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Bank bias in Europe: effects on systemic risk and growth

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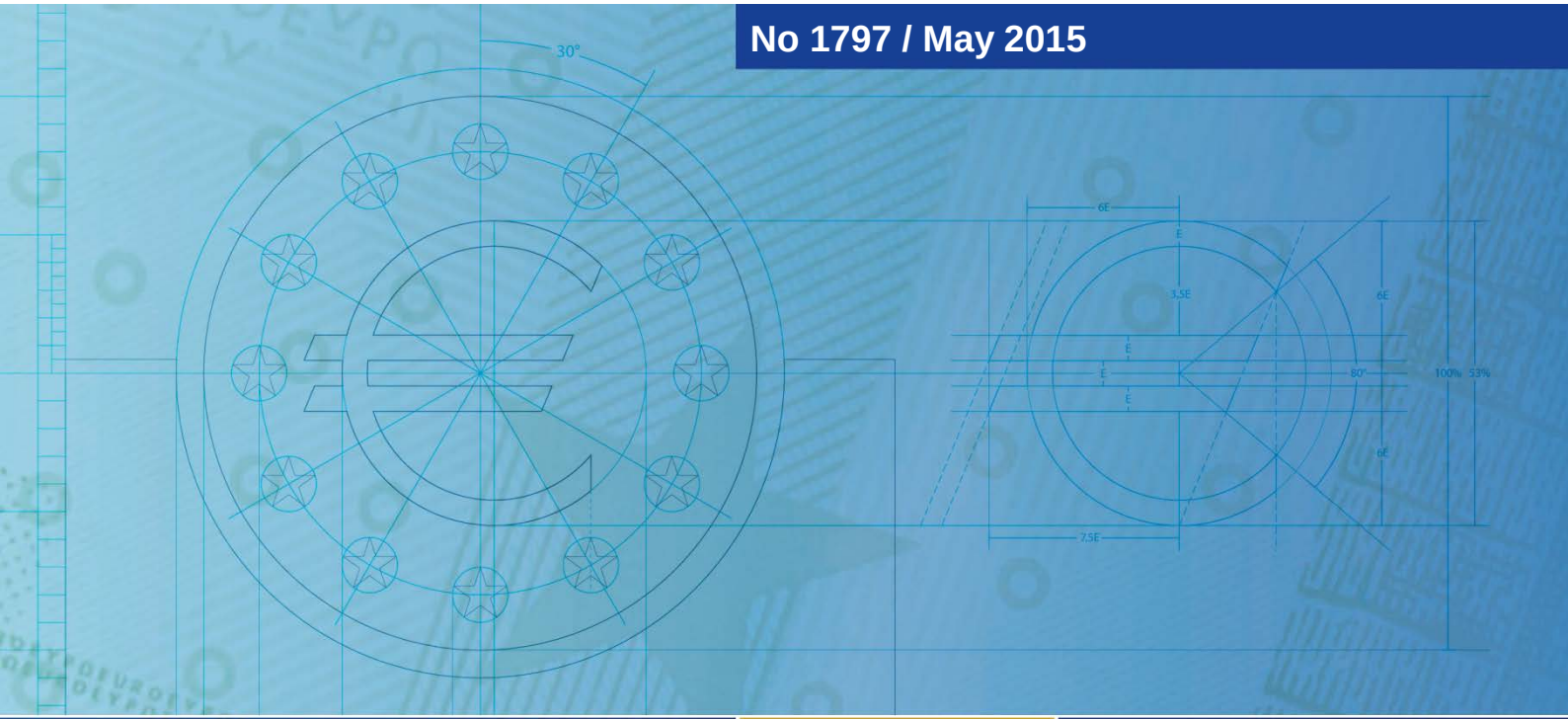


Abstract

Europe's financial structure has become strongly bank-based – far more so than in other economies. We document that an increase in the size of the banking system relative to equity and private bond markets is associated with more systemic risk and lower economic growth, particularly during housing market crises. We argue that these two phenomena arise owing to an amplification mechanism, by which banks overextend and misallocate credit when asset prices rise, and ration it when they drop. The paper concludes by discussing policy solutions to Europe's "bank bias", which include reducing regulatory favouritism towards banks, while simultaneously supporting the development of securities markets.

JEL Codes: G1, G2

Keywords: banks, financial structure, systemic risk, bank regulation

Non-technical summary

Since the early 1990s, Europe's banking system has expanded rapidly: much faster than Europe's economic output and wealth, and much faster than most other banking systems. Meanwhile, Europe's capital markets have barely grown. Europe's financial structure has therefore become strongly bank-based – far more so than in other advanced economies.
Being highly leveraged, banks respond disproportionately to changes in collateral values: balance sheets expand when asset prices rise, and contract when prices drop. This amplification mechanism underpins two predictions regarding the implications of Europe's bank-based financial structure.

First, we hypothesise that systemic risk tends to be higher in bank-based financial structures. When asset prices rise, banks' expansion occurs at the expense of credit quality. Banks' additional risk-taking is uncovered once asset prices drop. Second, we hypothesise that economic growth tends to be lower in bank-based financial structures, particularly during times of large drops in asset prices. Banks' excessive credit creation in the upswing of the financial cycle results in more funding being directed to bad projects with low productivity, while insufficient credit creation in downswings means that good opportunities are forgone.

We test these two predictions empirically. To do so, we assemble a large international panel dataset, which includes observations on the size of countries' banking systems and stock and private bond markets; banks' systemic risk-taking; economic growth; and housing and stock prices.

The results of our panel regressions accord with both hypotheses. First, bank-based financial structures are associated with more systemic risk-taking by banks, controlling for bank and year fixed effects and time-varying bank characteristics such as size and leverage. The increase in systemic risk is particularly strong when real house prices drop by more than 10%, reflecting the importance of housing as collateral. Second, we find that bank-based financial structures are associated with lower economic growth, particularly when real house prices drop substantially. This finding holds when we address the potential endogeneity of financial structure to economic growth.

This empirical analysis highlights the social costs of excessive reliance on banks, which we refer to as a "bank bias". To reduce Europe's bank bias, policymakers could act on two fronts. First, policymakers could continue to remove the regulatory favour hitherto afforded to Europe's banks. Recent reforms strengthening the regulation, supervision and resolution of banks in Europe are important steps forward, but more could be done to cap the growth and size of large banks, which account for most of Europe's "bank bias". Second, policy should encourage deeper and broader security markets, as envisaged by the EU Commission's goal of a "capital markets union". Useful steps towards this capital markets union would include the integration of stock trading platforms in Europe; a reduction of the fixed costs faced by small and medium firms in accessing capital markets; greater standardisation of corporate bond issues and private placement transactions; and measures to improve the depth and quality of asset-backed securities markets.

"Looking at our past experience, the absence of an alternative funding channel increased overall economic risk – because the bank lending channel got clogged. Better to have a plurality of channels financing the real economy than to rely on just one."

ECB President Mario Draghi at the European Parliament on 17 November 2014

1. EUROPE'S BANKING SYSTEM IN PERSPECTIVE

Europe is home to the world's largest banking system. The total assets of banks in the EU amounted to €42tn (334% of EU GDP) in 2013. By contrast, Japanese banks' assets added up to €8tn (196% of Japan's GDP), while US banks' assets were worth €11tn (88% of US GDP). Converting the US figure to international accounting standards would add €3.5tn,[1] bringing the US banking system to 115% of US GDP – still just over a third of the size of Europe's banking system.[2]

Europe's banking system has not always been extraordinarily large, as Figures 1 and 2 reveal. From 1880 until the 1960s, bank assets to GDP fluctuated around 70% in both the US and major western European countries. In the late 1980s, bank assets amounted to about 180% of GDP in Japan and major western European countries. Only since 1990 has Europe's banking system grown so much larger than its international peers.[3]

See Figure 1

See Figure 2

Why have Europe's banks grown so much? One possible explanation could be the contemporaneous rise in the wealth of European households, documented by Piketty and Zucman (2014).[4] Banks, and financial firms more generally, provide wealth preservation services to households. Gennaioli, Shleifer and Vishny (2014) build a Solow-style growth model which captures this wealth preservation activity, and predicts that the size of financial intermediaries should grow in proportion to household wealth, rather than GDP.

In fact, the rise in European banks' assets has outpaced the rise in private wealth, as shown in Figure 3. Between 1880 and 1950, the ratio of total bank assets to private wealth fluctuated around 17% in Germany, the UK and the US. After 1950, the ratio in Germany and the UK trended upwards, reaching approximately 100% by 2011. Meanwhile,

[1] This €3.5tn adjusts for the underestimation of on-balance-sheet derivative positions by US local GAAP accounting standards compared to IFRS. To estimate this uplift, we extend Hoenig's (2013) calculations on G-SIB US banks to all major US banks with substantial derivatives books. This entails adding a GAAP-bank's off-balance-sheet derivative exposures to its reported total assets. Hereafter, all data and regression estimations shown in this paper use IFRS-equivalent estimations of US banks' total assets.

[2] Furthermore, including the assets of Fannie Mae and Freddie Mac would add €4tn (31% of US GDP).

[3] A similar pattern is obtained if the size of the banking system is measured by the ratio of bank loans (instead of bank assets) to GDP: according to data collected by Schularick and Taylor (2012), the ratio of European bank loans to GDP has become about 2.5 times its 1980 level, while in Figure 1 the ratio of European bank assets to GDP is 2.9 times its 1980 level. Additional evidence on the size of Europe's banking system is presented in Pagano *et al* (2014).

[4] Between 1980 and 2010, private wealth to GDP rose from 230% to 354% in Germany, 261% to 461% in the UK, and 302% and 351% in the US.

the US series remained flat at around 17%. The growth in household wealth therefore provides a reasonable explanation for the size of the US banking system, but it cannot account for the growth in bank assets in Germany and the UK.

See Figure 3

This enormous expansion of banking has rendered European countries' financial structures strongly bank-based. We characterise financial structure by the ratio of bank assets to the capitalisation of stock and private bond markets, and for brevity we refer to this measure as a country's bank-market ratio. This ratio was in decline in Germany and the UK in the late 1980s and early 1990s, but began to grow sharply from the mid-1990s, as Figure 4 shows. These trends are true also of the rest of Europe, as Figure 5 reveals. The reason for these trends is the burgeoning size of the banking system – coupled with a stock market that has fluctuated but not increased in value, and a private bond market which has barely grown. In contrast with these European trends, the US bank-market ratio has remained flat since 1995. Figure 6 shows that Europe's financial structure in 2011 was much more bank-based in comparison not only with the US, but also with other developed economies such as Japan, Canada and Australia. Even developing economies such as Brazil and India are less bank-based than any European country except Sweden.

See Figure 4

See Figure 5

See Figure 6

Given the tight connection between financial systems and macroeconomic performance, it is natural to question whether Europe's increasing dependence on banks has affected the stability and growth of its economy. We explore this issue by asking two related questions. First, is a more bank-based financial structure associated with greater systemic risk? Second, is it associated with worse economic growth performance, in the sense of a growth rate that is both lower on average and more sensitive to large drops in asset prices? In Section 2, we explain the rationale for these potential effects, based on theories of bank behaviour over the financial cycle. Sections 3 and 4 present and discuss empirical evidence regarding these two questions, and quantify the extent to which Europe's bank-based structure has contributed to systemic risk and affected economic growth.

As we shall see, Europe's bank-based financial structure has sizeable adverse economic implications: in this sense, it is warranted to label Europe's financial structure as exhibiting a "bank bias". In Section 5, we argue that this bias largely reflects political factors and policy choices. Different political attitudes and more enlightened policymaking could therefore reduce Europe's bank bias. Section 6 discusses policies which would encourage, in the words of ECB President Mario Draghi, "a plurality of channels financing the real economy".

2. BANK-BASED VS MARKET-BASED FINANCE: AN UNSETTLED DEBATE

The finance literature has long debated the relative merits of bank-based and market-based financing, seeking to establish whether and why either one of the two financial structures may be regarded as superior in terms of its effects on economic growth and on the allocation of risk (Allen and Gale, 2000). Reviewing this debate is useful, because it provides a conceptual backdrop and motivation for our subsequent empirical analysis.

A bank-based structure can contribute to economic growth by improving access to finance. Banks are specialists at mitigating asymmetric information problems between lenders and borrowers (Boot, 2000). As a result, banks diminish adverse selection through the *ex ante* screening of borrowers, and reduce moral hazard by monitoring firms' *ex post* investment decisions. Small firms, which typically have no access to securities markets owing to their modest size, are among the biggest beneficiaries of banks' information-processing role.

Security market participants do not have the same incentive to engage in these costly information-based activities, since free-riding by other market participants would largely prevent them from appropriating the benefits of screening and monitoring. Banks' mitigation of asymmetric information problems is particularly important for firms that do not have an established track record as creditworthy borrowers. In contrast, firms that have such a record can more easily access securities markets and obtain direct funding from investors (Diamond, 1991).

However, the superiority of banks in acquiring information about their borrowers is a mixed blessing: banks' informational advantage may induce them to appropriate a sizeable share of their borrowers' profits, thus thwarting borrowers' incentives to perform. This hold-up problem is analysed by Rajan (1992), who shows that it can be mitigated if a borrower also has some access to market-based funding, which provides external competition and thus reduces banks' bargaining power vis-à-vis their borrowers. Unfortunately, many firms, especially small and medium enterprises (SMEs), have no access to market-based funding, and therefore remain vulnerable to the hold-up problem.

Moreover, it is not clear that banks are superior to securities markets in their ability to mitigate borrowers' moral hazard. Stiglitz and Weiss (1983), among others, have argued that banks can discipline borrowers by punishing defaults with the refusal of further credit. However, even though the threat of such punishment may be optimal *ex ante*, the threat is not credible. Once default occurs, the lender's costs are sunk; if the borrower has another project with positive net present value, the bank will want to provide finance. Hence, the bank will renege on its *ex ante* threat to punish defaulters by continuing to extend credit – a practice known as "ever-greening" or forbearance. By contrast, securities markets tend to be more credible: defaulting borrowers typically find it difficult to restructure their bonds and obtain further funding. The transaction costs of renegotiating with many bondholders, rather than a single bank, tend to be large. Moreover, each bondholder has the incentive to "hold out" while allowing other bondholders to renegotiate – hence all bondholders hold out, and no renegotiation occurs (Dewatripont and Maskin, 1995).

Banks and markets also have comparative advantages in funding different types of projects. Owing to the bilateral nature of their relationships with borrowers, banks are better than markets at protecting confidential information regarding their clients' business plans – such as new products or technical breakthroughs – which can be very valuable in protecting their clients' competitive advantages (Yosha, 1995). On the other hand, securities markets tend to be better financiers of innovation when there is a wide diversity of prior beliefs about the expected value of new projects: optimistic investors can finance these projects, while pessimistic investors can remain uninvested (Allen and Gale, 1999). Historically, transformational technological innovations have tended to occur in countries with market-based financial structures (Allen, 1993), also because these structures tend to foster venture capital firms (Black and Gilson, 1998).

Hence, the theoretical literature has not established a clear-cut prediction regarding the superiority of bank-based or market-based finance in promoting the efficient allocation of funding, and thus on economic performance. In light of this, it may not be surprising that Levine (2002) finds no relationship between financial structure and economic growth in World Bank data covering the period between 1980 and 1995.[5] After carrying out many robustness checks, Levine concludes that:

"the results are overwhelming. There is no cross-country empirical support for either the market-based or the bank-based views. Neither bank-based nor market-based financial systems are particularly effective at promoting growth" (p. 403).

However, recent evidence suggests that these conclusions might not hold when the data are extended to include the past two decades (Gambacorta, Yang and Tsatsaronis, 2014; Pagano *et al*, 2014; Levine, Lin and Xie, 2015). One of the contributions of this paper is to extend this emerging literature by estimating the within-country effect of financial structure on economic growth, and by controlling for the endogeneity of financial structure, by instrumenting it with past reforms of financial regulation.

The effect of financial structure on economic growth is not the only dimension along which one can assess the relative merits of bank-based and market-based finance. Another key dimension is the extent to which banks and markets enable efficient risk-sharing and enhance the resilience of the economy to macroeconomic shocks. In this respect, banks' comparative advantage lies in their ability to collect private information about their borrowers through repeated interaction. Insofar as this information enables banks to identify solvent borrowers facing a temporary liquidity shortfall, banks can help these borrowers to overcome idiosyncratic liquidity shocks. Insuring firms against liquidity shocks is regarded as the quintessential feature of "relationship banking", whereby a firm borrows mainly or exclusively from a single bank over a long period of time. Evidence suggests that firms with close relationships with banks pay lower interest rates and are less likely to pledge collateral (Berger and Udell, 1995). The informational superiority of relationship banking may also increase the resilience of the economy during crises, according to the model in Bolton,

[5] Levine (2002) measures financial structure by the ratio of either domestic stock trading or stock market capitalization to the credit extended by banks to the private sector.

Freixas, Gambacorta and Mistrulli (2013), who also present evidence that Italian relationship banks continued lending to solvent firms following the bankruptcy of Lehman Brothers. In the same vein, Beck, Degryse, De Haas and van Horen (2014) show – using data from 21 countries in central and eastern Europe – that relationship lending alleviated firms' credit constraints during the cyclical downturn of 2008-09, but not during the boom period of 2005.

However, in most countries relationship banks account for a modest portion of total bank lending. In a sample of 1,079 firms in 22 European countries, only 14.5% of firms had borrowed from a single bank and another 18.8% had borrowed from two banks (Ongena and Smith, 2000). Hence, the stabilizing role of relationship banking does not dominate the aggregate behaviour of bank lending. On the contrary, at the macroeconomic level, bank lending is more volatile and pro-cyclical than bond financing, especially during financial crises. As Figure 7 shows, bank loans to euro area firms dropped substantially between 2009 and 2011, but expanded much more in the early 2000s. Moreover, Figure 7 shows that the two types of financing are partial substitutes: in both the subprime crisis and the euro area debt crisis, bank loans to euro-area firms dropped, while their debt security financing expanded, relative to GDP. Firms with access to debt security markets were able to respond to the contraction in bank loan supply by issuing more debt securities. A similar picture emerges from US flow of funds data: the bank loan series is strongly pro-cyclical, while bond financing is more stable and less affected by recessions, and even rose over the recent financial crisis.[6]

See Figure 7

This greater cyclicality of bank lending compared to bond financing may stem from banks' high leverage. When asset prices rise, the increase in the value of collateral and of firm equity allows banks to expand credit, which in turn feeds back into asset prices, prompting further credit expansion – as shown by Bernanke and Gertler (1989), Kiyotaki and Moore (1997) and Bernanke, Gertler and Gilchrist (1999). The highly leveraged nature of banks further amplifies the operation of this mechanism: when asset prices increase, banks' own equity value increases, so that loans can be expanded by a multiple of the gains on banks' equity, even while keeping their leverage ratio unchanged. By the same token, an asset price drop forces banks to deleverage, driven both by market and regulatory pressures.[7] This aggregate deleveraging process induces a recessionary impulse, which exacerbates the initial asset price decline, prompting further deleveraging. Hence, banks' high leverage creates a mechanism that amplifies the impact of asset price shocks both on

[6] There is consistent evidence of the substitution between loans and bond financing in recessions. Adrian, Colla and Shin (2012) document that, although US bank lending to firms declined during the 2007-09 crisis, bond financing increased to make up much of its drop. Becker and Ivashina (2014) document substitution from bank loans to debt securities during times of tight monetary policy, tight lending standards, high levels of non-performing loans, and low bank equity prices. Finally, Grjebine, Szczerbowicz and Tripier (2014), using a quarterly panel of 25 countries over the period 1989-2013, find that "the substitution of loans for bonds is a regular property of business cycles".

