The key explanatory variable is trust, proxied by *Crisis length*.

Dep. Var	*Interbank borrowing*				
	(1)	(2)	(3)	(4)	(5)
	Excl. US	Excl. US/other fin centers	Full sample	Excl. US	Excl. US/other fin centers
Crisis length	-0.00306*	-0.00305*	-0.00444***	-0.00482***	-0.00480***
	(0.00158)	(0.00157)	(0.00126)	(0.00125)	(0.00124)
LtD	0.0688***	0.0679***	0.0705***	0.0720***	0.0713***
	(0.00813)	(0.00818)	(0.00852)	(0.00885)	(0.00892)
Securities	0.0734***	0.0728***	0.101***	0.0989***	0.0981***
	(0.0164)	(0.0165)	(0.0104)	(0.0180)	(0.0181)
Equity	-0.220***	-0.233***	-0.152***	-0.168***	-0.176***
	(0.0422)	(0.0423)	(0.0266)	(0.0398)	(0.0403)
ROA	-0.00742	-0.0128	0.00916	-0.0522	-0.0621
	(0.156)	(0.157)	(0.0779)	(0.135)	(0.136)
Banksize	0.0126***	0.0124***	0.0119***	0.0154***	0.0154***
	(0.00125)	(0.00125)	(0.00147)	(0.00148)	(0.00148)
Common law	0.0557***	0.0482***	0.0519***	0.0614***	0.0484***
	(0.00954)	(0.00996)	(0.00825)	(0.0132)	(0.0161)
Rule of law	0.0261***	0.0251***	0.0461***	0.0476***	0.0469***
	(0.00496)	(0.00502)	(0.00615)	(0.00654)	(0.00662)
Private credit	0.00215	0.000574	0.0288***	0.0213**	0.0205**
	(0.0117)	(0.0117)	(0.00982)	(0.00988)	(0.00992)
Mkt. cap.	-0.0465***	-0.0465***	-0.0610***	-0.0585***	-0.0581***
	(0.00742)	(0.00746)	(0.00585)	(0.00651)	(0.00656)
Central bank	-0.320***	-0.318***	0.0197	0.0135	0.0101
	(0.0669)	(0.0671)	(0.0657)	(0.0665)	(0.0664)
Bank Zscore	-0.00170***	-0.00168***	-0.00197***	-0.00285***	-0.00285***
	(0.000534)	(0.000536)	(0.000408)	(0.000453)	(0.000455)

Table A4 continued					
Concentration	0.107***	0.110***	0.0732***	0.0744***	0.0759***
	(0.0273)	(0.0277)	(0.0238)	(0.0246)	(0.0250)
Bond			-0.0667***	-0.0683***	-0.0678***
			(0.00966)	(0.00962)	(0.00964)
Cons.	-0.0715***	-0.0678***	-0.0560***	-0.0684***	-0.0662***
	(0.0208)	(0.0210)	(0.0199)	(0.0194)	(0.0198)
Year FE	YES	YES	YES	YES	YES
# of obs.	42,543	42,463	64,654	40,343	40,263
Adj. R^2	0.300	0.299	0.496	0.367	0.365