

Bank bailouts, competitive distortions, and consumer welfare

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Abstract

In this paper, we raise two questions: First, do large-scale government interventions in banking systems such as blanket guarantees, liquidity support, recapitalizations, and nationalizations distort competition? This question is important because the pricing of banking products has implications for consumer welfare, giving rise to our second question: Do these government interventions affect consumer welfare? Exploiting data for 138 countries that witnessed a variety of different policy responses to 46 banking crises, and using difference in difference estimations, we present the following key results: (i) Government interventions robustly reduce Lerner indices and net interest margins in banking systems, and this effect remains in place over five years following the announcement of these interventions. (ii) The competition-enhancing effect of government interventions is greater in countries where banking systems are more concentrated and less contestable prior to the crises, but the distortionary effects are mitigated in more transparent banking systems. (iii) The channel by which interventions reduce net interest margins operates via competition in loan rather than deposit markets. (iv) Policy responses affect consumer welfare. While the different interventions help sustain credit provision, liquidity support, recapitalizations, and nationalizations reduce access to banking services, and blanket guarantees and nationalizations also tend to redistribute assets towards larger banks, resulting in increased industry concentration. These results suggest bailouts contribute to a reallocation of funds away from small and informationally opaque borrowers that face bigger obstacles obtaining financing from large banks. Our findings carry important policy implications.

Keywords: Banking competition; government interventions; bailouts; consumer welfare

JEL Classification: G28, G21, C32

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Abstract

In this paper, we raise two questions: First, do large-scale government interventions in banking systems such as blanket guarantees, liquidity support, recapitalizations, and nationalizations distort competition? This question is important because the pricing of banking products has implications for consumer welfare, giving rise to our second question: Do these government interventions affect consumer welfare? Exploiting data for 138 countries that witnessed a variety of different policy responses to 46 banking crises, and using difference in difference estimations, we present the following key results: (i) Government interventions robustly reduce Lerner indices and net interest margins in banking systems, and this effect remains in place over five years following the announcement of these interventions. (ii) The competition-enhancing effect of government interventions is greater in countries where banking systems are more concentrated and less contestable prior to the crises, but the distortionary effects are mitigated in more transparent banking systems. (iii) The channel by which interventions reduce net interest margins operates via competition in loan rather than deposit markets. (iv) Policy responses affect consumer welfare. While the different interventions help sustain credit provision, liquidity support, recapitalizations, and nationalizations reduce access to banking services, and blanket guarantees and nationalizations also tend to redistribute assets towards larger banks, resulting in increased industry concentration. These results suggest bailouts contribute to a reallocation of funds away from small and informationally opaque borrowers that face bigger obstacles obtaining financing from large banks. Our findings carry important policy implications.

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“[The] Financial crisis was a seismic event with far-reaching consequences”

Andresen (2011, p.2)

“[...] interventions to restore financial stability will lead to massive distortions of competition in the banking sector”

Beck, Coyle, Dewatripont, Freixas, and Seabright (2010, p. 2)

“[...] banks’ competitive conduct after the crisis may not be independent of government intervention during the crisis”

Gropp, Hakenes, and Schnabel (2011, p. 2086)

Financial systems and regulatory frameworks have been profoundly reshaped by the financial crisis and the concomitant policy responses. The three quotes above illustrate a growing concern among policy makers and academics about the effects on banking competition resulting from the massive interventions into financial systems.

In recent years, governments, central banks, and other authorities designated with supervision and regulation of financial institutions introduced blanket guarantees, extended liquidity support to banks, provided capital injections, and nationalized banks on an unprecedented scale (Laeven and Valencia, 2008a, 2008b, 2010; Hoshi and Kashyap, 2010; Bayazitova and Shivdasani, 2012).¹ During tranquil periods, the competitive effects of rescue operations such as capital injections, emergency liquidity facilities, and assisted mergers tend to be only relevant for a limited number of distressed institutions and their immediate competitors (Hakenes and Schnabel, 2010; Gropp et al., 2011). However, banking crises frequently result in large-scale and repeated policy responses that affect large numbers of institutions with implications for industry structure and competitive conduct in financial systems over longer periods of time (Acharya and Mora, 2012).² This is the subject of our research.