[7] The pro-cyclical behaviour of bank lending may at least partly be attributed to regulatory requirements. For instance, Adrian, Colla and Shin (2012) argue that banks' credit supply decreases during a recession because they are forced to reduce their exposure to rising default risk in order to satisfy a Value-at-Risk constraint.

lending and economic activity. Owing to the non-linearity of this amplification mechanism, relatively small negative shocks can lead to banking crises and persistent recessions (Brunnermeier and Sannikov, 2012; He and Krishnamurti, 2012; Boissay, Colliard and Smets, 2014). As a result, one would expect economic activity to be more sensitive to asset price fluctuations in bank-based structures than in market-based structures, owing to a greater build-up of risks during asset price booms and more pronounced deleveraging once asset prices drop substantially.

3. HYPOTHESES TO BE TESTED

The build-up of risk before financial crises and the sensitivity of economic activity to financial shocks is therefore expected to be larger in bank-based than in market-based structures. This central idea underlies two hypotheses.

The first hypothesis concerns the relationship between financial structure and banks' risk taking. When asset prices rise, banks' rapid credit expansion occurs at the expense of credit quality. As aggregate credit creation increases, banks are increasingly likely to finance risky and unprofitable borrowers, as the pool of creditworthy borrowers thins. Banks' systematic financing of loss-making projects is revealed only once asset prices revert and the mispricing of credit risk by banks is corrected.

Why do banks willingly expand credit volume at the expense of credit quality when asset prices rise? Asset price booms generally occur against the backdrop of abundant funding liquidity, which encourages banks to lower their credit standards. A rationale for this is offered by Acharya and Naqvi (2012): in their model, banks face random deposit withdrawals and, in the event of a liquidity shortfall, incur a penalty, as they are forced to "fire sell" assets. Absent moral hazard, this penalty induces banks to choose a lending rate that properly reflects the risk of the projects. But if loan officers' effort is unobservable, then it is optimal to tie officers' compensation to the quantity of loans that they originate, and randomly carry out a costly audit to determine whether officers have over-lent or under-priced loans. The time-consistent policy is to audit loan officers only when the liquidity shortfall is sufficiently large. So when the bank enjoys abundant liquidity, loan officers will rationally anticipate a lenient policy of infrequent audits, and will accordingly engage in excessive lending, charging an interest rate that under-prices credit risk.[8]

When many banks simultaneously engage in such behaviour, their excessive risk-taking can have systemic consequences, as the values of their exposures are highly correlated. When asset prices drop, banks will simultaneously deleverage, engage in collateral sales and prompt their customers to do the same: this process can lead to fire sales of assets and widespread defaults, resulting in economy-wide contagion. The magnitude of these phenomena should be greater in economies that are more dependent on bank credit, as bondholders and stockholders are typically less leveraged than banks and therefore tend to absorb losses stemming from asset price drops without generating

[8] Indeed, Maddaloni and Peydró (2011), Dell'Ariccia, Igan and Laeven (2012), Jiménez, Ongena, Peydró and Saurina (2014) and Altnubas, Gambacorta and Marques-Ibanez (2014) all find that, prior to the subprime mortgage crisis, the rapid expansion of credit and low policy interest rates softened bank lending standards.

simultaneous deleveraging and spill-over effects in the economy. These arguments lead to our first hypothesis, to be tested in Section 4.

Hypothesis 1: Financial Structure and Systemic Risk

Bank-based financial structures feature higher systemic risk than market-based structures, particularly during times of large drops in asset prices.

If bank-based financial structures indeed feature higher systemic risk, then structure is also likely to have implications for economic growth. When systemic risk is high, financial crises are more frequent and more severe. Crises tend to have a scarring effect, imposing long-lasting damage on economies (Reinhart and Rogoff, 2009). If the evidence is consistent with Hypothesis 1, then we should expect bank-based structures to reduce economic growth via its impact on the frequency and severity of financial crises.

Financial structure can also affect economic growth in non-crisis times. The amplification mechanism described above implies that banks, being highly leveraged, create excessive credit in good times (when asset prices are rising) and insufficient credit in bad times (when asset prices are falling). This pro-cyclicality of credit supply is likely to lead to an inefficient allocation of external funding. In good times, banks finance a large quantity of bad projects, harming economy-wide productivity growth.[9] Symmetrically, when asset prices fall substantially, the resulting deleveraging forces banks to deny credit to profitable projects. In many cases, these profitable investment opportunities cannot survive until banks return to their target leverage ratios and asset prices begin rising again. If entrepreneurs cannot obtain external funding from non-bank sources, as is likely in bank-biased financial structures, then the potential value in these investment opportunities will be permanently destroyed. These inefficiencies are exacerbated when banks engage in excessive forbearance of non-performing loans, tending to refinance low-productivity projects while refusing funds to new, more productive projects (Peek and Rosengren, 2005; Caballero, Hoshi and Kashyap, 2008; ESRB ASC, 2012). By engaging in excessive forbearance, banks distort the process of market entry and exit, and in doing so harm aggregate productivity growth (Disney, Haskel and Heden, 2003). By contrast, markets avoid throwing "good money after bad": owing to higher coordination costs, they can credibly commit to refuse to refinance unprofitable projects (Dewatripont and Maskin, 1995).

In summary, banks' credit creation features inefficiencies that could be detrimental to economic growth, both in the upswing and the downswing of the financial cycle. These inefficiencies are magnified during times of crisis. These arguments lead to the second hypothesis, which is tested in Section 4.

Hypothesis 2: Financial Structure and Economic Growth

Bank-based financial structures feature lower economic growth, particularly during times of large drops in asset prices.

[9] This was apparent in the housing and construction boom in Spain, where investment in housing as a proportion of total investment increased from just above 60% in the late 1990s to more than 70% in 2006, driven by an expansion in bank lending. This phenomenon is not new: Rajan and Ramcharan (2015) document that bank credit availability amplified the boom and bust in farm land prices in the US in the 1920s.

4. FINANCIAL STRUCTURE AND SYSTEMIC RISK

This section tests Hypothesis 1: that bank-based financial structures feature higher levels of systemic risk than market-based structures, particularly during times of large drops in asset prices. Banks expand their balance sheet and increase their risk-taking when asset prices rise, owing to higher values of collateral and bank equity. As bank-based structures tend to be more leveraged than market-based financial structures, one should observe greater systemic risk-taking in the former than in the latter. The risk is systemic in the sense that the risk-taking behaviour of banks during credit expansions threatens not only their individual stability, but that of the entire financial system, owing to contagion effects arising from contractual relationships, information externalities, fire-sale externalities, and common asset exposures. The losses arising from such systemic risk-taking only materialise in the downswing of the financial cycle when asset prices drop.

To test Hypothesis 1, we construct a dataset comprising systemic risk at the bank-level, alongside bank balance sheet characteristics, plus information on total bank assets and stock and private bond market capitalisation at the country-level. To capture banks' contribution and exposure to systemic risk, we use the variable SRISK, as calculated by New York University's Volatility Laboratory, based on work by Brownlees and Engle (2012) and Acharya, Engle and Richardson (2012). SRISK measures the euro-amount of equity capital that a bank would need to raise in the event that the broad stock market index falls by 40% over six months. A bank's SRISK is a function of its initial leverage and an estimate of its "downside beta" – that is, the sensitivity of the bank's equity value to large declines in the broad stock market index.

We divide SRISK by a bank's total assets to compute the quantity of systemic risk per unit of asset, which we label "systemic risk intensity". This normalisation is important, as it ensures that the results are not driven by the size of individual banks or a country's banking system. Furthermore, following Acharya, Engle and Richardson (2012), we replace negative observations on "systemic risk intensity" by truncating the variable at zero, since negative equity shortfalls do not contribute to systemic risk. More than half of the observations on this variable are negative, which implies that systemic risk creation is concentrated in a minority of banks.

The resulting dataset covers 517 listed banks resident in 20 different countries. The panel extends from 2000 to 2012, encompassing approximately 5,000 bank-year observations on the "systemic risk intensity" variable. After truncation, the mean is 1.4% and the observation at the 90th percentile is 5.1%. In our dataset, the highest observation on SRISK is Royal Bank of Scotland's €186bn in 2008; scaled by RBS's €2.5tn balance sheet, this corresponds to a "systemic risk intensity" of 7.4%.

These bank-level data are matched with country-year observations on the bank-market ratio, which is computed as total bank assets divided by the sum of stock and private bond market capitalisation. These two measures of market capitalisation are obtained from the World Bank's financial development and structure dataset, described in Beck, Demirgüç-Kunt and Levine (2000). To obtain a comparably large country panel of total bank assets, we turn to country-level sources, requiring careful attention to cross-country comparability.

Data on bank assets were collected on a host-country basis, meaning that we count the assets of all banks resident in that country, including branches and subsidiaries of foreign banks. Our definition of banks includes all credit institutions with a banking license to receive retail deposits, including savings institutions. Other monetary financial institutions, such as money market funds, are not included.

Hypothesis 1 postulates that systemic risk intensity is likely to be particularly high in bank-based financial structures during times of large drops in asset prices. To test this hypothesis, we compute two dummy variables to capture different types of financial crisis. The first dummy variable – "housing market crisis" – is equal to 1 when a country's real house prices drop by at least 10% in one year, and 0 otherwise. The second – "stock market crisis" – is equal to 1 when a country's real stock prices drop by at least 20% in one year, and 0 otherwise.[10] It is important to capture different types of financial crisis, since banks' balance sheets can respond differently to the price changes of different asset classes. Moreover, different financial crises often occur at different times. This is underscored by Figure 8, which plots the frequency of the two types of crisis between 1990 and 2011.

See Figure 8

These data are used to test the hypothesis that bank-based financial structures tend to feature greater systemic risk, particularly during times of large drops in asset prices. We estimate panel regressions with fixed effects, to control for time-invariant unobserved heterogeneity across countries, and with year dummies to control for effects which vary over time but not across countries. The dependent variable in these regressions is banks' systemic risk intensity. Since this variable is observed at bank-level, it is unlikely to have a reverse causal effect on financial structure, which is measured at the country-level. As such, we interpret the estimated coefficient of the bank-market ratio as the conditional effect of that variable on banks' systemic risk intensity.

Table 1 shows the results of the bank-level panel regression estimations. Results of the initial specification, shown in columns I and III of Table 1, reveal that bank-based countries feature greater systemic risk intensity at the bank-level. In column I, in which a crisis is defined as an annual real house price drop of at least 10%, the effect of the bank-market ratio on systemic risk intensity operates entirely through the positive coefficient of the interaction between the bank-market ratio and the crisis dummy. A change in the bank-market ratio outside of housing crises exerts no significant effect on systemic risk intensity. By contrast, in column III of Table 1, in which a crisis is defined as an annual real stock price drop of at least 20%, the coefficients of both the bank-market ratio and its interaction with the stock market crisis dummy are positive and significant.

[10] The "stock market crisis" dummy is therefore distinct from the SRISK variable. SRISK is computed as a bank's equity shortfall conditional on a hypothetical stock market crash of 40%, while the "stock market crisis" dummy takes the value of 1 following an actual stock market drop of more than 20%. Naturally, we expect the coefficient of the "stock market crisis" dummy to be positive, since the capital shortfall arising associated with a hypothetical stock market crash of 40% should be larger if it occurs in the wake of an actual stock market drop of more than 20%.

Columns II and IV of Table 1 control for three time-varying bank characteristics – bank size (measured as total liabilities), bank size relative to GDP, and leverage – all lagged by one year to mitigate endogeneity concerns. The conceptual rationale for the inclusion of these three variables is as follows. First, large banks tend to be more interconnected with other banks, which increases their importance within financial networks, particularly in derivatives markets, which feature high scale economies (Langfield, Liu and Ota, 2014). Large banks also tend to have less stable funding structures, more market-based activities, and more complex organisational structures. These features lead large banks to create more systemic risk (Laeven, Ratnovski and Tong, 2014). Second, a measure of size as a proportion to GDP captures the relative importance of that bank to the real economy, both in terms of a large share of deposits and in the ongoing provision of loans to the real economy. Size is one of the key indicators used by the Basel Committee to identify systemically important banks (BCBS, 2013). Such banks are more likely to receive public-sector support, in the form of extraordinary liquidity assistance and creditor bail-out in the event of distress, owing to their importance to the financial system and real economy. The moral hazard arising from this implicit subsidy leads large banks to take additional risk (Afonso, Santos and Traina, 2014). Third, highly leveraged banks are likely to have a higher systemic risk intensity, owing not only to the role of leverage in the construction of the SRISK variable, but also to the effect of low franchise value on shareholders' incentives to "gamble for resurrection" by requiring bank managers to take excessive risks (Admati and Hellwig, 2013). The coefficients of all three control variables in columns II and IV of Table 1 are statistically significant and have the expected positive sign.

Upon the inclusion of these additional controls, the estimated coefficients of the key variables of interest prove robust. Comparing columns I and II of Table 1, in which the crisis dummy is defined as a stock market crisis, the magnitude of the coefficient of the interaction term decreases only slightly, from 0.011 to 0.009, and remains significant at the 1% level of confidence. Comparing columns III and IV, in which the crisis dummy is defined as a stock market crisis, the significance of the interaction term disappears, although the coefficients of the bank-market ratio and of the crisis dummy both strengthen in terms of estimated magnitude and significance.

See Table 1

An increase in the bank-market ratio at country-level therefore tends to increase banks' systemic risk intensity – conditional on time-varying bank characteristics and year and fixed effects. The economic magnitude of this finding is visualised in Figure 9, which plots the predicted effect of a within-country change in financial structure on banks' systemic risk intensity over the distribution of the bank-market ratio. The right-hand-side of each graph corresponds to the most bank-based financial structure in our country-year panel. Crucially, the slope of the predicted effect conditional on a crisis is higher during housing market crises, reflecting the positive and significant coefficient of the interaction term estimated in column II of Table 1. By contrast, the coefficient of the interaction term is insignificant in column IV of Table I, in which the crisis dummy is defined as a stock market crash. As a

result, the two lines in the right hand side graph of Figure 9 have equal gradients. Both lines are upward-sloping, and the line referring to stock market crises has a higher intercept, reflecting the positive and significant coefficient of the crisis dummy in column IV of Table I.

See Figure 9

To garner further insight on the economic magnitude of the predicted effect, consider a hypothetical large bank with total liabilities of €1tn. Fixing the size of the bank affects the predicted systemic risk intensity, as the specifications shown in columns II and IV of Table 1 include bank size and bank size relative to GDP among the explanatory variables, and both of these variables are positively associated with systemic risk intensity. Fixing bank size permits a conversion of the "systemic risk intensity" variable into a euro-amount of systemic risk. By way of illustration, Figure 10 shows the predicted systemic risk contribution of a €1tn bank according to the bank-market ratio of five major countries in 2011: the United States, France, the United Kingdom, Germany and Italy. The differential effect across these five countries is sizable. During a housing market crisis, the model predicts that a €1tn bank resident in a country with a financial structure similar to Germany's, where the bank-market ratio was 5.7 in 2011, will contribute €78bn to systemic risk. By contrast, a €1tn bank resident in a country with a financial structure similar to that of the US, which had a bank-market ratio of 0.7 in 2011, will contribute €48bn to systemic risk during a housing market crisis – a differential of €30bn. In the absence of a housing market crisis, the differential in predicted systemic risk for a €1tn bank between the financial structures of Germany and the US drops to €10bn.

See Figure 10

Recall that negative observations on the dependent variable, "systemic risk intensity", are truncated at zero. Following Acharya, Engle and Richardson (2012), negative SRISK observations do not imply a contribution to systemic risk, but also do not reduce aggregate systemic risk, as surplus equity capital at individual banks cannot be redistributed throughout the banking system. Although this truncation makes sense economically, it could be problematic econometrically, resulting in biased panel regression estimations in Table 1. As a robustness check, we re-estimate the specification used in Table 1 with trimmed least squares estimators, as developed by Honoré (1992). This model results in consistent estimators in the context of a truncated dependent variable, while preserving our fixed-effects panel set-up.

Results of this trimmed least squared panel estimation, shown in Table 2, are largely consistent with those of the standard fixed effects panel regression estimations shown in Table 1. In all specifications, an increase in the bank-market ratio at the country-level is associated with more systemic risk intensity at the bank-level. In columns I and II of Table 2, in which the crisis dummy is defined as an annual real house price drop of at least 10%, we estimate positive and significant coefficients of the crisis dummy on its own and in interaction with the bank-market ratio. These are qualitatively the same as the results shown

in Table 1, although the predicted effect is smaller: comparing Tables 1 and 2, the estimated coefficient of the interaction between the bank-market ratio and the crisis dummy declines from 0.011 to 0.005 in column I, and from 0.009 to 0.006 in column II. In columns III and IV, in which the crisis dummy is defined as an annual real stock price drop of at least 20%, results are less clear-cut. The standard fixed-effects panel regression model in Table 1 delivered a positive and significant coefficient of the interaction term in column III, and an insignificant coefficient in column IV. By contrast, the trimmed least squares fixed-effects panel regression model estimated in Table 2 delivers negative and significant coefficients of the interaction terms in columns III and IV, although the magnitude of this effect is dominated by the estimated coefficients of the bank-market ratio and of the crisis dummy taken on their own.

See Table 2

Summing up, the estimates shown in Tables 1 and 2 suggest that an increase in a country's bank-market ratio tends to increase systemic risk intensity at the bank-level. Results suggest that much of this effect operates through the performance of the banking sector during housing market crises, when real house prices drop by more than 10% over one year. This finding can be viewed in light of the importance of mortgage lending in banks' balance sheets, as documented by Jordà, Schularick and Taylor (2014). As a result, changes in bank leverage are in large part guided by swings in the price of housing. By contrast, we obtain ambiguous results for the effect of a stock market crisis on the sensitivity of banks' systemic risk intensity to the bank-market ratio, suggesting that changes in stock market value are less important for systemic risk in bank-based financial structures.

5. FINANCIAL STRUCTURE AND ECONOMIC GROWTH

We now turn to Hypothesis 2, which postulates that more bank-based financial structures feature lower economic growth, particularly during times of large drops in asset prices. In Section 3, we found evidence that more bank-based financial structures feature higher systemic risk. Owing to the permanent damage that financial crises typically wreak on the real economy, we expect that the higher level of systemic risk observed in bank-biased structures would also lead to lower economic growth. In addition, the amplification mechanism determined by bank leverage implies excessive credit in good times and insufficient credit in bad times, leading to an economy-wide misallocation of real resources, and thus to lower long-run growth.

To test Hypothesis 2, we complement the dataset described in Section 3 with macroeconomic data, while dropping bank-level observations on systemic risk intensity. The resulting dataset contains 748 observations for 45 countries between 1988 and 2011. The binding constraint on the size of the dataset is the private bond market capitalisation variable, which is available for fewer countries than the stock market capitalisation variable, and for which observations begin only in the late 1980s in the World Bank's financial development and structure dataset. To avoid clouding the relationship between growth and

financial structure with fluctuations at business-cycle frequency, we divide our 1988-2011 panel into five non-overlapping periods of five years' duration, and use the average of each variable over five years as our observation unit. The resulting estimates are shown in Table 3. As a robustness check, we also estimate the regressions with yearly data and report the results in the Appendix.

The new dependent variable is the yearly growth in real GDP per capita, averaged over five-year periods. The independent variable of interest is the bank-market ratio, which is the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation, averaged over five years.

We estimate panel regressions with country-level fixed effects and time dummies, to control for unobserved time-invariant heterogeneity across countries and for common time-varying effects. In column III, we see that the bank-market ratio is negatively correlated with GDP growth, such that an increase in the size of a country's banking sector relative to stock and private bond market capitalisation is associated with lower GDP growth in the subsequent five-year period, conditional on time fixed effects. This result contrasts with Levine (2002), who – as mentioned in Section 2 – finds no relationship between financial structure and economic growth between 1980 and 1995. Pagano *et al* (2014) re-estimate the specifications reported in Levine (2002) using updated data, and find that more bank-based financial structures are conditionally associated with lower economic growth – consistent with the findings reported in Table 3. This time-varying relationship between financial structure and economic growth can be interpreted in light of the basic facts presented in Section 1: the banking system only started to become extraordinarily large from the mid-1990s, especially in European countries.

Columns II and III of Table 3 introduce crisis dummies, also interacted with the bank-market ratio. The introduction of crisis dummies permits us to test the hypothesis that growth in countries with a bank-based financial structure is more severely affected by financial crises than in countries with market-based structures. As in Tables 1 and 2, we classify two types of crises: a "housing market crisis" and a "stock market crisis". For consistency with the other variables, which are defined over five-year intervals, we now define the housing market crisis dummy as equal to 1 if real house prices drop at an average annual rate of at least 5% over five years, and 0 otherwise. Similarly, the stock market crisis dummy is equal to 1 if the domestic stock market index drops at an average annual rate of at least 10% over five years, and 0 otherwise. In terms of severity, these five-year thresholds are approximately equivalent to the 10% and 20% yearly thresholds which defined the two crisis dummies in Tables 1 and 2 (and in Tables A-1, A-3 and A-4 in the appendix).

The resulting estimates indicate that an increase in the bank-market ratio during housing market crises is associated with lower economic growth five years later. By contrast, the coefficient of the interaction between the stock market crisis dummy and the bank-market ratio is not significantly different from zero, as in column IV of Table 1. This finding reflects the important role played by house prices in determining the value of the collateral attached to bank loans. Consequently, when house prices drop, banks are constrained in their ability to provide new funding to profitable projects. The evidence presented in column II of Table 3 is consistent with the idea that the contraction in bank credit destroys the

potential value in transient profitable investment opportunities that fail to receive external funding, and that this amplification mechanism is more prominent in bank-based economies than in market-based ones. Likewise, based on 150 years of US data, Giesecke, Longstaff, Schafer and Strebulaev (2014) find that banking crises have strong and persistent effects on macroeconomic growth, while corporate default crises do not.

See Table 3

Figure 11 plots the predicted economic magnitude, based on the estimations shown in Table 3. The two graphs plot the modelled relationship between countries' bank-market ratio and GDP growth over the distribution of the bank-market ratio. Three insights stand out. First, the lines are downward sloping in both graphs, indicating a negative association between an increase in the bank-market ratio at country-level and predicted GDP growth five years later. Second, the dark grey line, which shows predicted GDP growth conditional on a financial crisis, always lies below the light grey line, which shows predicted GDP growth in non-crisis periods. This reveals the additional negative impact that crises have on GDP growth. Third, the slope of the dark grey line is particularly large conditional on a housing market crisis, which reflects the strongly negative coefficient of the respective interaction term estimated in column II of Table 3.

See Figure 11

To estimate the economic magnitude for major European countries, Figure 12 provides specific predictions based on the bank-market ratio in France, the UK, Italy and Germany in 2011, compared with that of the US. The predicted effects shown in Figure 12 are based on the estimated coefficients in column II of Table 3, in which the crisis dummy is defined as an average annual drop in real house prices of at least 5% over five years. We choose this specification because, during housing market crises, the bank-market ratio has a particularly strong and significant effect on economic growth, according to the estimations shown in Table 3. Figure 12 provides specific point estimates of predicted real GDP growth over the distribution of the bank-market ratio and conditional on a housing market crisis. For example, if a country's bank-market ratio were to increase from 133%, which corresponds to the US's ratio in 2011, to 324%, which corresponds to Germany's ratio in 2011, the predicted impact on annual growth in real GDP per capita of a five-year housing market crisis would increase by 3.6% points.

See Figure 12

The regressions estimated in Table 3 are potentially subject to endogeneity concerns. Unlike the regressions estimated in Tables 1 and 2, in which the dependent variable is observed at bank-level and the key independent variable (the bank-market ratio) is observed at country-level, Table 3 models the conditional relationship between two country-level variables: GDP growth and the bank-market ratio. GDP growth could plausibly

exert a reverse causal effect on the bank-market ratio, compromising a causal interpretation of the regression results shown in Table 3. In particular, a surprise increase in GDP growth would tend to increase stock and private bond market capitalisation immediately, given that capitalisation is measured at market prices. Bank total assets, however, would respond more gradually, as book values are slow to adjust. Therefore, the negative conditional relationship between GDP growth and the bank-market ratio that we estimate in Table 3 could in part reflect the negative causal impact of GDP growth on the bank-market ratio – although this concern is to some extent assuaged by the fact that our observations are five-year averages. Short-term fluctuations of the bank-market ratio induced by surprises in GDP growth at the business cycle frequency should largely disappear upon averaging both the growth rate and the bank-market ratio over five years.

To further control for the potential endogeneity of the bank-market ratio to GDP growth, we estimate instrumental variable (IV) regressions. The IV regressions use six measures of financial reforms as instruments, provided by Abiad, Detragiache and Tressel (2008): a measure of the strength and intrusiveness of banking sector supervision; a measure of security market liberalisation; a measure of ceilings on bank credit; a measure of interest rate liberalisation; a measure of privatisation of banks; and an indicator of the contestability of the banking market (that is, an inverse measure of barriers to entry). The choice of these instruments is motivated by the idea that a change in the legal and regulatory environment will affect financial structure in equilibrium. For example, an increase in our first instrument – the strength of banking sector supervision – should increase the relative attractiveness of non-bank intermediation. In terms of validity, these instruments are themselves potentially affected by endogeneity insofar as financial sector liberalisation is more likely to occur in fast-growing economies. To address this concern, we lag the observations on the financial sector reform instruments by six years (and take the five-year average of this lagged variable). After this time, the effect of financial sector liberalisation on GDP growth is likely to have fully petered out, leaving in the data only the effect on the level of GDP.

In the first-stage regressions reported in Column 1 of Table 4, the coefficients of the six measures of financial reform are jointly statistically significant: F-tests reject the null hypothesis that their coefficients are all zero at the 5% confidence level, implying that the instruments are conditionally correlated with the bank-market ratio. In particular, in column I, the estimated coefficients on measures of the strength and intrusiveness of banking sector supervision, and in some regressions also those of security market liberalisation, privatization and contestability of the banking market, are individually significant, and have the expected signs. In particular, the strength and intrusiveness of banking sector supervision is negatively associated with the bank-market ratio, since it moderates the relative attractiveness of bank-based finance.

See Table 4

Table 5 reports the results of the second-stage IV regression. Overall, the results are consistent with those in Tables 3, in the sense that an increase in the bank-market ratio

is associated with lower economic growth. This is true of all specifications reported in Table 5. However, the source of the effect varies. In column II, the coefficient of the interaction between the housing market crisis dummy and the bank-market ratio is significantly negative. This suggests that the contraction in lending and growth owing to banks' deleveraging is strongest during housing market crises. This finding emphasises the importance of housing and related assets on banks' balance sheets. By contrast, the coefficient of the interaction term in column III, in which the crisis dummy is defined as a stock market crisis, is positive, although it is significant only at the 10% level of confidence, and the magnitude of its effect on the bank-market ratio is dominated by that of the estimated coefficient of the bank-market ratio itself. Since the instrumental variable panel regression model is over-identified in all four specifications of Table 5, we perform the Sargan test of the over-identifying restrictions. As shown by the p-values reported at the bottom of Table 5, the Sargan test does not reject the over-identifying restrictions assumption even at the 10% level for any of the four regressions.

See Table 5

The results in Tables 3 and 5 yield two key common insights. First, bank-based structures have a negative effect on economic growth in all specifications. Second, housing market crises exert a strongly negative effect on economic growth in countries with bank-based financial structures, probably owing to the importance of assets related to housing on banks' balance sheets. Both of these insights are consistent with our second hypothesis.

6. WHY DID EUROPE DEVELOP A BANK BIAS?

Financial structures dominated by banks tend to have adverse effects on financial stability and macroeconomic performance, according to the evidence presented in Sections 4 and 5, so it seems appropriate to refer to Europe's current financial structure as featuring a "bank bias". In light of the negative effects of "bank bias", it is important to consider why banks became so dominant in Europe, as Section 1 documents. To understand the factors underlying Europe's increasing bank bias, it is worth noticing that its financial system has been increasingly dominated by the largest banks, not just by banks in general. To show this, we perform the following thought experiment. Suppose that the assets of the largest 20 European banks had grown in line with nominal GDP since 1996: then, what would have been the total size of Europe's banking system in 2012? The grey dashed line in Figure 13 plots this resulting "counterfactual ratio" between bank assets and GDP, while the black solid line plots the corresponding actual values. Strikingly, the near-doubling in the size of the EU banking system (relative to GDP) since 1996 is entirely attributable to the growth of the largest 20 banks.

See Figure 13

Explaining why Europe has developed an increasing bank bias amounts largely to asking which factors account for the growth of Europe's largest banks. As shown by the first-stage regressions shown in Table 5, changes in financial regulation and supervision have been significant drivers of the relative importance of banks and markets. Accordingly, in this section, we consider two public-policy factors: first, state support and prudential supervision of banks; and second, political support for banks. We argue that these two factors have been particularly supportive of the expansion of large banks in Europe.

6.1. Public Support and Prudential Supervision

In most countries, banking is one of the most regulated and closely supervised industries. The intensity of bank regulation and supervision arises from the peculiar severity of moral hazard problems in banking: banks borrow from a large pool of unsophisticated and dispersed depositors, creating risk-shifting incentives for banks' shareholders and managers. These moral hazard problems, coupled with banks' intrinsic fragility stemming from their maturity transformation function, explain why public policy typically protects depositors via insurance schemes and subjects banks to prudential regulation and supervision to curb their risk-shifting incentives and create equity buffers to absorb losses in case of distress.

However, intensive bank regulation and supervision might be inadequate, and engender unintended consequences. Deposit insurance schemes generate moral hazard, as they shift insolvency risk onto taxpayers. Capital requirements are often softened by banks, especially the largest ones, by exploiting loopholes in prudential regulation. Banks that are so large and interconnected with others that their collapse would threaten systemic stability can expect to be bailed out by the government in case of distress: they are "too big to fail" (TBTF). This implicit creditor bailout guarantee is a further source of moral hazard, beyond that implied by public deposit guarantees.

In turn, the public support granted to TBTF institutions may prompt bank managers to pursue size as an objective *per se*, in order to become systemically important and obtain the public subsidies afforded to systemically important banks. They can do so in a variety of ways: by expanding lending in areas where it is quickly and easily scalable, such as loans secured against housing (Manove, Padilla and Pagano, 2001); by acquiring other banks or merging with them; or by proprietary investment in securities. In all of these activities, bank managers will place relatively little weight on risk management, since the main objective is to expand the size of their balance sheet.

These factors, however, are not specific to Europe: while they may have driven growth in banks worldwide, they cannot explain why Europe's banking system expanded more, or why Europe's largest banks have grown so large. What is special about Europe that triggered these phenomena?

One possible explanation is that European governments have been particularly supportive of banks, especially large ones, both in the form of bailout guarantees and regulatory forbearance. Lambert and Ueda *et al* (2014) find that the magnitude of this implicit government subsidy of banks has declined somewhat from crisis peaks, but that it remains

substantial, especially in the euro area. Importantly, euro area banks continue to benefit from a greater reduction in funding costs owing to government support than US or even UK banks. This reflects not only the generally weaker state of euro area banks' balance sheets, but also differences in policy frameworks, such as that of bank resolution.

National supervisors in the EU have been far less inclined to shut down and liquidate distressed banks than the FDIC in the US, which has acquired a reputation for swift and efficient bank resolution. This transatlantic discrepancy is highlighted by Figure 14, which shows that far fewer EU banks have failed since 2008 compared with the number of banks that have been resolved by the FDIC in the US. Although the FDIC mostly resolves small banks with assets under $100m, it occasionally resolves medium and large banks. The largest bank ever resolved by the FDIC is Washington Mutual Bank, which held $307bn of assets at the time of its closure in September 2008. Only about 20 banks in the EU are larger than Washington Mutual; 7,238 EU banks are smaller, and could therefore feasibly be resolved by a European version of the FDIC.

See Figure 14

A low bank failure rate during a systemic banking crisis suggests a greater degree of regulatory forbearance by supervisors towards undercapitalised banks. Rather than resolving distressed banks, European authorities have often preferred to rescue them by favouring acquisitions by (or mergers with) other banks. Over the financial crisis, there are many examples of national governments and supervisors facilitating distressed mergers or acquisitions, despite concerns regarding excessive concentration and lack of competition.[11] Between August 2008 and February 2014, the EU Commission received 440 requests from EU member states to provide state aid to financial institutions. The EU Commission did not object to the vast majority (413) of these requests, although state aid approvals often entail bank restructuring requirements, which in some cases are substantial (EU Commission, 2011).

This "lack of exit" induced by public support for distressed and unprofitable banks helps to explain simultaneously both the increase in Europe's bank bias, and its coincidence with the growth of the largest banks. This policy has contributed to the increase in bank concentration, and at least partly explains the low frequency of bank failures in Europe. Moreover, by worsening banks' moral hazard problems, this strong government support is

[11] For example, Banco di Napoli, a distressed publicly-owned bank, was sold by the Italian government in 1997 for a nominal sum to Banca Nazionale del Lavoro and the Istituto Nazionale delle Assicurazioni, and resold in 2002 by these banks to the Sanpaolo IMI (which later merged with Banca Intesa). Similarly, the UK Treasury facilitated the merger of Lloyds with the ailing HBOS in September 2008, overruling the competition concerns raised by the Office of Fair Trading by not referring the case to the Competition Commission. In 2008-09, the Irish government brushed aside the Irish Competition Authority to promote mergers among distressed Irish banks. Other examples have arisen following the crisis: once Spain's property bubble burst in 2008, many of the cajas that had funded the housing boom were distressed or insolvent. The Banco de España's rescue strategy was to merge them with other banks. Seven cajas merged into a single entity – Bankia – in December 2010.

likely to correlate with greater risk-taking.[12] Thus, public support also helps to explain why greater bank bias is associated with greater systemic risk, as documented in Section 3.

What explains the greater public support given to distressed banks in the EU, as compared with the US? One can think of several reasons, aside from politics (the role of which will be discussed in the next section).

First, banking supervision in parts of Europe has historically been less effective than in the US. Until 2014, when a single supervisor was created in the euro-area, bank supervision in Europe was a national preoccupation – but the span of European mega-banks' operations was international. This mismatch impaired the effectiveness of national banking supervisors in the EU. Moreover, supervisors' power was impaired by a weak, even non-existent, bank resolution framework throughout the EU. That such a weak bank supervision may have contributed to the European bank bias is consistent with the results shown in Table 5.

Second, in Europe the universal banking business model is pervasive, as shown by Pagano *et al* (2014). Universal banks' securities trading arm can obtain funding at interest rates that reflect the public subsidies associated with their deposit-taking arm, increasing universal banks' incentive to take excessive risk in securities markets. The econometric analysis in Annex A4.2 of the Commission's report on implicit state guarantees to EU banks (EU Commission, 2014a) finds that the European banks that receive a larger implicit public subsidy are larger, riskier, more interconnected, less capitalised, and rely more on the wholesale market for funding: in short, they are large universal banks, with a strong presence in securities markets.

A third specificity of Europe is that, in the euro area, the expansion of banking rode on the back of the process of financial integration that accompanied and followed monetary unification. Lane (2013) and Lane and McQuade (2014) document that, before the crisis, international capital flows in the euro area were associated with abnormal expansions of credit and housing market bubbles in the "euro-area periphery": core country credit flowed into Spain, Ireland and Greece, funding housing and consumption booms in these countries; it also flowed from Germany, Austria and Italy to fund a similar boom in central and eastern Europe.

6.2. Political Factors

Throughout history, banking and politics have been closely connected (Calomiris and Haber, 2014). Political factors have played a particularly important role in the recent growth of European banks, especially the largest ones, in a variety of ways. One factor, already analysed above, is the public support given to distressed institutions, and its interaction with regulatory forbearance by prudential authorities. But public support to banks by politicians may extend far beyond the case of distressed banks.

[12] Marques, Correa and Sapriza (2013) find that the intensity of government support is positively related to measures of bank risk taking, especially over 2009-10.

First and foremost, European governments have nurtured the birth and growth of mega-banks that act as "national champions" in competition with foreign banks – an attitude that Véron (2013) labels "banking nationalism". This policy ranges from preferential treatment by governments to the protection against foreign competition and against takeover bids by foreign banks. The connection between banks and politics may also be self-reinforcing. Banks have been able to strengthen their dominance within Europe's financial structure over time by lobbying for favourable legislation; and, as they have become more vital to the functioning of financial markets and to the economy, they have increased their lobbying power vis-à-vis politicians.

Second, in some EU countries politicians have a direct interest in supporting some banks and ensuring their survival, because banks are either publicly owned or their management is politically appointed, either directly or indirectly. In Germany, public sector banks account for 46% of all bank assets (Hau and Thum, 2009), and are mainly of two types: the savings banks (*Sparkassen*), which have local or regional scope, and are owned by their respective municipalities or counties; and the regional banks (*Landesbanken*), which are major universal banks with nationwide and international operations. In Italy, political influence on banks is more indirect, but it is also pervasive: politicians, especially local ones, affect the governance of "banking foundations" (*fondazioni bancarie*), which in turn have important stakes in the share ownership structure of many banks, including the largest. The banks in which foundations have major equity stakes comprise 23% of total Italian banking assets, and the foundations' stakes typically amount to 20% or more of bank capital, although in several large banks they control boards with a smaller share of ownership, often via agreements with other shareholders (Jassaud, 2014). In Spain, the management of savings banks (*cajas*) is closely connected with local politicians, a connection that according to Garicano (2012) was a factor in the slow and ineffective response of Spanish prudential supervisors to the crisis, and the protracted forbearance of bad loans to real estate developers.

7. POLICY SOLUTIONS TO EUROPE'S BANK BIAS

Before turning to policy, let us recap the main findings of the paper. Section 1 documented that banking in Europe has expanded at an extraordinary pace, far more than in the US and Japan, especially since 1995. As a result, Europe's financial structure has become bank-biased, in the sense that the size of banks dwarfs that of the stock and private bond markets. Section 2 discussed theories that suggest that bank bias can raise systemic risk, particularly during times of large drops in asset prices; and that bank bias can lower economic growth, particularly during times of large drops in asset prices. Sections 3 and 4 produced evidence that is largely consistent with these two predictions: based on our estimations, Europe's bank-biased financial structure is associated with greater systemic risk and worse growth performance than would exist if its structure were more balanced. In Section 5, we argued that Europe's peculiarly bank-biased financial structure can be traced to particularly generous public support for banks, both through implicit bailout guarantees and supervisory

forbearance, coupled with a political attitude which favours "national champions" and publicly owned banks.

Reducing Europe's bank bias should therefore be an important intermediate objective of financial policy. To some extent, Europe's financial structure is already in the early stages of a re-balancing away from banks and towards market-based intermediation. Since 2011, European banks have downsized, creating slack in the supply of external funding which security markets have partly taken up (ECB, 2014). Primary corporate bond issuance has increased, alongside the total size of non-bank financial institutions which are associated with the development of securities markets, such as institutional investors. This re-balancing is somewhat cyclical: as Figure 7 shows using aggregate data, and as Becker and Ivashina (2014) document using firm-level data, bank loans and debt securities are partial substitutes. But the shift towards market-based finance is also likely to prove structural – an expectation which European policymakers share (Constâncio, 2014; Liikanen, 2014).