While a quickly evolving body of research has started to examine the effects of bank bailouts and other policy responses to curtail risk-taking on the bank level (e.g., Cordella and Yeyati, 2003; Hoshi and Kashyap, 2010; Hakenes and Schnabel, 2010; Berger et al., 2010; Duchin and Sosyura, 2011; Gropp et al., 2011; Tirole and Farhi, 2012), less effort has been devoted to the closely related issue of how these actions distort competition in banking systems.

In this paper, we add further perspectives to this important debate and ask two questions: We first raise the issue of how the responses to crises such as blanket guarantees, liquidity support, recapitalizations, and nationalizations distort competition in banking.

How can such government interventions affect competition? Primarily, the distortion is attributable to supplanted market discipline which reduces banks’ funding costs. Gropp et al. (2011) focus on individual banks, and argue that bailouts and guarantees reduce protected banks’ refinancing costs vis-à-vis their competitors because bailouts undermine market participants’ monitoring incentive and the demand for adequate risk premia since claimants expect to be compensated. In turn, the protected banks’ competitors also become more aggressive because their charter values are eroded. Another argument relates to moral hazard. Berger et al. (2010) suggest that bailouts increase moral hazard as the bailed institutions’ incentive to monitor borrowers is

¹ In two papers, Acharya and Yorulmazer (2007, 2008) show that when the number of bank failures is large, regulators find it optimal to rescue some or all distressed institutions, while failed banks can be acquired via private sector arrangements when the number of failures is small. This phenomenon is referred to as the ‘too-many-to-fail’ effect. Empirical evidence for this effect is reported by Brown and Dinc (2011).

² Typical examples for responses to systemic crises that affect all banks are blanket guarantees, and reductions of the policy rate by central banks. During the current crisis, all these actions have been adopted. Laeven and Valencia (2008) show the global financial landscape has undergone major transformations recently. Banks from the U.S. and Western Europe that dominated global banking have become considerably smaller in terms of market capitalization, and banks from countries largely unaffected during the crisis are now among the largest institutions in the world.

distorted which also suggests loan pricing is inadequate. Duchin and Sosyura (2011) offer some evidence for this idea. They focus on risk-taking following bank recapitalizations in the U.S. during the Troubled Asset Relief Program (TARP), and report that loans originated by banks that participated in TARP tend to become riskier.

However, these arguments may be counterbalanced by the increase in charter value arising from the bailouts. Theories by Cordella and Yeyati (2003) emphasize a reduction in bank risk-taking which suggests less aggressive competitive conduct in instances when banks are subject to bailouts.

These countervailing arguments highlight that it is far from clear how the competitive landscape in banking changes in the aftermath of large-scale government interventions. Ultimately, the effect of rescue operations on competition therefore remains an empirical question which we address in this paper.

The question of how competition is distorted is important because the mispricing of products may have unintended and possibly detrimental consequences for consumer welfare and society. Guarantees can result in the entrenchment of the supported institutions, assisted mergers of large financial institutions increase concentration in banking systems and strengthen the perception that these banks are 'too-big-to-fail' (Beck et al., 2010; Hakenes and Schnabel, 2010), thus reinforcing moral hazard.³ Moreover, barriers to entry have risen as a consequence of stability-enhancing reforms and tighter regulation (Andresen, 2011). In turn, prices of banking services provided by bailed institutions may be affected (Hakenes and Schnabel, 2010). Competitor banks may benefit *indirectly* because crises are stalled, or *directly* because they are creditors of the rescued institution (Beck et al., 2010). Other concerns relate to lending behavior and liquidity creation because rescue operations may influence credit supply and liquidity creation. These effects have potential to spill over into the real economy (Giannetti and Simonov, 2010; Black and Hazelwood, 2011; Berger et al., 2010).

Consequently, these considerations beg a second question: How do these policy responses affect consumer welfare?

We address this question by scrutinizing the effects of blanket guarantees, liquidity support, recapitalizations, and nationalizations separately on competition in deposit and in loan markets to establish whether lenders or borrowers are more affected. In addition, we then explore the ramifications on provision of credit, access to finance, and if the government interventions are associated with changes in the structure of the banking industry.

For the empirical analysis below, we exploit a vast array of information about government interventions in banking systems obtained from Laeven and Valencia (2008a, 2008b, 2010) to account for several different types of policy interventions in the containment and resolution phase of banking crises. Our dataset provides a complete overview of 46 episodes of banking crisis (34 systemic and 12 borderline cases) spanning a 15-year period between 1996 and 2010. Specifically, we account for the presence of two types of interventions in the containment phase (blanket guarantees and liquidity support), and another two in the resolution phase (recapitalization and nationalization).

To examine the effects of these different policy measures, we exploit the variation across countries across different time periods when these measures are implemented and use a difference in difference estimation framework in our main analysis.

³ Hakenes and Schnabel (2010) note that the German government was criticized by the European Commission for the competitive distortions that may arise from the rescue of Commerzbank. Furthermore, several financial institutions issuer ratings experienced rating uplifts due to implicit government support between 2007 and 2009, and banking system concentration measures based on the five largest institutions increased in France, Germany, Japan, UK, and in the U.S. (Andresen, 2011).

The widespread use of blanket guarantees, emergency liquidity support, recapitalizations, and nationalizations in numerous countries provides a natural testing ground to identify the effects of such government interventions on distortions for competition in banking. While our illustration below underscores that the occurrence of government interventions during crises is exogenous with respect to the competitive environment in a banking system because the prevailing competitive conditions do not predict these policy responses, changes in conduct by banks located in countries that reverted to such actions during banking crises considerably affect competition. In contrast, other countries that do not experience such actions by their governments experience no such changes in competition.

Therefore, our use of difference in difference estimation allows establishing the causal effects that arise from the different policy responses for two complementary measures of banking competition: the Lerner index and net interest margins. The former provides information about banks' market power. It offers a comprehensive way of gauging bank competition on and off the balance sheet. Net interest margins allow further analyses, e.g., by decomposing the competition effect in deposit and loan markets. Moreover, net interest margins are better suited to draw competition inferences for traditional banking activities that prevail in many of the countries in our sample, which contains many emerging market economies.

By way of preview, our main result suggests that government interventions have a causal effect on competition in the banking sector. The difference in difference estimates indicate that measures of containment and resolution of crisis episodes (e.g., emergency loans for liquidity support, recapitalizations, and nationalizations) raise competition of the banking system. This increase in competition is reflected in reductions of market power by the Lerner index, and in declining net interest margins. A long-run analysis over the five years following the government interventions illustrates that both Lerner indices and net interest margins remain below the level they had at the year of the announcement of the policy responses, suggesting long-run distortions for competition.

To give a concrete example for those distortions, our estimates suggest that the Lerner index for the average bank in Indonesia (a country located at the 25th percentile of the distribution of the Lerner index) is reduced from 0.167 to 0.126, a level equivalent to the competitiveness of the Belgian banking system, located at the 12th percentile.

Moreover, the distortionary effects remain qualitatively very similar when small countries and off-shore financial centers, when high income economies, and when emerging market economies are excluded in our regressions. We can rule out that the competitive response to these policy measures simply constitutes a response to banking crises, and we also have no reason to believe that structural adjustment programs by the International Monetary Fund, and the too big to fail effect are the driving forces behind this result. Furthermore, our findings also stand up firmly against a set of placebo regressions with the difference in difference estimator, and the findings are also largely reinforced in tests based on propensity score matching methods that account for the fact that government interventions do not occur randomly. Our findings therefore complement evidence on the micro level by Gropp et al. (2011). They show that public bailouts give rise to market distortions by encouraging competitors of protected banks to compete more aggressively.