In Section 5, we argued that Europe's bank-biased financial structure arose largely due to past policies and political attitudes. As such, a substantial and long-lasting re-balancing of Europe's financial structure can only be achieved with appropriate reforms and changes in political attitudes, in particular on two fronts. First, policymakers should reduce regulatory favouritism towards banks. Many recent policy innovations go in this direction, as Section 6.1 documents – but more progress is needed, in particular in terms of structural reform targeted at large universal banks and a more stringent anti-trust policy. Second, policymakers should support the development of securities markets as an alternative source of external funding. Here, policy reform is in its early stages: the EU Commission has announced its intention to deliver a "capital markets union" in Europe, but its contents are still being debated (Hill, 2014; Juncker, 2014). Section 6.2 outlines how this capital markets union should be designed in a way which lowers Europe's bank bias, thereby reducing systemic risk and supporting economic growth.

7.1. Reducing Regulatory Favouritism Towards Banks

Recent reforms adopted by the EU establish a stricter regulatory regime for banks, by requiring banks to fund themselves with more and higher quality capital, tightening prudential supervision and improving the process of resolution of insolvent banks. Four policy innovations are particularly noteworthy:

- In July 2013, the fourth "capital requirements" legislative package – comprising both a regulation (CRR) and a directive (CRD) – entered into force. This legislation brings to the EU the expected benefits of the Basel III agreement. Importantly, the legislation creates new legal powers for authorities to impose additional capital requirements. For example, authorities can impose an additional systemic risk buffer on all (or a subset of) banks, with the intention to "prevent and mitigate long term non-cyclical systemic or macroprudential risks" (Article 133 of the CRD) – such as the elevated systemic risk associated with bank-biased financial structures

documented in this paper. More generally, imposing stricter capital requirements is important to reduce the inefficiencies associated with high leverage (Admati, DeMarzo, Hellwig and Pfleiderer, 2014).

- In November 2013, the "SSM regulation" – conferring bank-supervisory powers on the ECB – entered into force. The Single Supervisory Mechanism creates a new system of financial supervision comprising the ECB and the national competent authorities of participating EU countries. From the perspective of this paper, the SSM should help to combat the "banking nationalism" which hitherto fostered national banking champions and contributed to the EU's bank bias.
- In July 2014, the bank recovery and resolution directive (BRRD) entered into force. The BRRD will enable (from 2016) authorities to "bail-in" the eligible liabilities (including unsecured creditors) of banks subject to resolution. Resolution authorities will have substantial powers to intervene *ex ante* in banks which are deemed irresolvable. This should help reduce the TBTF subsidy given to EU banks.
- In August 2014, a regulation establishing a Single Resolution Mechanism (SRM) entered into force. The SRM establishes a resolution authority in the euro-area, and therefore will complement the SSM. As part of the SRM regulation, a Single Resolution Fund, financed *ex ante* by banks, will help to provide "bridge financing" for resolved banks. However, the resolution mechanism is extremely complex, and the resolution fund will not reach its target level (of 1% of insured bank deposits: about €55bn) until 2023.

These four policy innovations – CRD, SSM, BRRD and SRM – are necessary steps towards a healthy banking system in the EU. Higher bank capital requirements under the CRD will reduce the probability of bank failure, while resolution powers stemming from the BRRD ensure that resolution authorities will be able to respond in the event of bank failure. In the euro area, the establishment of the SRM is essential for the SSM to be effective: historically, one of the key impediments to effective prudential supervision in Europe has been the absence of crisis management and resolution policy tools.

Though necessary, these reforms are unlikely to be sufficient to substantially reduce Europe's bank bias. In particular, the effectiveness of the Single Resolution Mechanism faces three challenges. First, the SRM entrusts the decision to resolve a bank to many authorities: the ECB (as prudential supervisor), the Board of the SRM (which comprises five full-time members and representatives from national resolution authorities), the EU Commission and the EU Council, while it leaves implementation to national authorities. Second, the Single Resolution Fund might have limited capacity to support the resolution of a systemically important financial institution (Gordon and Ringe, 2014). Third, the EU resolution mechanism is not complemented by a centralised deposit insurance mechanism, unlike the FDIC in the US: hence, bank runs could occur in countries where banks are perceived as distressed, as depositors try to move their deposits to banks in countries with more trustworthy legal arrangements. This type of behaviour could interfere with the orderly resolution of a distressed bank. These three challenges – the complexity of the resolution

mechanism; the potentially insufficient scale of its funding; and the absence of a centralised deposit insurance mechanism – could therefore hinder the prompt and orderly resolution of large, systemically important banks in the EU.

A more direct and potentially effective correction of Europe's bank bias may come from "structural reform" of the EU banking system. The EU Commission has put forward a proposal (published in January 2014) for legislation that aims to separate the lending activity of banks from their security trading activity, with the aim of limiting their risk exposure and controlling systemic risk. The separation would apply only to banks of global systemic importance or beyond a certain size. The proposal would also ban banks' proprietary trading, in the narrow sense of trading specifically dedicated to taking positions for making a profit for the bank's own account. This proposal would help to reduce both the size of the largest banks and their risk-taking in securities markets. Separation would effectively eliminate the ability of large universal banks to fund their trading activities at interest rates that benefit from the public subsidies associated with their deposit-taking activities. This cross-subsidy raises large universal banks' incentives to take excessive risk in securities markets. Structural reform targeted at the largest banks would reduce Europe's bank bias by shrinking large banks' security trading activities, while at the same time mitigating the systemic risk that these banks tend to generate, as shown by the estimations in Section 4.

To complement structural reform targeted at the largest and most systemically relevant banks, the EU could also implement a more aggressive anti-trust policy. This would help to address Europe's bank-bias problem, which arose owing to the growth of its largest banks. Aggressive anti-trust policy would also curtail national governments' tendencies to protect and nurture "national champions" to the detriment of foreign competitors. Such policies would operate in synergy with the Single Supervisory Mechanism (SSM), which already creates greater distance between the supervisor and the largest banks, as compared with the *status quo ante*. Historically, EU competition policy has been only weakly applied to banks, except in some cases of conditional state aid approvals and cross-border acquisitions. This reflects the fact that the EU Commission has limited powers: unlike, for example, UK competition authorities, the Commission cannot address market structure issues, intervening whenever it detects excessive market power. Moreover, unlike the US, the EU has no hard ceiling on the maximum size of a single bank.[13] Hence, a more aggressive anti-trust policy is only possible if the powers of the EU Commission in this area are considerably strengthened.

7.2. Supporting the Development of Securities Markets

Reducing Europe's bank bias need not reduce European firms and households' access to external funding if policymakers simultaneously encourage the development of security markets (including the stock market, the corporate bond market, and markets for asset-

[13] US law prevents a bank from acquiring other banks after it has exceeded 10% of US deposits (see the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994). However, the law does not prohibit banks from exceeding the 10% ceiling through organic deposit growth. Indeed, three (nearly four) US banks currently exceed the 10% threshold.

backed securities) and other non-bank funding sources. Indeed, the results presented in Section 4 suggest that a more balanced financial structure would support economic growth by improving access to external funding, particularly during large asset price declines when banks tend to retrench.

Supporting the development of securities markets is a key objective of the Juncker Commission, which began its five-year term in November 2014. To this end, the Commission has pledged to deliver a "capital markets union" (Hill, 2014), complementing the newly established "banking union", which comprises the Single Supervisory Mechanism and Single Resolution Mechanism described in Section 6.1. The capital markets union is explicitly intended to "reduce the very high dependence on bank funding" which prevails in Europe (Juncker, 2014). The evidence presented in Sections 3 and 4 provides strong support for this goal of reducing Europe's bank bias.

How should policymakers design the capital markets union to achieve maximum effect? Unlike the banking union, which is comprised of two key pillars (the SSM and SRM), the capital markets union requires a multiplicity of policy reforms in order to provide sufficient impetus to the development of securities markets. In what follows, we highlight some key reforms that can be expected to support the development of the stock market, the corporate bond market, and markets for asset-backed securities. Some of these reforms are outlined in a Green Paper on "Building a Capital Markets Union", presented by the EU Commission in February 2015.

To develop the issuance of equity, policymakers could address the current fragmentation of stock exchanges in Europe. Unlike the US, which is served by the NYSE and NASDAQ, there is no stock exchange which serves the whole of Europe. Euronext – covering the Netherlands, France, Belgium and Portugal – is the only large multinational exchange. Fragmentation inhibits market liquidity – and thereby discourages issuance of new equity – for three reasons (Foucault, Pagano and Roell, 2013): first, fragmentation confers an advantage to informed investors, who have access to multiple exchanges, and therefore increases these investors' informational rents; second, fragmentation implies that several prices are quoted simultaneously, increasing search costs; and third, fragmentation prevents investors from taking full advantage of the "thick market externalities" arising from the fact that each additional market participant increases liquidity for all other traders (Pagano, 1989). However, favouring the consolidation of Europe's stock trading platforms is unlikely to be the best policy response to such fragmentation, as it would result in a lack of competition (Foucault and Menkveld, 2008): in the extreme, monopoly rents could erode all efficiency gains from consolidation. A more efficient policy would be to link markets together so that trades for a given security always occur at the best possible price. This is the approach adopted in the US with Regulation NMS, where the so-called "trade-through rule" obliges any trading platform to reroute marketable limit orders to the platform posting the best price for the execution of this order when it is submitted. Of course, this approach also has its drawbacks, as it emphasises the quality rather than the speed of order execution, whereas some investors (such as high-frequency traders) value the latter more than the former. But the approach would allow competing platforms to be integrated in a single network, and hence to effectively behave as a single stock market.

However, an integrated, hence highly liquid, pan-European stock market might still fall short of its potential if the number of listed companies remains limited. Policymakers' attention should therefore also address the obstacles that prevent small and medium sized enterprises' (SMEs') access to initial public offerings (IPOs). Currently, stock exchanges are generally not well geared towards SMEs, since fixed costs associated with IPOs and subsequent listing requirements are relatively high. Some specialised exchanges attempt to limit fixed costs by limiting pre-IPO filing requirements, but equity issuance via such exchanges is still relatively limited.[14] To further reduce the fixed costs of IPOs for smaller firms, policymakers could explore how to simplify the prospectuses that firms must file before an IPO, streamline its approval process, and even relax disclosure and audit requirements on certain listed firms.[15] Moreover, the deep-seated cultural reluctance of many small European firms to go public could justify initial subsidies or preferential treatment in order to provide impetus for the development of specialised stock exchanges. This would also encourage the development of the financial "ecosystem" that complements stock exchanges, which has deteriorated in Europe in the past decade – namely venture capital firms for potential future issuers; advisory services for issuers; auditors for listed firms; and third-party assessors/analysts, brokers and market-makers for investors (Giovannini and Moran, 2013).

The issuance of corporate bonds, including covered bonds, could be increased by encouraging the standardisation of issuance, including of characteristics such as coupons and maturities. This would permit existing issues to be reopened, rather than creating new bespoke securities – thus reducing the number of distinct bonds. If such reopening were to occur via auctions, issuers would also save underwriting fees, thereby reducing the "barrier to entry" which prevents many medium-sized firms in Europe from raising external funding via bond issuance. Moreover, the standardisation of maturity dates and their alignment with bond futures and credit derivatives would facilitate hedging (CGFS, 2014). The liquidity of corporate bond markets may be further enhanced by transforming them from over-the-counter (OTC) markets, which are typically decentralised, opaque and illiquid, to electronic limit-order-book (LOB) markets, which are centralised, more transparent, and offer cheaper trade execution. Standardisation would also be helpful to promote the marketing of bond issuances to final investors. To improve transparency and comparability of credit risk across firms, a common template for prospectuses could be used, as in the US (Dixon, 2014).

The non-bank financing of firms could also be encouraged by developing pan-European private placement markets to provide private debt financing to unlisted companies and to listed but unrated companies. Steps in this direction may include overcoming discrepancies between national insolvency laws, and standardizing the processes,

[14] In Germany, the Neuer Markt – an attempt by Deutsche Börse to facilitate IPOs for SMEs with high growth potential –closed in 2003. Its more successful British cousin – LSE's AIM – has 1,099 listed firms with a total market cap of £72bn (as of November 2014), but just 12 of these firms (with total market cap of less than £1bn) are incorporated in continental Europe (i.e. outside of Britain and Ireland) – so this is a negligible source of external finance for continental European SMEs.

[15] For example, disclosure and audit requirements could be relaxed on firms classified in "SME growth markets", as defined in Article 33 of the European Union's Markets in Financial Instruments Directive (MIFID) II.

documentation and information about issuers at EU level. The provision of non-bank financing could also be greatly expanded by the development of bank loan mutual funds and business development companies (BDCs), which in the US provide a sizeable portion of medium-sized firms' debt financing.[16]

Markets for asset-backed securities (ABS) represent another potential source of non-bank funding. The credit underlying ABS is typically originated by banks, but the structured and somewhat standardised nature of these securities permits tranches to be sold, typically over-the-counter, to non-bank investors. ABS therefore expand the potential funding available to firms and households, while retaining banks' comparative advantage in originating loans. Securitisation has gained a bad reputation from securities based on US sub-prime mortgages, which collapsed in value over 2007 and 2008 as risks had been systematically underestimated (Keys, Mukherjee, Seru and Vig, 2010). European ABS markets have not recovered since 2008 (Altomonte and Bussoli, 2014; Nassr and Wehinger, 2014) – even though structured credit in Europe had much lower default rates than in the US over the crisis, according to the ECB and Bank of England (2014).

Securitisation activity may have been subdued in part by the calibration of current regulations – particularly the CRD IV package and Solvency II – which penalise holdings of structured credit relative to other assets with similar risk characteristics. In addition, European ABS markets may be held back by the bad track record developed by ABS in the US sub-prime crisis, but this reputational problem could be addressed by enhanced transparency and comparability of risk characteristics across products and geographies. Authorities could develop a data warehouse containing standardised and granular information on firms' credit risk – in the short-run by granting non-bank investors access to existing national credit registers, and in the medium-run by developing a European credit register accessible to both bank and non-bank investors (Almeida and Damia, 2014).

[16] BDCs are permanent-life vehicles subject to a 1:1 debt-equity ratio limit and to diversification requirements. BDCs raise capital from both institutional and retail sources, and perform rigorous screening and monitoring of their borrowers. Beltratti, Bock and Nelson (2015) show that in terms of total return performance BDCs have outperformed most other asset classes, also on a risk-adjusted basis, and that during the crisis they performed much better than bond and loan indices.

REFERENCES

Acharya, Viral, Robert Engle and Matthew Richardson (2012). "Capital shortfall: A new approach to ranking and regulating systemic risks." *American Economic Review*, 102.3: 59-64.

Acharya, Viral and Hassan Naqvi (2012). "The seeds of a crisis: A theory of bank liquidity and risk taking over the business cycle." *Journal of Financial Economics*, 106(2): 349-366.

Admati, Anat and Martin Hellwig (2013). *The Bankers' New Clothes: What's wrong with banking and what to do about it*. Princeton University Press.

Admati, Anat, Peter DeMarzo, Martin Hellwig and Paul Pfleiderer (2014). "The leverage ratchet effect." Working paper.

Adrian, Tobias, Paolo Colla and Hyun Song Shin (2012). "Which financial frictions? Parsing the evidence from the financial crisis of 2007-9." NBER Working Paper No. 18335.

Afonso, Gara, João Santos and James Traina (2014). "Do 'too-big-to-fail' banks take on more risk?" *Federal Reserve Bank of New York Economic Policy Review*.

Allen, Franklin (1993). "Stock markets and resource allocation." In: *Capital Markets and Financial Intermediation*, Colin Mayer and Xavier Vives (eds.). Cambridge University Press.

Allen, Franklin and Douglas Gale (1999). "Diversity of opinion and the financing of new technologies." *Journal of Financial Intermediation*, 8: 68-89.

Allen, Franklin and Douglas Gale (2000). *Comparing Financial Systems*. MIT Press.

Almeida, Ana M de and Violetta Damia (2014). "Challenges and prospects for setting-up a European Union shared system on credit." Irving Fisher Committee bulletin no.37: proceedings of the BIS Porto workshop on "Integrated management of micro-databases".

Altnubas, Yener, Leonardo Gambacorta and David Marques Ibanez (2014). "Does monetary policy affect bank risk?" *International Journal of Central Banking*, 10(1): 95-135.

Altomonte, Carlo and Patrizia Bussoli (2014). "Asset-backed securities: The key to unlocking Europe's credit markets?" Bruegel.

Basel Committee on Banking Supervision (BCBS) (2013). "Global systemically important banks: updated assessment methodology and the higher loss absorbency requirement."

Beck, Thorsten, Berrak Buyukkarabacak, Felix Rioja and Neven Valev (2012). "Who gets the credit? And does it matter? Household vs. firm lending across countries." *The B.E. Journal of Macroeconomics*, 12(1).

Beck, Thorsten, Aslı Demirgüç-Kunt and Ross Levine (2000). "A new database on financial development and structure." *World Bank Economic Review*, 14: 597-605.

Beck, Thorsten, Hans Degryse, Ralph de Haas, and Neeltje van Horen (2014). "When arm's length is too far: Relationship banking over the business cycle." CentER Discussion Paper no. 2014-042.

Becker, Bo and Victoria Ivashina (2014). "Cyclicality of credit supply: firm level evidence." *Journal of Monetary Economics*, 62: 76-93.

Beltratti, Andrea, Jonathan Bock, and Gregory Nelson (2015). "BDCs – The most important commercial lenders you've never heard about." Working paper.

Berger, Allen N. and Gregory F. Udell (1995). "Relationship lending and lines of credit in small business finance." *Journal of Business*, 68(3): 351-381.

Bernanke, Ben S. and Mark Gertler (1989). "Agency costs, net worth, and business fluctuations." *American Economic Review*, 79(1): 14-31.

Bernanke, Ben, Mark Gertler and Simon Gilchrist (1999). "The financial accelerator in a quantitative business cycle framework." *Handbook of Macroeconomics*, volume 1, chapter 11, John B. Taylor and Michael Woodford (eds.), Elsevier.

Black, Bernard S. and Ronald J. Gilson (1998). "Venture capital and the structure of capital markets: Banks versus stock markets." *Journal of Financial Economics*, 47(3): 243-277.

Boissay, Fréderic, Fabrice Colliard and Frank Smets (2014). "Booms and banking crises." ECB Working Paper no. 1514.

Bolton, Patrick, Xavier Freixas, Leonardo Gambacorta, and Paolo E. Mistrulli (2013). "Relationship and transaction lending in a crisis." Temi di Discussione no. 917, Bank of Italy.

Boot, Arnoud (2000). "Relationship banking: what do we know?" *Journal of Financial Intermediation*, 9(1): 7-25.

Brownlees, Christian and Robert F. Engle (2012). "Volatility, correlation and tails for systemic risk measurement." Working paper.

Brunnermeier, Markus K. and Yuliy Sannikov (2012). "A macroeconomic model with a financial sector." *American Economic Review*, 104(2): 379-421.

Caballero, Ricardo J., Takeo Hoshi and Anil K. Kashyap (2008). "Zombie lending and depressed restructuring in Japan." *American Economic Review*, 98(5): 1943-1977.

Calomiris, Charles W. and Stephen H. Haber (2014). *Fragile by Design: The Political Origins of Banking Crises and Scarce Credit*. Princeton University Press.

Chakraborty, Indraneel, Itay Goldstein and Andrew MacKinlay (2014). "Do asset price booms have negative real effects?" Working paper.

Committee on the Global Financial System (CGFS) (2014). "Market-making and proprietary trading: industry trends, drivers and policy implications." CGFS Paper No.52.

Constâncio, Vítor (2014). "Beyond traditional banking: a new credit system coming out of the shadows." Speech at the 2nd Frankfurt Conference on Financial Market Policy: Banking Beyond Banks, organised by the SAFE Policy Center of Goethe University.

Cuñat, Vicente and Luis Garicano (2009). "Did good cajas extend bad loans? The role of governance and human capital in cajas' portfolio decisions." FEDEA monograph.

Dewatripont, Mathias and Eric Maskin (1995). "Credit and efficiency in centralized and decentralized economies." *Review of Economic Studies*, 62: 541-555.

Diamond, Douglas (1991). "Monitoring and reputation: the choice between bank loans and directly placed debt." *Journal of Political Economy*, 99(4): 689-721.

Disney, Richard, Jonathan Haskel and Ylva Heden (2003). "Restructuring and productivity growth in UK manufacturing." *Economic Journal*, 113(489): 666-694.

Dixon, Hugo (2014). "Unlocking Europe's capital markets union." Centre for European Reform.

ECB (2014). "Banking structures report." October.

EU Commission (2011). "The effects of temporary state aid rules adopted in the context of the financial and economic crisis." Commission Staff Working Paper.

EU Commission (2015). "Building a capital markets union." Green Paper.

European Systemic Risk Board Advisory Scientific Committee (2012). "Forbearance, resolution and deposit insurance."

Foucault, Thierry and Albert J. Menkveld (2008). "Competition for order flow and smart order routing systems." *Journal of Finance*, 63: 119-158.

Foucault, Thierry, Marco Pagano and Ailsa Roell (2013). *Market Liquidity: Theory, Evidence and Policy*. Oxford University Press.

Gambacorta, Leonardo, Jing Yang and Kostas Tsatsaronis (2014). "Financial structure and growth." BIS Quarterly Review, March.

Garicano, Luis (2012). "Five lessons from the Spanish cajas debacle for a new euro-wide supervisor." Banking Union for Europe: 79.

Gennaioli, Nicola, Andrei Shleifer and Robert Vishny (2014). "Finance and the preservation of wealth." *Quarterly Journal of Economics*, 129(3): 1221-1254.

Giesecke, Kay, Francis A. Longstaff, Stephen Schafer and Ilya A. Strebulaev (2014). "Macroeconomic effects of corporate default crisis: A long-term perspective." *Journal of Financial Economics*, 111(2): 297-310.

Giovannini, Alberto and John Moran (2013). "Finance for growth." Report of the High Level Expert Group on SME and Infrastructure Financing.

Gordon, Jeffrey N. and Wolf-Georg Ringe (2014). "Resolution in the European banking union: a transatlantic perspective on what it would take." Oxford Legal Studies Research Paper No. 18/2014.

Grjebine, Thomas, Urszula Szczerbowics and Fabien Tripier (2014). "Corporate debt structure and economic recoveries." Working paper.

Hau, Harald and Marcel P. Thum (2009). "Subprime crisis and board (in-)competence: Private vs. public banks in Germany." *Economic Policy*, 24(60): 701-751.

He, Zhiguo and Arvind Krishnamurthy (2012). "A model of capital and crises." *Review of Economic Studies*, 79(2): 735–777.

Hill, Jonathan (2014). "Capital markets union – finance serving the economy." Speech.

Hoenig, Thomas M. (2013). "Basel III capital: A well-intended illusion." Speech at the International Association of Deposit Insurers.

Honoré, Bo E. (1992). "Trimmed LAD and least squares estimation of truncated and censored regression models with fixed effects." *Econometrica*, 60(3): 533-565.

Jassaud, Nadège (2014). "Reforming the corporate governance of Italian banks." IMF Working Paper 14/181.

Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina (2014). "Hazardous times for monetary policy: what do 23 million loans say about the impact of monetary policy on credit risk-taking?" *Econometrica*, 82(2): 463-505.

Jordà, Òscar, Moritz Schularick and Alan M. Taylor (2014). "The great mortgaging: Housing finance, crises, and business cycles." NBER Working Paper no. 20501.

Juncker, Jean-Claude (2014). “A new start for Europe: My agenda for jobs, growth, fairness and democratic change.” Opening statement in the European Parliament plenary session.

Keys, Benjamin J., Tanmoy Mukherjee, Amit Seru and Vikrant Vig (2010). “Did securitization lead to lax screening? Evidence from subprime loans.” *Quarterly Journal of Economics*, 125(1): 307-362.

Kiyotaki, Nobu and John Moore (1997). “Credit chains.” *Journal of Political Economy*, 105(21): 211-248.

Laeven, Luc, Lev Ratnovski and Hui Tong (2014). “Bank size and systemic risk.” *IMF Staff Discussion Note*, 14/04.

Lambert, Frederic J., Kenichi Ueda, Pragyan Deb, Dale F. Gray and Pierpaolo Grippa (2014). “How big is the implicit subsidy for banks considered too important to fail?” Chapter 3 in *Global Financial Stability Report*, International Monetary Fund, April.

Lane, Philip R. (2013). “Capital flows in the euro area.” EU Commission Economic Papers no.497.

Lane, Philip R. and Peter McQuade (2014). “Domestic credit growth and international capital flows.” *Scandinavian Journal of Economics*, 116(1): 218-252.

Langfield, Sam, Zijun Liu and Tomohiro Ota (2014). “Mapping the UK interbank system.” *Journal of Banking & Finance*, 45: 288-303.

Levine, Ross (2002). “Bank-based or market-based financial systems: which is better?” *Journal of Financial Intermediation*, 11(4): 398-428.

Levine, Ross, Chen Lin and Wensi Xie (2015). “Spare tire? Stock markets, banking crises, and economic recoveries.” NBER Working Paper No. 20863.

Liikanen, Erkki (2014). “On a sound and growth-enhancing financial sector in Europe.” Speech at the financial risk and stability network joint conference in Berlin.

Manove, Michael, A. Jorge Padilla and Marco Pagano (2001). “Collateral vs. project screening: A model of lazy banks.” *RAND Journal of Economics*, 32(4): 726-744.

Nassr, Iota Kaousar and Gert Wehinger (2014). “Non-bank debt financing for SMEs: The role of securitisation, private placements and bonds.” OECD Journal: Financial Market Trends.

Ongena, Steven and David C. Smith (2000). “What determines the number of bank relationships? Cross-country evidence.” *Journal of Financial Intermediation*, 9(1): 26-56.

Pagano, Marco (1989). “Endogenous market thinness and stock price volatility.” *Review of Economic Studies*, 56(2).

Pagano, Marco, Sam Langfield, Viral Acharya, Arnoud Boot, Markus Brunnermeier, Claudia Buch, Martin Hellwig, André Sapir and Ieke van den Burg (2014). “Is Europe overbanked?” Report no.4 of the European Systemic Risk Board’s Advisory Scientific Committee.

Peek, Joe and Eric S. Rosengren (2005). “Unnatural selection: Perverse incentives and the misallocation of credit in Japan.” *American Economic Review*, 95(4): 1144-1166.

Piketty, Thomas and Gabriel Zucman (2014). “Capital is back: Wealth-income ratios in rich countries, 1700-2010.” *Quarterly Journal of Economics*, 129(3): 1155-1210.

Rajan, Raghuram G. (1992). “Insiders and outsiders: The choice between informed and arm’s-length debt.” *Journal of Finance*, 47(4): 1367-1400.

Rajan, Raghuram G. and Rodney Ramcharan (2015). “The anatomy of a credit crisis: the boom and bust in farm land prices in the United States in the 1920s.” *American Economic Review*, 105(4): 1439-77.

Rajan, Raghuram G. and Luigi Zingales (2003). “The great reversals: the politics of financial development in the twentieth century.” *Journal of Financial Economics*, 69(1): 5-50.

Reinhart, Carmen and Kenneth Rogoff (2009). *This Time is Different: Eight Centuries of Financial Folly*. Princeton University Press.

Schularick, Moritz, and Alan M. Taylor (2012). “Credit booms gone bust: Monetary policy, leverage cycles, and financial crises, 1870-2008.” *American Economic Review*, 102(2): 1029-1061.

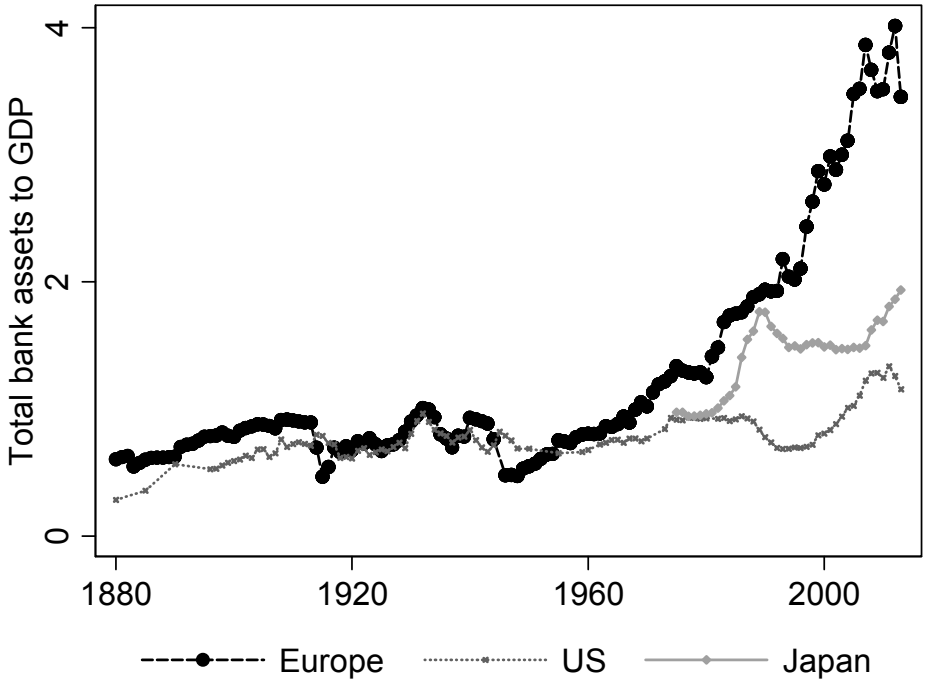
Stiglitz, Joseph E. and Andrew Weiss (1983). “Incentive effects of terminations: Applications to the credit and labor markets.” *American Economic Review*, 73(5): 912-927.

Véron, Nicolas (2013). “Banking nationalism and the European crisis.” Bruegel.

Véron, Nicolas (2014). “Defining Europe’s capital markets union.” Bruegel.

Yosha, Oved (1995). “Information disclosure costs and the choice of financing source.” *Journal of Financial Intermediation*, 4(1): 3-20.

Figure 1: Total bank assets to GDP: Europe, US and Japan

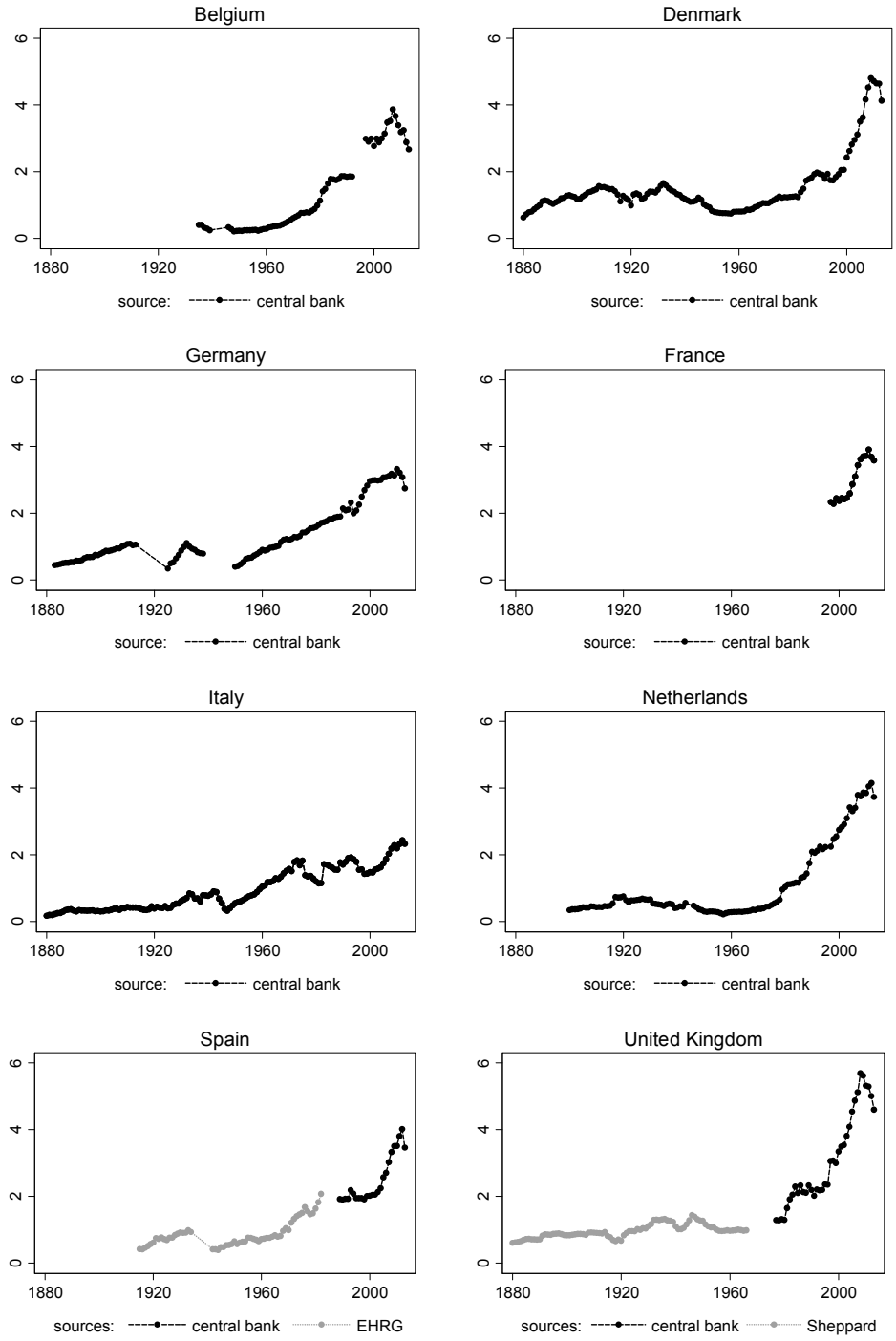


Notes: The "Europe" series represents the median of bank total assets to GDP in seven European countries for which reliable long time series data are available: Belgium, Denmark, Germany, Italy, the Netherlands, Spain and the UK. This median series tracks the (unreported) weighted mean very closely.

Sources: see endnote to Figure 2.

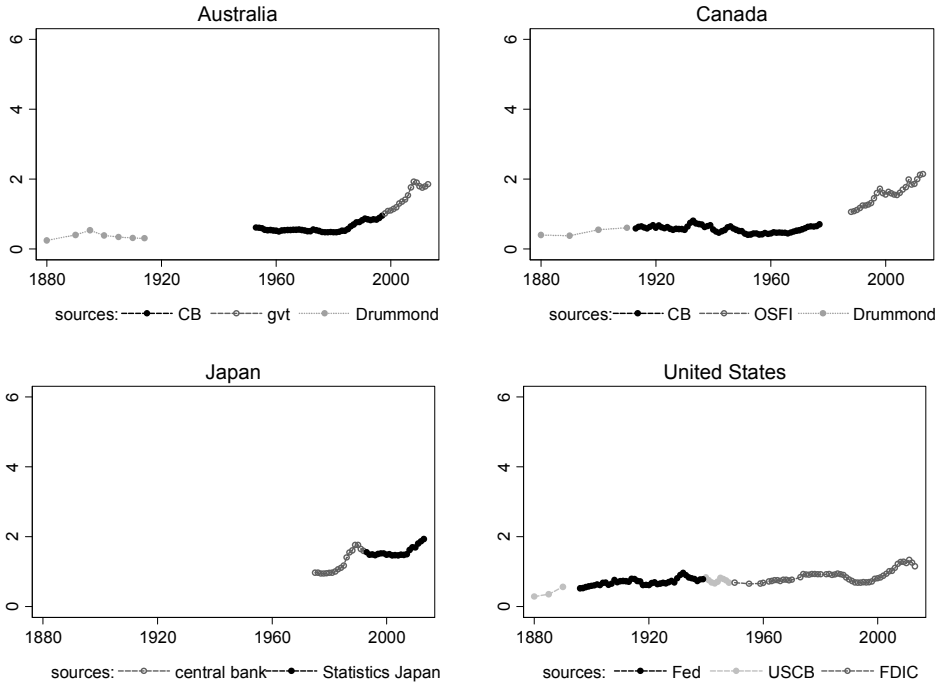
Figure 2: Total bank assets to GDP

Panel A: EU countries



Panel B: Non-EU European countries

Panel C: Non-European countries



Detailed source list:

Australia. Total bank assets: 1880, 1890, 1895, 1900, 1905, 1910, 1914: Drummond (1991); 1953-2013: Reserve Bank of Australia. Nominal GDP: 1880-2000: Mitchell (2008); 2001-2013: Australian Bureau of Statistics. ***Belgium.*** Total bank assets: *1935-1992*: National Bank of Belgium; *1997-2013*: ECB BSI. Nominal GDP: *1880-1994*: Smits, Woltjer and Ma (2009); *1995-2013*: National Bank of Belgium. ***Canada.*** Total bank assets: *1880, 1890, 1895, 1900, 1905, 1910, 1914*: Drummond (1991); *1913-1977* and *2003-2013*: Bank of Canada. Nominal GDP: *1880-1980*: Urquhart (1993) and Mitchell (2007b); *1981-2013*: Statistics Canada. ***Denmark.*** Total bank assets: *1880-2005*: Abildgren (2006); *2000-2013*: ECB BSI. Nominal GDP: *1880-2011*: Mitchell (2007a). ***France.*** Total bank assets: *1997-2013*: ECB BSI. Nominal GDP: *1880-1948:* Piketty and Zucman (2014); *1949-2013*: INSEE (Institut National de la Statistique et des Études Économiques). ***Germany.*** Total bank assets: *1883-1918* and *1925-1940* and *1950-2013*: Deutsche Bundesbank; *1997-2013*: ECB BSI. Nominal GDP: *1880-1913* and *1925-1938* and *1950-2006*: Mitchell (2007a); *2007-2013*: Statistisches Bundesamt. ***Italy.*** Total bank assets: *1880-2011*: Banca d'Italia; *1997-2013*: ECB BSI. Nominal GDP: *1880-1999*: Mitchell (2007a); *2000-2013*: ISTAT (Istituto Nazionale di Statistica). ***Japan.*** Total bank assets: *1975-1992*: Statistics Japan*; 1993-2013:* Bank of Japan. Nominal GDP: *1885-1954*: Mitchell (2008); *1955-1993*: Japanese Statistics Bureau; *1994-2013*: Japanese Cabinet Office. ***Netherlands.*** Total bank assets: *1900-2013*: De Nederlandsche Bank; *1997-2013*: ECB BSI. Nominal GDP: *1900-2013*: De Nederlandsche Bank. ***Norway.*** Total bank assets: *1880-2013*: Norges Bank. Nominal GDP: *1880-2013:* Grytten (2004). ***Spain.*** Total bank assets: *1915-1934* and *1942-2000*: Economic History Research Group (EHRG). *1997-2013*: ECB BSI. Nominal GDP: *1880-1958*: Prados de la Escosura (2003); *1959-1994*: Mitchell (2007a); *1995-2013*: Instituto Nacional de Estadística. ***Switzerland.*** Total bank assets: *1906-2008*: Swiss National Bank. Nominal GDP: *1880-1913* and

1924 and *1929-2011*: Halbeisen, Müller and Veyrassat (2012). ***United Kingdom.*** Total bank assets: *1880-1966*: Sheppard (1971); *1977-2013*: Bank of England. Nominal GDP: *1880-1976*: Bank of England; *1977-2013*: Office for National Statistics. ***United States.*** Total bank assets: *1880, 1885, 1890:* 'Statistical Abstract of the United States'; *1896-1939:* 'All-bank Statistics, United States, 1896-1955', Board of Governors of the Federal Reserve System; *1940-1949:* 'Statistical Abstract of the United States'; *1950-1983:* 'Statistical Abstract of the United States' and FDIC; *1984-2013:* FDIC. Nominal GDP: *1880-1928*: Carter *et al* (2006); *1929-2013*: Bureau of Economic Analysis.