We extend our main analysis in several dimensions.

First, we explore whether the effect of government interventions on banking competition depends on the initial conditions in the banking sector in terms of market structure (concentration), contestability (foreign ownership, activity restrictions, and entry restrictions), and presence of moral hazard (deposit insurance). Our estimates show that the competition-increasing effect of interventions is larger in countries with more concentrated banking systems, and in countries with limited contestability, in particular when foreign bank penetration is limited, and when barriers to

entry are higher. Explicit deposit insurance, on the other hand, tends to offset the impact of government intervention on competition, at least partially.

Second, we offer additional tests of theoretical predictions that relate banking system transparency and charter values to the presence of government interventions. Transparency, reflected in disclosure requirements, and charter values may either amplify or mitigate the competition effects of government interventions. Consistent with the first set of theories, we present evidence that government interventions have competition-enhancing effects in countries that have less transparent banking systems that are characterized by less stringent disclosure requirements. However, our findings for the effect of higher charter values do not support the predictions. Our results provide no evidence that public bailouts such as blanket guarantees increase charter values which would incentivize banks to compete less aggressively.

Finally, we also consider how government interventions affect consumer welfare. Our initial analysis here decomposes the net interest margin into loan and deposit rates to gain insights into which parties benefit from the increase in competition. This analysis indicates a disparate effect. We detect no beneficial effects on depositors. However, we observe lower loan rates, suggesting borrowers benefit from the increase in competition, and this effect is more pronounced in bank based financial systems. Further, we show that government interventions are positively associated with credit provision but this beneficial effect comes at the cost of reductions in the number of bank branches and increased concentration in banking systems. While we do not claim to have uncovered causal linkages in the analysis of how access to finance is affected due to the difficulties arising from separating out demand and supply side effects, the empirical patterns we have uncovered cannot be explained by a number of alternative explanations and suggest indeed a reallocation of access to banking services away from under-served borrowers.

The policy implications associated with the empirical evidence presented in this paper are critically important. The response by governments to banking system distress needs to consider possible competitive distortions. Such distortions follow, in particular, from liquidity support, recapitalizations, and nationalizations. This is important, not only because the pricing of loans and deposits is affected, but so is access to finance with implications for economic growth and for small and medium-sized firms that rely on bank funding. Moreover, the distortions in competition may sow the seeds of future banking problems by promoting competitive bank behavior.

Our paper proceeds as follows. Section I discusses the dataset and the variables we use with a particular focus on the policy responses to banking crises. We describe in Section II our identification strategy with the difference in difference regression setup followed by the main results. This section also contains robustness tests, and a discussion of how initial banking market characteristics affect the effectiveness of the policy responses. Section III explores the role of banking system transparency and charter values when governments intervene into distressed banking systems, and Section IV examines the long-run effects of government interventions. Section V reports a series of tests about the effect of interventions on consumer welfare. Here, we explore whether bank borrowers or depositors benefit more from the change in competitiveness of banking systems, and the final set of tests examines effects on provision of credit and financial outreach. Concluding remarks and policy implications are offered in Section VI.

I. Data and overview about policy responses to banking crises

In this section, we describe our data set that spans the period 1996 - 2010.

A. Data sources

The data on crises is obtained from Laeven and Valencia (2008b), and we retrieve information on the corresponding policy responses from Laeven and Valencia (2008a, 2010).

We classify a country as having experienced a systemic banking crisis if its banking system experienced significant signs of financial stress (indicated by significant bank runs, losses, and bank liquidations) and, additionally, if significant policy interventions can be observed in response to the losses in the banking system. Policy interventions are considered to be significant if the following forms of interventions have been used: significant guarantees are put in place, extensive liquidity support (5 percent of deposits and liabilities to nonresidents), bank recapitalizations with public funds (exceeding 3 percent of GDP), and significant bank nationalizations took place.