References for historical total assets and GDP data

Abildgren, Kim (2006), "Monetary trends and business cycles in Denmark 1875-2005." Danmarks Nationalbank Working Papers, No. 43.

Carter, Susan B., Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch and Gavin Wright (eds.) (2006). *Historical Statistics of the United States: Millennial Edition*, vol.3.

Drummond, Ian M. (1991). "Banks and banking in Canada and Australia." In Rondo Cameron and V.I. Bovykin (eds.), *International Banking 1870-1914*.

Grytten, O.H. (2004). "The gross domestic product for Norway 1830-2003." Chapter 6 in Ø. Eitrheim, J.T. Klovland and J.F. Qvigstad (eds.), *Historical Monetary Statistics for Norway 1819-2003*, Norges Bank Occasional Paper no. 35.

Grossman, Richard S. (2010). "US Banking History, Civil War to World War II." Economic History Association.

Grytten, O.H. (2004). "The gross domestic product for Norway 1830-2003." Chapter 6 in Ø. Eitrheim, J.T. Klovland and J.F. Qvigstad (eds.). *Historical Monetary Statistics for Norway 1819-2003*, Norges Bank Occasional Papers no. 35.

Halbeisen, Patrick, Margrit Müller and Béatrice Veyrassat (2012). "Wirtschaftsgeschichte der Schweiz im 20. Jahrhundert." Schwabe Verlag Basel.

Mitchell, Brian R. (2007a). *International Historical Statistics 1750-2005: Europe.* Palgrave Macmillan.

Mitchell, Brian R. (2007b). *International Historical Statistics 1750-2005: Americas.* Palgrave Macmillan.

Mitchell, Brian R. (2008). *International Historical Statistics: Africa, Asia and Oceania, 1750-2005*. Palgrave Macmillan.

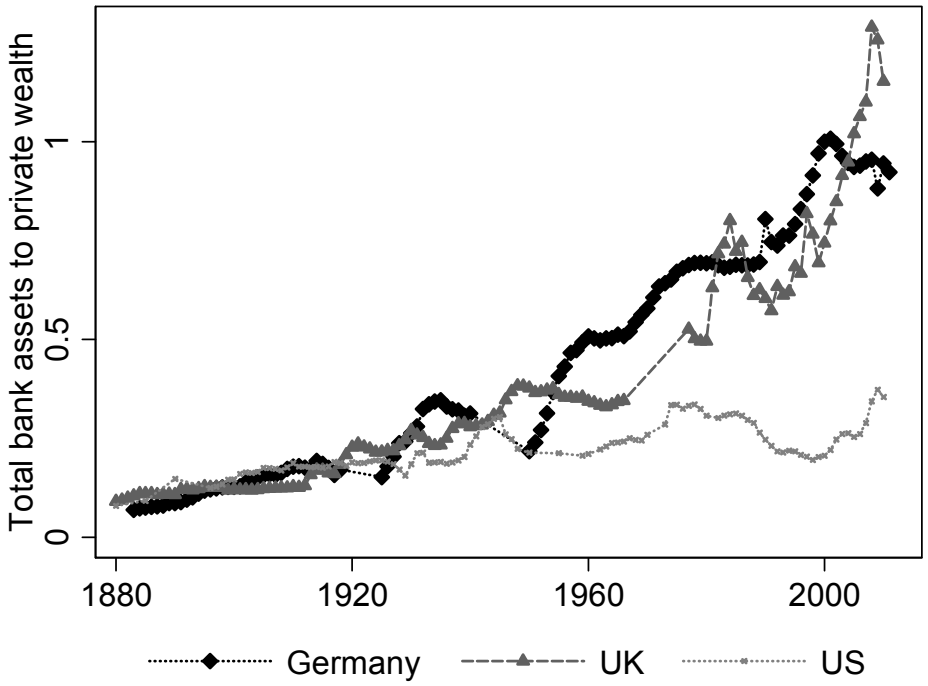
Prados de la Escosura, L. (2003). "El Progreso Económico de España, 1850-2000." Bilbao: Fundación BBVA.

Sheppard, David K. (1971). *The Growth and Role of UK Financial Institutions 1880-1962*. Methuen.

Smits, Jan-Pieter, Pieter Woltjer and Debin Ma (2009). "A dataset on comparative historical national accounts, ca. 1870-1950." University of Groningen research memorandum.

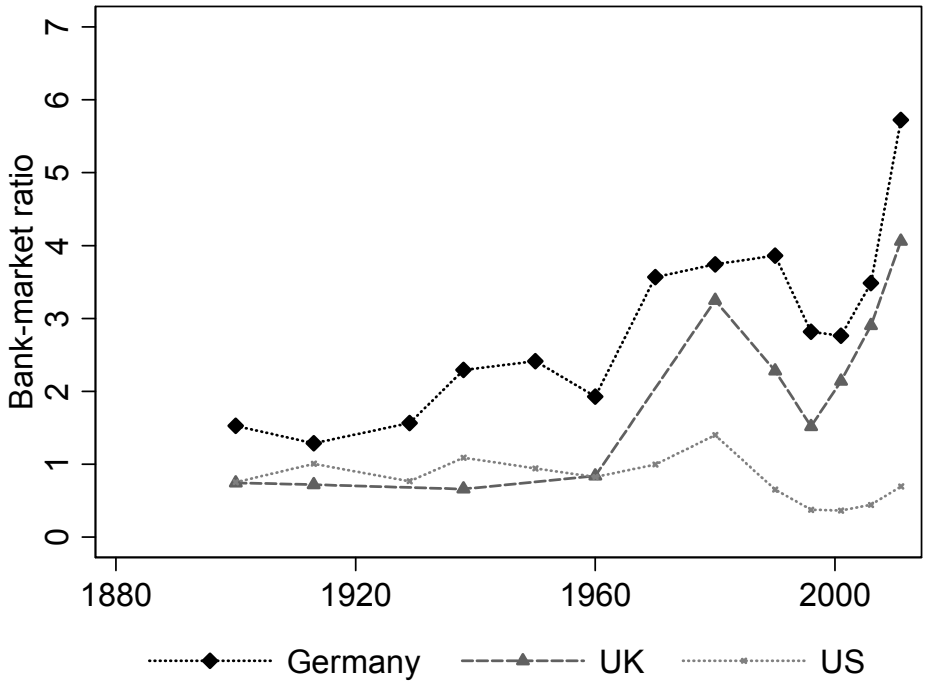
Urquhart, M. C. (1993). *Gross National Product, Canada, 1870-1926: The Derivation of the Estimates*. McGill-Queen's University Press.

Figure 3: Total bank assets to private wealth: Germany, UK and US



Sources: Piketty and Zucman (2014) for private wealth data. German bank assets data are sourced from the Deutsche Bundesbank. UK bank assets data are sourced from Sheppard (1971) for 1880-1966 and from the Bank of England for 1977-2013. US bank assets data are sourced from the 'Statistical Abstract of the United States' for 1880, 1885 and 1890; from 'All-bank Statistics, United States, 1896-1955', published by the Board of Governors of the Federal Reserve System, for 1896-1939; from the 'Statistical Abstract of the United States' for 1940-1949; from the 'Statistical Abstract of the United States' and FDIC for 1950-1983; and from FDIC for 1984-2013.

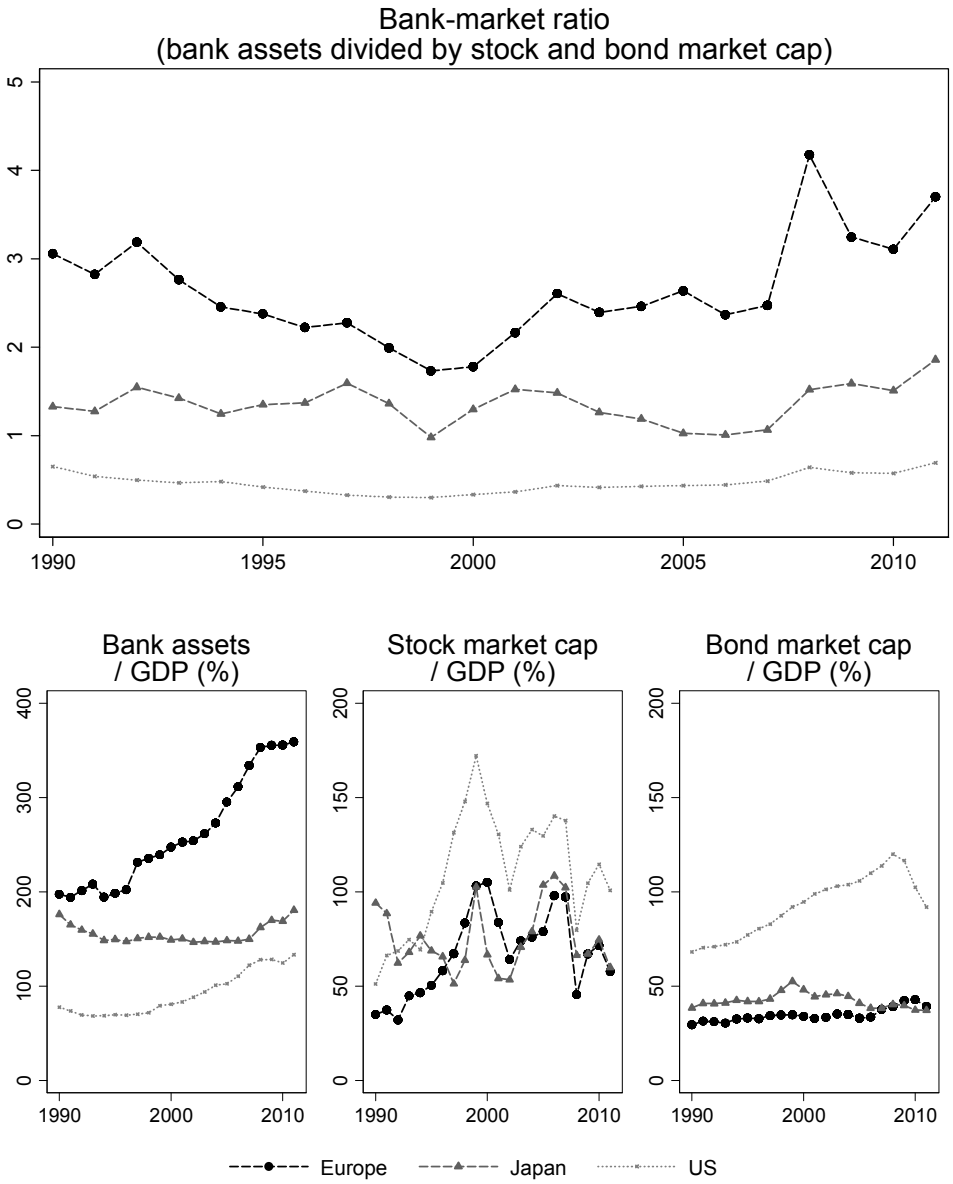
Figure 4: Financial structure since 1900 in Germany, the UK and the US



Notes: The bank-market ratio is defined as the ratio of total bank assets to stock and private bond market capitalisation.

Sources: Rajan and Zingales (2003) and World Bank for stock and private bond market capitalisation data. German bank assets data are sourced from the Deutsche Bundesbank. UK bank assets data are sourced from Sheppard (1971) for 1880-1966 and from the Bank of England for 1977-2013. US bank assets data are sourced from the 'Statistical Abstract of the United States' for 1880, 1885 and 1890; from 'All-bank Statistics, United States, 1896-1955', published by the Board of Governors of the Federal Reserve System, for 1896-1939; from the 'Statistical Abstract of the United States' for 1940-1949; from the 'Statistical Abstract of the United States' and FDIC for 1950-1983; and from FDIC for 1984-2013.

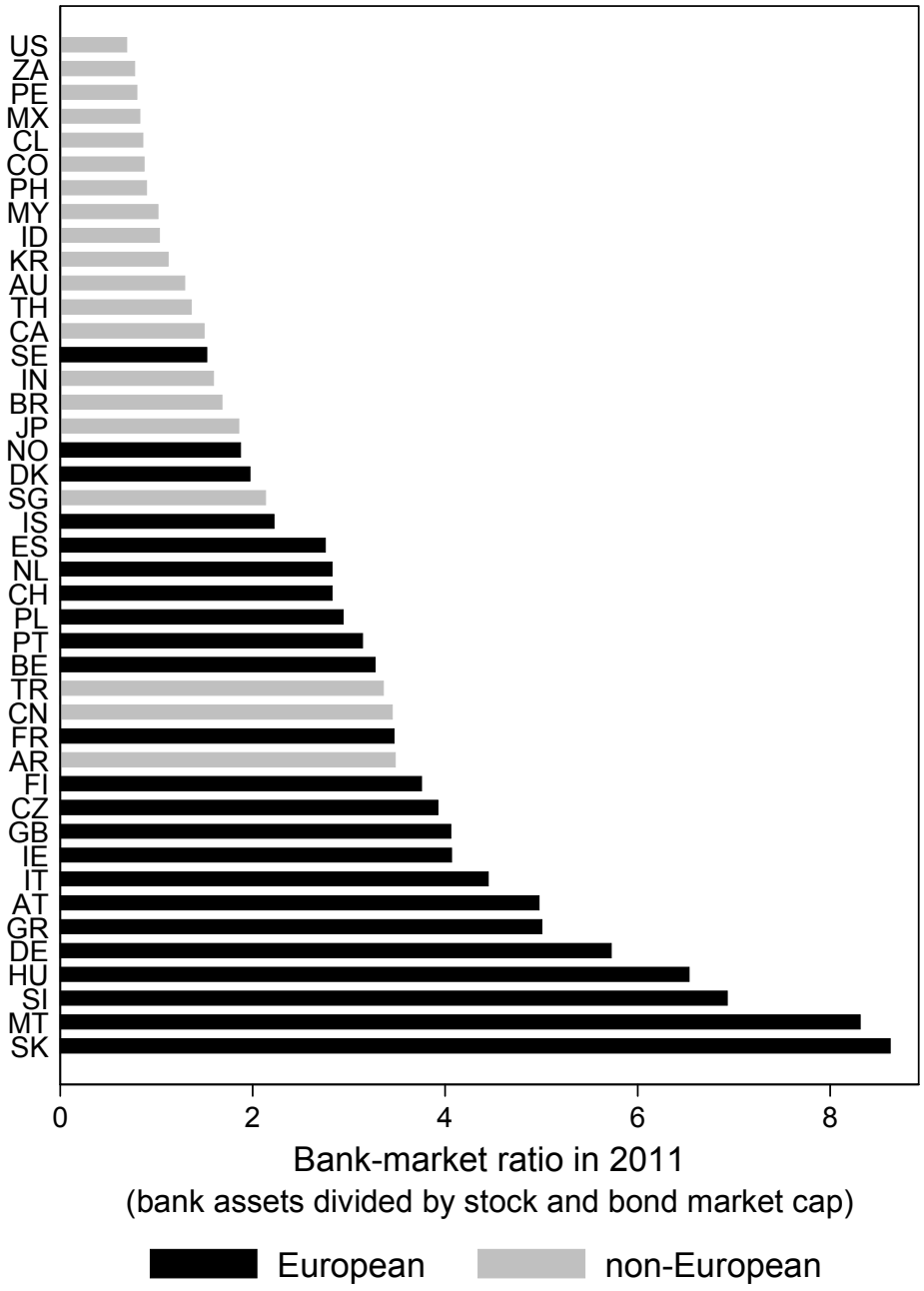
Figure 5: Financial structure since 1990 in Europe, Japan and the US



Notes: The bank-market ratio is defined as the ratio of total bank assets to stock and private bond market capitalisation. The "Europe" series is a composite of all countries in geographic Europe: that is, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Sources: World Bank for stock and private bond market capitalisation data. See endnote to Figure 2 for sources of bank assets data.

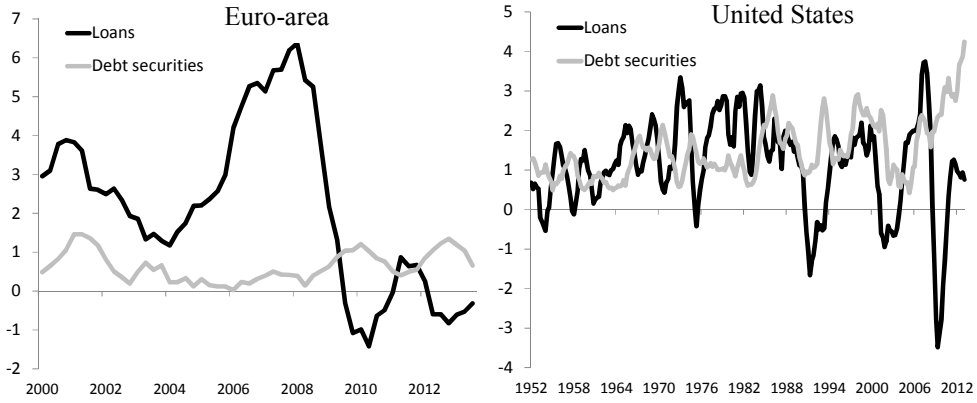
Figure 6: Financial structure in 2011 in European and non-European countries



Notes: The bank-market ratio is defined as the ratio of total bank assets to stock and private bond market capitalisation.

Source: World Bank; see endnote to Figure 2 for sources of bank assets data.

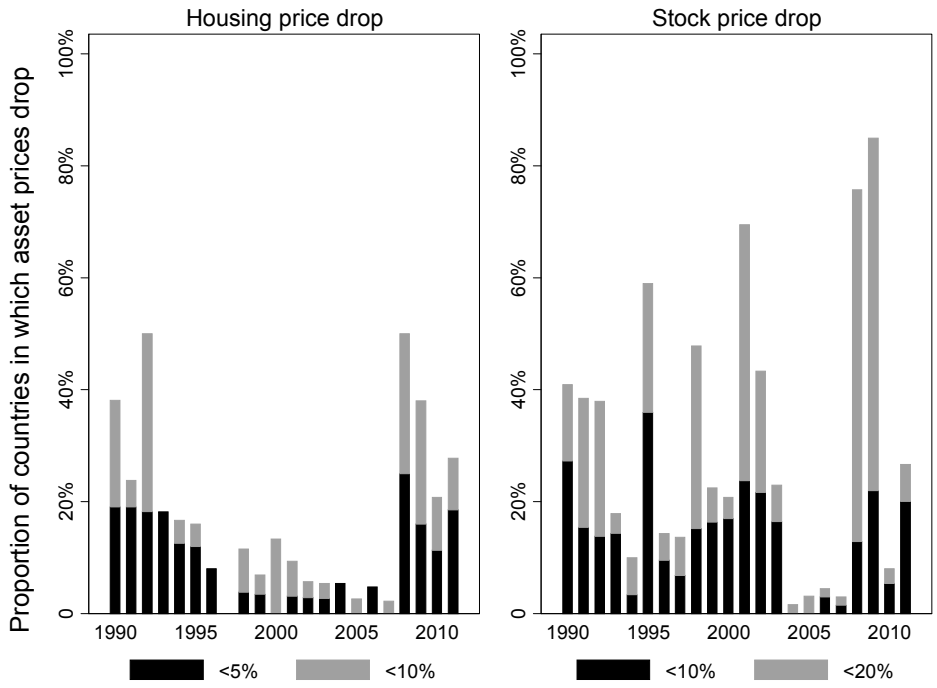
Figure 7: Non-financial firms' financing in loans and debt securities



Notes: The figures plot the year-on-year change in non-financial corporations' outstanding external liabilities (broken down as loans and debt securities) divided by nominal GDP. Loans exclude intra-NFC loans.

Sources: Left hand figure: ECB (Euro Area "Flow of Funds" Accounts). Right hand figure: Board of Governors of the Federal Reserve System (flow of funds accounts of the United States).

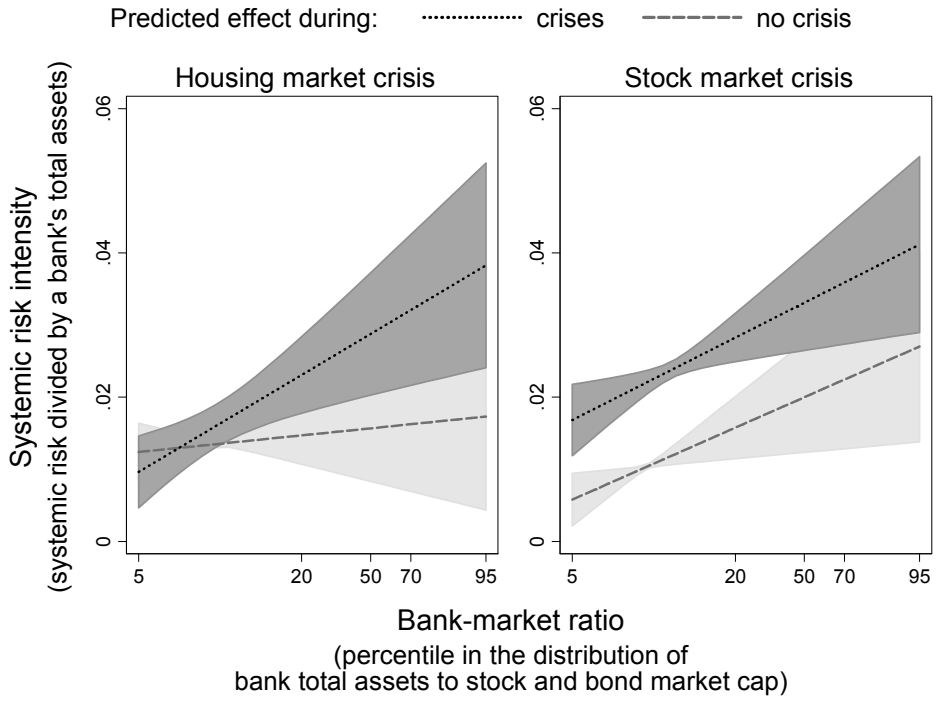
Figure 8: Frequency of financial crises



Notes: The vertical axis reports the percentage of country-year observations in which asset prices drop by the specified amount.

Sources: World Bank.

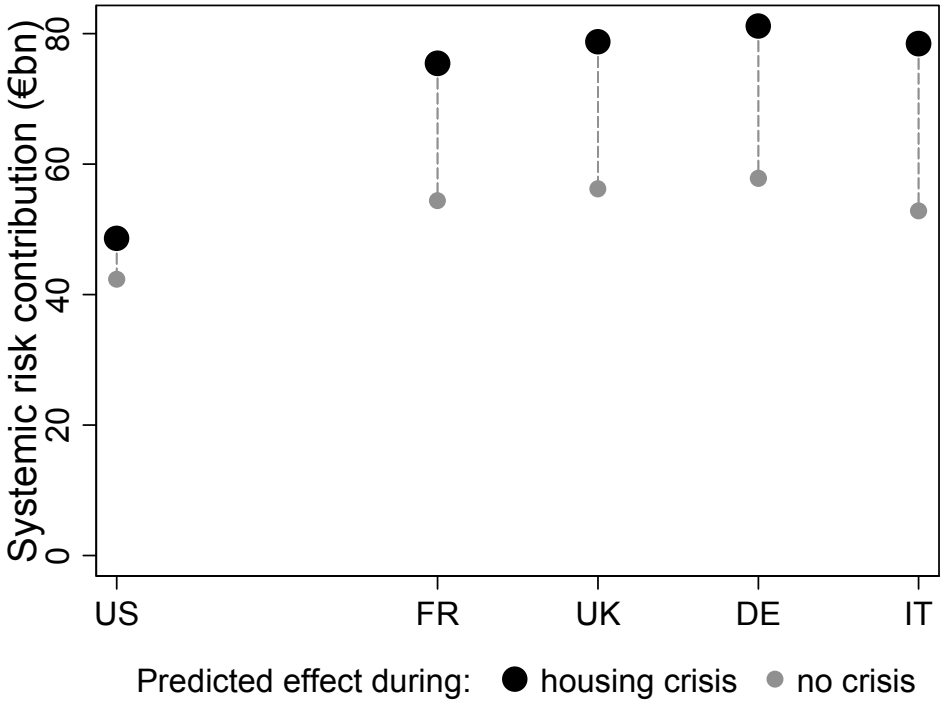
Figure 9: Predicted effect of the bank-market ratio on systemic risk intensity



Notes: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation. High values therefore correspond to a bank-based financial structure. "Systemic risk intensity" is a bank-level variable defined as SRISK (calculated by NYU's V-Lab) divided by a bank's total assets. A "housing market crisis" is defined as a year in which a country's real house prices drop by at least 10%; and a "stock market crisis" is defined as a year in which a country's real stock prices drop by at least 20%. The shaded areas represent 90% confidence intervals around the predicted effect, based on cluster-robust standard errors.

Sources: Bloomberg; World Bank; see endnote to Figure 2 for sources of bank assets data; see Table 1 (columns II and IV) for authors' calculations of the predicted effect.

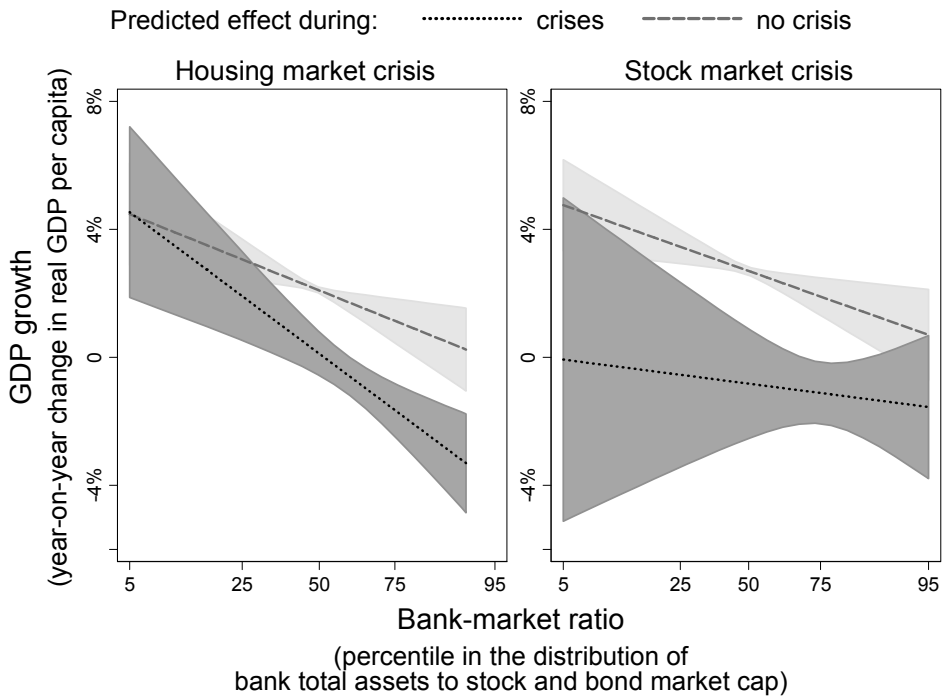
Figure 10: Predicted systemic risk contribution of a €1tn bank



Notes: The vertical axis shows the predicted contribution to systemic risk of a hypothetical large bank with total liabilities of €1tn. The predicted systemic risk contribution varies over (i) the occurrence of a housing crisis (shown by the black versus grey circles); and (ii) the bank-market ratio (shown over the horizontal axis). To illustrate the predicted effect, we take the observations on the bank-market ratio in five countries in 2011: United States (with a bank-market ratio of 0.7 in 2011), France (3.5), the United Kingdom (4.1), Germany (5.7) and Italy (4.4).

Sources: Bloomberg; World Bank; see endnote to Figure 2 for sources of bank assets data; see Table 1 (column II) for authors' calculations of the predicted effect.

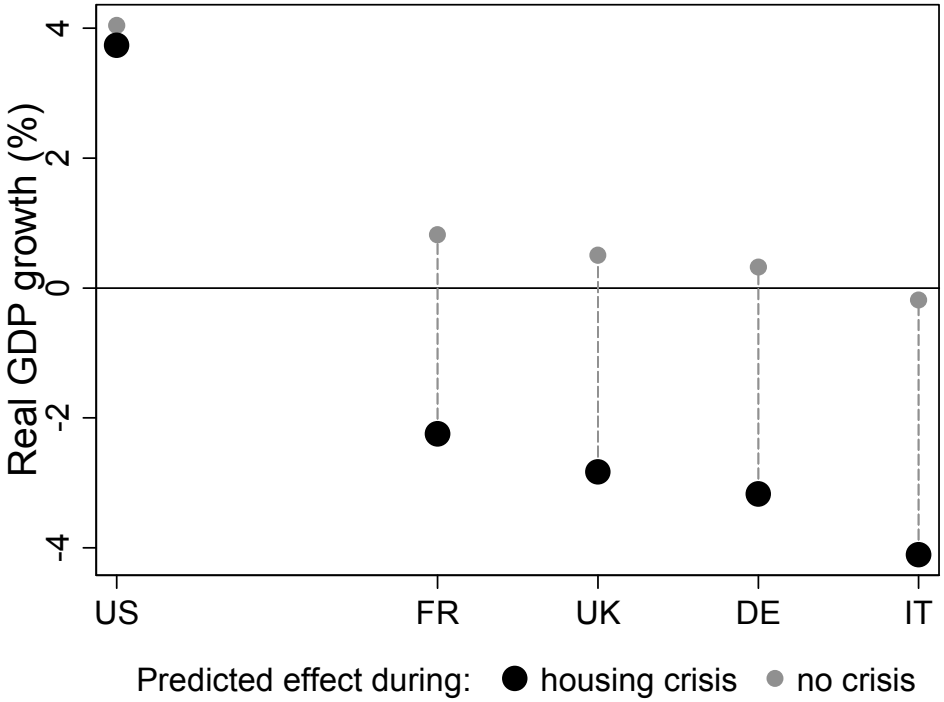
Figure 11: Predicted effect of the bank-market ratio on GDP growth



Notes: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation. High values therefore correspond to a bank-based financial structure. "GDP growth" is the year-on-year change in real GDP per capita. A "housing market crisis" is defined as a five-year period in which a country's real house prices drop at an average annual rate of at least 5%; and a "stock market crisis" is defined as a five-year period in which a country's real stock prices drop at an average annual rate of at least 10%. The shaded areas represent 90% confidence intervals around the predicted effect, based on cluster-robust standard errors.

Sources: World Bank; see endnote to Figure 2 for sources of bank assets data; see Table 3 for authors' calculations of the predicted effect.

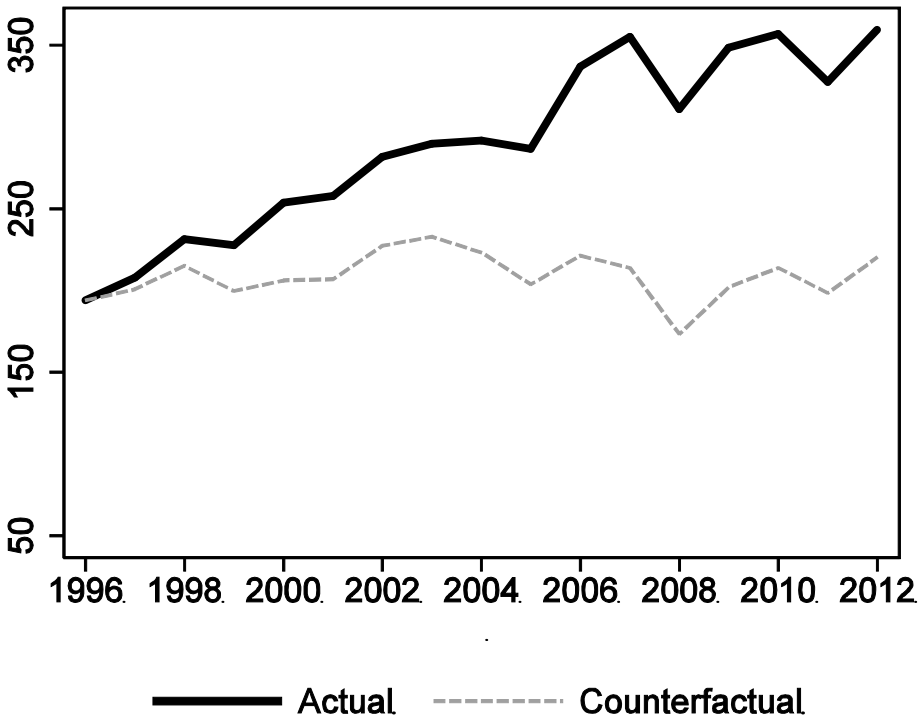
Figure 12: Predicted marginal effect of the bank-market ratio on GDP growth



Notes: The vertical axis shows the predicted yearly growth in real GDP per capita. Predicted GDP growth varies over (i) the occurrence of a housing crisis (shown by the black versus grey circles); and (ii) the bank-market ratio (shown over the horizontal axis). To illustrate the predicted effect, we take the observations on the bank-market ratio in five countries in 2011: United States (with a bank-market ratio of 0.7 in 2011), France (3.5), the United Kingdom (4.1), Germany (5.7) and Italy (4.4).

Sources: World Bank; see endnote to Figure 2 for sources of bank assets data; see Table 3 for authors' calculations of the predicted effect.

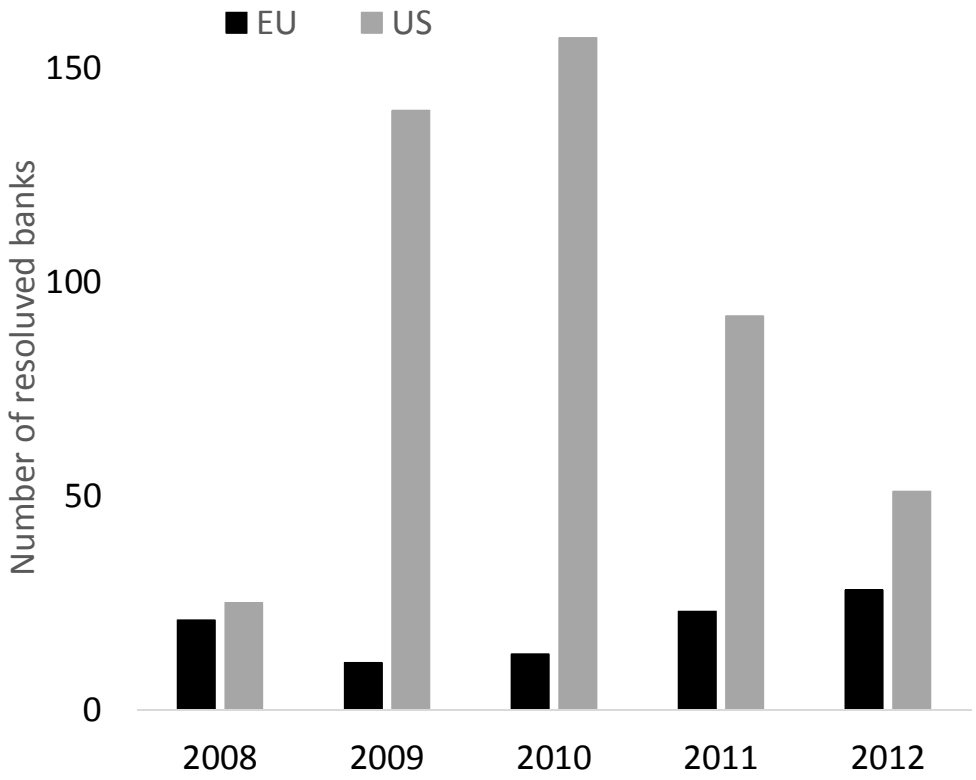
Figure 13: Actual and "counterfactual" total EU banking system assets as a percentage of GDP



Notes: "Actual" plots actual observations on the ratio of total EU banking system assets to GDP. "Counterfactual" is the same, except that the assets of the largest 20 EU banks are assumed to grow in line with nominal GDP from 1996. The largest 20 EU banks are BNPP, BBVA, Santander, Barclays, Commerzbank, Danske, Deutsche, Dexia, HSBC, ING, Intesa, KBC, LBG, Natixis, RBS, SEB, Societé Générale, Standard Chartered, Svenska Handelsbanken and UniCredit. The denominator is the sum of the nominal GDPs of the nine EU countries home to at least one top 20 bank (i.e. BE, DK, DE, ES, FR, IT, NL, SE and the UK).

Sources: Bloomberg; own calculations.

Figure 14: Frequency of bank resolutions in the US and EU



Notes: US data count the number of banks which failed and for which the FDIC was appointed receiver. EU data are from Open Economics, and count the total number of banks which failed (in a broad sense). EU data therefore include distressed mergers and part nationalisations; US data do not.

Sources: FDIC and Open Economics.

Table 1: Banks' systemic risk intensity and countries' bank-market ratios (bank-level panel regressions)

	DV: Systemic risk intensity			
	Housing market crisis		Stock market crisis	
	I	II	III	IV
Bank-market ratio	0.00141	0.00191	0.00742*	0.00822**
	(0.00384)	(0.00334)	(0.00385)	(0.00333)
Crisis dummy	0.00812***	0.00859***	0.00134	0.00528***
	(0.00164)	(0.00150)	(0.00157)	(0.00166)
Bank-market ratio	0.0111***	0.00918***	0.00314***	0.00120
× Crisis dummy	(0.00174)	(0.00161)	(0.00109)	(0.000977)
Bank size		0.00495**		0.00624***
(1-year lag)		(0.00205)		(0.00211)
Bank size / GDP		0.0185***		0.0186**
(1-year lag)		(0.00689)		(0.00778)
Leverage		0.000484***		0.000527***
(1-year lag)		(0.000138)		(0.000147)
Constant	0.00974***	-0.0340**	0.0143***	-0.0388**
	(0.00309)	(0.0151)	(0.00322)	(0.0153)
Year dummies	Yes	Yes	Yes	Yes
Bank-level fixed effects	Yes	Yes	Yes	Yes
Observations	4,316	4,274	4,237	4,197
R-squared	0.423	0.451	0.414	0.446
Number of banks	485	483	475	473

Standard errors, robust to clustering at the bank-level, are shown in parentheses.

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

Specification: Fixed effects panel regression model with cluster-robust standard errors.

Dependent variable: "Systemic risk intensity" is a bank-level variable defined as SRISK (i.e. a bank's systemic risk contribution, calculated by NYU's V-Lab) divided by a bank's total assets. Negative observations on "systemic risk intensity" are replaced by truncating the variable at zero.

Independent variables: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation, lagged by one year. "Crisis dummy" adopts two definitions: in columns I and II, it is equal to 1 when a country's real house prices drop by at least 10%, and 0 otherwise; in column III and IV, it is equal to 1 when a country's real stock prices drop by at least 20%, and 0 otherwise. "Bank size" is the natural logarithm of a bank's total liabilities (in USD), lagged by one year. "Bank size / GDP" is a bank's total liabilities (in USD) divided by the GDP of its country of residence, lagged by one year. "Leverage" is a bank's book value of assets divided by its book value of equity, lagged by one year.

Table 2: Banks' systemic risk intensity and countries' bank-market ratios (bank-level panel regressions with trimmed least squares estimators)

	DV: Systemic risk intensity			
	Housing market crisis		Stock market crisis	
	I	II	III	IV
Bank-market ratio	-0.000236	-0.000264	0.0122***	0.0129***
	(0.00503)	(0.00479)	(0.00361)	(0.00301)
Crisis dummy	0.00869***	0.00954***	0.0117***	0.0149***
	(0.00208)	(0.00194)	(0.00206)	(0.00205)
Bank-market ratio	0.00503***	0.00566***	-0.00627***	-0.00743***
× Crisis dummy	(0.00178)	(0.00157)	(0.00103)	(0.000969)
Bank size		0.00239		0.00782
		(0.00455)		(0.00480)
Bank size / GDP		0.00168		0.000469
		(0.00518)		(0.00463)
Leverage		0.000405**		0.000512***
		(0.000183)		(0.000195)
Year dummies	Yes	Yes	Yes	Yes
Bank-level fixed effects	Yes	Yes	Yes	Yes
Observations	3,981	3,945	3,909	3,875
Number of banks	467	467	457	457

Standard errors are shown in parentheses.

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

Specification: Fixed effects panel regression model with trimmed least squares estimators (Honoré, 1992).

Dependent variable: "Systemic risk intensity" is a bank-level variable defined as SRISK (i.e. a bank's systemic risk contribution, calculated by NYU's V-Lab) divided by a bank's total assets. Negative observations on "systemic risk intensity" are replaced by truncating the variable at zero.

Independent variables: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation, lagged by one year. "Crisis dummy" adopts two definitions: in columns I and II, it is equal to 1 when a country's real house prices drop by at least 10%, and 0 otherwise; in column III and IV, it is equal to 1 when a country's real stock prices drop by at least 20%, and 0 otherwise. "Bank size" is the natural logarithm of a bank's total liabilities (in USD), lagged by one year. "Bank size / GDP" is a bank's total liabilities (in USD) divided by the GDP of its country of residence, lagged by one year. "Leverage" is a bank's book value of assets divided by its book value of equity, lagged by one year.

Table 3: GDP growth and the bank-market ratio (country-level panel regressions)

	DV: GDP growth (5-year average)		
	No crisis	Housing market crisis	Stock market crisis
	I	II	III
Bank-market ratio	-0.0216***	-0.0200***	-0.0178***
	(0.00589)	(0.00696)	(0.00635)
Crisis dummy		-0.0436	-0.0338**
		(0.00530)	(0.0157)
Bank-market ratio		-0.0171***	0.0113
× Crisis dummy		(0.00549)	(0.0123)
Constant	0.0469***	0.0413***	0.0471***
	(0.00681)	(0.00704)	(0.00780)
Time dummies	Yes	Yes	Yes
Country-level fixed effects	Yes	Yes	Yes
Observations	178	138	140
Number of countries	45	42	38

Standard errors, robust to clustering at the country-level, are shown in parentheses.

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

Specification: Fixed effects panel regression model, with five-year time periods and with standard errors robust to clustering at the country-level.

Dependent variable: “GDP growth” is a country-level variable defined as the year-on-year growth in real GDP per capita, averaged over five years.

Independent variables: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation, averaged over five years. “Crisis dummy” adopts two definitions: in column II, it is equal to 1 when a country’s real house prices drop at an average annual rate of at least 5% over five years, and 0 otherwise; in column III, it is equal to 1 when a country’s real stock prices drop at an average annual rate of at least 10% over five years, and 0 otherwise.

Table 4: First stage of instrumental-variable panel regressions with five-year periods, using measures of changes in financial regulation as instruments

	No crisis	Housing market crisis		Stock market crisis	
	I	IIa	IIb	IIIa	IIIb
Crisis dummy		1.5460*	3.0647***	2.3229*	-1.8752***
		(0.8396)	(0.8400)	(1.1877)	(0.3972)
Bank supervision	-0.8873***	-0.7280**	0.06688	-0.6292*	0.4605***
	(0.2783)	(0.3435)	(0.3436)	(0.3571)	(0.1194)
Bank supervision		-1.2281	-1.7344*	0.2860	-0.3245
× Crisis dummy		(0.9601)	(0.9605)	(0.5794)	(0.1938)
Security market	-0.8018	-1.645*	-0.0781	-0.4443	0.1545
liberalisation	(0.8743)	(0.8410)	(0.8414)	(0.9135)	(0.3055)
Security market liberalisation		-	-	-1.9384*	2.3655***
× Crisis dummy				(0.9783)	(0.3272)
Credit ceilings	-1.8620	-1.3465	-0.4914	-2.0485	-0.9840*
	(1.4563)	(1.3429)	(1.3436)	(1.7034)	(0.5697)
Credit ceilings		-	-	-	-
× Crisis dummy					
Interest rate controls	-0.0191	0.6693	1.0821	-0.2156	0.0376
	(1.4563)	(0.6969)	(0.6972)	(0.3729)	(0.1247)
Interest rate controls		-	-	-	-
× Crisis dummy					
Privatisation	0.0576	-0.7659*	-0.2336	0.1538	0.1312
	(0.2645)	(0.4397)	(0.4399)	(0.2514)	(0.0841)
Privatisation		-0.5376	-0.5889	-0.3888	-0.4013***
× Crisis dummy		(0.4406)	(0.4408)	(0.3900)	(0.1304)
Contestability	-0.2888	-0.3928	-0.8189**	-0.0091	-0.0917
	(0.3110)	(0.3243)	(0.3245)	(0.3434)	(0.1149)
Contestability		-	-	-0.2733	1.2765***
× Crisis dummy				(0.7094)	(0.2372)
Year dummies	Yes	Yes	Yes	Yes	Yes
Country-level fixed effects	Yes	Yes	Yes	Yes	Yes
P-value of F-test	0.0003	0.0003	0.0000	0.0060	0.0000
Observations	76	64	64	64	64
Number of countries	23	22	22	22	22

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Specification: First stage of instrumental variable country-level panel regressions, with five-year time periods and country-level fixed effects.

Dependent variable: In columns I, IIa and IIIa, the dependent variable is the bank-market ratio, which is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation, averaged over five years. In column IIb, the dependent variable is the bank-market ratio interacted with a housing market crisis dummy, which is equal to 1 when a country's real house prices drop at an average annual rate of at least 5%, and 0 otherwise. In column IIIb, the dependent variable is the bank-market ratio interacted with a stock market crisis dummy, which is equal to 1 when a country's real stock prices drop at an average annual rate of at least 10% over five years, and 0 otherwise.

Independent variables: "Crisis dummy" adopts two definitions: in columns IIa and IIb, it is equal to 1 when a country's real house prices drop at an average annual rate of at least 5% over five years, and 0 otherwise; in columns IIIa and IIIb, it is equal to 1 when a country's real stock prices drop at an average annual rate of at least 10% over five years, and 0 otherwise. The following country-level variables are used as instruments in this first-

stage regression: “bank supervision”, which is a measure of the strength and intrusiveness of banking sector supervision; “security market liberalisation”, which is a measure of security market liberalisation; “credit ceilings”, which is a measure of ceilings on bank credit; “interest rate controls”, which is a measure of interest rate liberalisation; “privatisation”, which is a measure of the degree of privatisation of banks; and “contestability”, which is an inverse measure of barriers to entry to the banking sector. Each variable takes the five-year average of the six-year lag. In columns II and III, each instrument is included on its own and in interaction with the crisis dummy. All instruments are taken from Abiad, Detragiache and Tressel (2008).

Table 5: Instrumental variable country-level panel regressions with five-year time periods and using measures of reforms of financial regulation as instruments

	DV: GDP growth (5-year average)			
	Table 3, column I on subsample	No crisis	Housing market crisis	Stock market crisis
		I	II	III
Bank-market ratio	-0.0313***	-0.0473***	-0.0179	-0.0389***
	(0.0076)	(0.0144)	(0.0125)	(0.0151)
Crisis dummy			0.0024	-0.0337***
			(0.01356)	(0.0135)
Bank-market ratio			-0.0301**	0.0198*
× Crisis dummy			(0.0136)	(0.0117)
Constant	0.0488***	0.0583***	0.0375***	0.0524***
	(0.00596)	(0.0094)	(0.0076)	(0.0090)
Year dummies	Yes	Yes	Yes	Yes
Country-level fixed effects	Yes	Yes	Yes	Yes
P-value of Sargan test		0.1270	0.3434	0.1424
Observations	76	76	64	64
Number of countries	23	23	22	22

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Specification: Instrumental variable country-level panel regressions, with country-level fixed effects. The table reports the second-stage instrumental variable regression. The following country-level variables are used as instruments in the first-stage regression: a measure of the strength and intrusiveness of banking sector supervision; a measure of security market liberalisation; a measure of ceilings on bank credit; a measure of interest rate liberalisation; a measure of privatisation of banks; and a measure of contestability of the credit market, i.e. an inverse measure of barriers to entry to the banking sector. All instruments are taken from Abiad, Detragiache and Tressel (2008).

Dependent variable: “GDP growth” is a country-level variable defined as the year-on-year growth in real GDP per capita, averaged over five years.

Independent variables: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation, averaged over five years. “Crisis dummy” adopts two definitions: in column II, it is equal to 1 when a country’s real house prices drop at an average annual rate of at least 5% over five years, and 0 otherwise; in column III, it is equal to 1 when a country’s real stock prices drop at an average annual rate of at least 10% over five years, and 0 otherwise.

APPENDIX

In this appendix we report some robustness checks of the growth regressions shown in Tables 3, 4 and 5.

First, we repeat the estimation of the specification of Table 3 using yearly values of all the variables, rather than 5-year averages. Hence, we revert to the –10% threshold to define a housing market crisis and to the –20% threshold to define a stock market crisis, as done in Tables 1 and 2, which are also based on yearly data. As shown in Table A-1 below, the results are qualitatively similar to those reported in Table 3, although the estimated coefficients of the main variables of interest – the bank-market ratio and its interaction with the crisis dummies – are smaller in size.

See Table A-1

When using yearly data, the potential endogeneity of the bank-market ratio is a greater concern than with 5-year averages. As a first step to address these endogeneity concerns, in Table A-2 we re-estimate column I of Table A-1 using long lags of the potentially endogenous bank-market ratio. In particular, Table A-2 re-estimates column I of Table A-1 for four different lag structures: 3-year, 5-year, 10-year and 15-year moving averages. Using such long lags diminishes endogeneity concerns, given that banks' book values should have sufficient time to adjust to any changes in fundamental values. The estimated coefficients of the lagged bank-market ratio remain stable as the moving average window increases over columns I, II, III and IV in Table A-2. The coefficient of the bank-market ratio estimated in column IV of Table A-2, which uses a 15-year moving average window, is similar to the comparable coefficient estimated in column I of Table A-1.

See Table A-2

Our second step in addressing the endogeneity problem is to estimate an IV regression on yearly data, using the same specification as in Table 4 in the text. The resulting estimates of the first and second stage of the IV regression are shown in Tables A-3 and A-4 respectively.

See Table A-3

See Table A-4

In both cases, the estimates are qualitatively similar to those obtained using 5-year averages in Tables 4 and 5 of the text, and the hypothesis that all the coefficients of the instruments are jointly zero is rejected by the F-test for all regressions. However, the instruments do not pass the Sargan test, so that some of them do not satisfy the exclusion restriction: hence, when using yearly data, using financial reforms as instruments does not rule out endogeneity issues, in contrast with the results obtained with 5-year averages.

Table A-1: GDP growth and the bank-market ratio (country-level panel regressions)

	DV: Year-on-year GDP growth		
	No crisis	Housing market crisis	Stock market crisis
	I	II	III
Bank-market ratio	-0.0158**	-0.0184***	-0.0127*
	(0.00614)	(0.00575)	(0.00709)
Crisis dummy		-0.0273***	-0.0114***
		(0.00691)	(0.00390)
Bank-market ratio		-0.0114**	-0.00525
× Crisis dummy		(0.00549)	(0.00547)
Constant	0.0366***	0.0359***	0.0363***
	(0.00454)	(0.00372)	(0.00501)
Year dummies	Yes	Yes	Yes
Country-level fixed effects	Yes	Yes	Yes
Observations	705	536	565
Number of countries	45	42	38

Standard errors, robust to clustering at the country-level, are shown in parentheses.

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

Specification: Fixed effects panel regression model, with one-year time periods and with standard errors robust to clustering at the country-level.

Dependent variable: “GDP growth” is a country-level variable defined as the year-on-year growth in real GDP per capita.

Independent variables: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation, lagged by one year. “Crisis dummy” adopts two definitions: in column II, it is equal to 1 when a country’s real house prices drop by at least 10%, and 0 otherwise; in column III, it is equal to 1 when a country’s real stock prices drop by at least 20%, and 0 otherwise.

Table A-2: Long lags of the bank-market ratio (country-level panel regressions)

	DV: Year-on-year GDP growth			
	3-year moving average	5-year moving average	10-year moving average	15-year moving average
	I	II	III	IV
Bank-market ratio	-0.0189***	-0.0161***	-0.0142**	-0.0209**
	(0.00592)	(0.00506)	(0.00670)	(0.00844)
Constant	0.0573***	0.0555***	0.0543***	0.0594***
	(0.00450)	(0.00390)	(0.00529)	(0.00660)
Year dummies	Yes	Yes	Yes	Yes
Country-level fixed effects	Yes	Yes	Yes	Yes
Observations	758	768	783	790
Number of countries	45	45	45	45

Standard errors, robust to clustering at the country-level, are shown in parentheses.

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

Specification: Fixed effects panel regression model, with one-year time periods and with standard errors robust to clustering at the country-level.

Dependent variable: “GDP growth” is a country-level variable defined as the year-on-year growth in real GDP per capita.

Independent variables: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation. In column I, this variable is calculated as the three-year (backward-looking) moving average; in column II, this variable is calculated as the five-year moving average; in column III, this variable is calculated as the 10-year moving average; and in column IV, this variable is calculated as the 15-year moving average.

Table A-3: First stage of instrumental-variable panel regressions with yearly periods, using measures of reforms of financial regulation as instruments

	No crisis	Housing market crisis		Stock market crisis	
	I	IIa	IIb	IIIa	IIIb
Crisis dummy		1.0547***	0.6458	0.1467	0.60117
		(0.5047)	(0.4030)	(0.3635)	(0.2999)
Bank supervision	-0.5671***	-0.3567***	0.3051	-0.5029***	0.1423
	(-0.1099)	(0.1098)	(0.0876)	(0.1169)	(0.0964)
Bank supervision		-0.1251	0.2913	-0.1315	-0.1049
× Crisis dummy		(0.2218)	(0.1771)	(0.1818)	(0.1501)
Security market	-0.4591***	-0.4614**	0.0864	-0.5169***	-0.0103
liberalisation	(0.1463)	(0.2059)	(0.1644)	(0.1604)	(0.1324)
Security market liberalisation		-0.7168	1.3090***	0.2337	0.7428***
× Crisis dummy		(0.5607)	(0.4477)	(0.2857)	(0.2358)
Credit ceilings	-0.4479	-0.7610**	-0.0629	-0.6116*	-0.1751
	(0.3173)	(0.3371)	(0.2691)	(0.3545)	(0.2925)
Credit ceilings				0.0545	2.9843***
× Crisis dummy				(0.9596)	(0.7919)
Interest rate controls	0.1180	0.2747	0.0974	0.1686	0.1365
	(0.1185)	(0.1779)	(0.1421)	(0.1252)	(0.1033)
Interest rate controls		0.3403	-1.584***	-0.1472	-0.7850***
× Crisis dummy		(0.4812)	(0.3842)	(0.3200)	(0.2641)
Privatisation	0.0017	-0.3778***	0.0761	0.0212	0.1432
	(0.1016)	(0.1300)	(0.1038)	(0.1064)	(0.0877)
Privatisation		-0.6124***	-0.7227***	0.0535	-0.6853***
× Crisis dummy		(0.2350)	(0.1876)	(0.1386)	(0.1143)
Contestability	0.2347**	0.1328	-0.2148***	0.2443**	-0.1066
	(0.1010)	(0.1028)	(0.0820)	(0.1080)	(0.0891)
Contestability		0.0877	0.8457***	-0.1156	0.5159**
× Crisis dummy		(0.3744)	(0.0820)	(0.2776)	(0.2290)
Year dummies	Yes	Yes	Yes	Yes	Yes
Country-level fixed effects	Yes	Yes	Yes	Yes	Yes
P-value of F-test	0.0000	0.0000	0.0000	0.0000	0.0018
Observations	392	307	307	324	324
Number of countries	23	22	22	20	20

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Specification: First stage of instrumental variable country-level panel regressions, with one-year time periods and country-level fixed effects.

Dependent variable: In columns I, IIa and IIIa, the dependent variable is the bank-market ratio, which is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation. In column IIb, the dependent variable is the bank-market ratio interacted with a housing market crisis dummy, which is equal to 1 when a country's real house prices drop by at least 10%, and 0 otherwise. In column IIIb, the dependent variable is the bank-market ratio interacted with a stock market crisis dummy, which is equal to 1 when a country's real stock prices drop by at least 20%, and 0 otherwise.

Independent variables: "Crisis dummy" adopts two definitions: in columns IIa and IIb, it is equal to 1 when a country's real house prices drop by at least 10%, and 0 otherwise; in columns IIIa and IIIb, it is equal to 1 when a country's real stock prices drop by at least 20%, and 0 otherwise. The following country-level variables are used as instruments in this first-stage regression: "bank supervision", which is a measure of the strength and intrusiveness of banking sector supervision; "security market liberalisation", which is a measure of security

market liberalisation; “credit ceilings”, which is a measure of ceilings on bank credit; “interest rate controls”, which is a measure of interest rate liberalisation; “privatisation”, which is a measure of the degree of privatisation of banks; and “contestability”, which is an inverse measure of barriers to entry to the banking sector. In the first-stage regression, each instrument is included on its own and in interaction with the crisis dummy. All instruments are taken from Abiad, Detragiache and Tressel (2008).

Table A-4: Instrumental variable country-level panel regressions with yearly time periods and using measures of reforms of financial regulation as instruments

		DV: GDP growth		
	Table 3, column I on subsample	No crisis	Housing market crisis	Stock market crisis
		I	II	III
Bank-market ratio	-0.0217***	-0.0267***	-0.00752	-0.0411***
	(0.00674)	(0.0101)	(0.0108)	(0.0114)
Crisis dummy			-0.0198**	-0.0207**
			(0.00993)	(0.00983)
Bank-market ratio			-0.0227*	0.00424
× Crisis dummy			(0.0117)	(0.00972)
Constant	0.0236**	0.0277***	0.0139	0.0450***
	(0.00948)	(0.0106)	(0.00924)	(0.0126)
Year dummies	Yes	Yes	Yes	Yes
Country-level fixed effects	Yes	Yes	Yes	Yes
P-value of Sargan test		0.0185	0.0002	0.0009
Observations	392	392	307	324
Number of countries	23	23	22	20

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Specification: Instrumental variable country-level panel regressions, with one-year time periods and country-level fixed effects. The table reports the second-stage instrumental variable regression. The following country-level variables are used as instruments in the first-stage regression: a measure of the strength and intrusiveness of banking sector supervision; a measure of security market liberalisation; a measure of ceilings on bank credit; a measure of interest rate liberalisation; a measure of privatisation of banks; and a measure of contestability of the credit market, i.e. an inverse measure of barriers to entry to the banking sector. All instruments are taken from Abiad, Detragiache and Tressel (2008).

Dependent variable: “GDP growth” is a country-level variable defined as the year-on-year growth in real GDP per capita.

Independent variables: The bank-market ratio is a country-level variable defined as the natural logarithm of the ratio of total bank assets to stock and private bond market capitalisation. “Crisis dummy” adopts two definitions: in column II, it is equal to 1 when a country’s real house prices drop by at least 10%, and 0 otherwise; in column III, it is equal to 1 when a country’s real stock prices drop by at least 20%, and 0 otherwise.

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