Clearly, governments also engage in other types of interventions, e.g., deposit freezes, bank holidays, and the establishment of asset management companies. As we discuss below, these measures can be short-lived and do not necessarily translate into unanimous predictions for competitive distortions. Therefore, we refrain from considering them in our analysis.⁴

We provide an overview about countries that experienced systemic crises, and details about the types of government interventions, including their distribution over time in these countries in Appendix I. Laeven and Valencia (2008b) identify 34 episodes of systemic banking crisis and 12 episodes of borderline crisis between 1996 and 2010. Note that Laeven and Valencia (2010) do not offer a specific definition for borderline cases. Countries that “almost met” the definition of a systemic crisis are classified as borderline cases. Half of the identified crisis episodes (23) took place during the period 2007-8 (that is, the recent global financial crisis), with most of them taking place in high-income economies.

To establish the effects of how the presence of government interventions during systemic crises impact upon bank competition, we exploit the data provided by Laeven and Valencia (2008a, 2008b, 2010) on a wide array of measures in 138 countries (of which 43 countries have experienced banking crises) during the sample period.⁵ Despite the fact that policies used to contain and resolve systemic crises vary to some extent in the cross-section and to a lesser extent also over time, we exploit the fact that governments tend to respond in similar ways to episodes of extreme stress in financial systems.

Policy responses to financial crises typically consist of an initial phase that is concerned with containing the impending liquidity strain, protecting liabilities, and limiting the adverse effects from fire sales triggered by capital losses. This containment phase results in wide-ranging liquidity support for the financial sector, government guarantees on banks’ liabilities, and, less frequently deposit freezes, and bank holidays as discussed more specifically below. In a subsequent phase, resolution and balance sheet restructuring take center stage: troubled institutions are resolved, recapitalized, nationalized, and unviable banks exit the market.

While policy responses such as deposit freezes and bank holidays are short-lived and there exist no clear theoretical prediction as to how they affect banking competition, other policy responses translate into precise predictions. Consequently, we constrain our subsequent analysis to those government interventions where theory offers clear indications as to how banking competition will be influenced. Among the containment measures, blanket guarantees and liquidity support meet this criterion, and recapitalizations and nationalizations also meet this condition among the resolution measures. These four measures are also the most frequently observed policy responses, and data for these measures are readily available.

⁴ In times of crisis, these interventions come along with the deployment of a series of countercyclical measures of monetary and fiscal policy – for instance, policy rate cuts and fiscal stimulus.

⁵ Laeven and Valencia (2008a, 2008b, 2010) assemble a database that enumerates 63 episodes of banking crisis for 54 countries over the period 1980-2010.

The common theme that links these four different manifestations of bank bailouts is moral hazard. The idea that safety net arrangements in general and bailout packages such as the ones we study in particular constitute a source of moral hazard seems undisputed in the literature (for an overview, see Farhi and Tirole, 2012). Usually, the literature casts the effects of bailouts in terms of their effect on risk-taking. However, since Keeley (1990) has shown that competition drives bank's risk-taking, the ideas put forward in the literature about the effects of bailout packages on risk-taking also apply in the context of our study.

Similar lines of reasoning are put forward by Acharya (2011). He argues that short-termist governments — thanks to the opaqueness of their balance sheet and activities— exploit moral hazard opportunities in the financial system to boost activity and ignore the tail risks associated with those actions. Either by extending guarantees or promoting risky lending for populist goals, the government — acting as a *shadow banker* allows excessive competition at the expense of instability of the financial system down the line. In short, bailout packages impose the costs associated with the “day of reckoning” on future generations.

Using deposit insurance arrangements, Demirguc-Kunt and Detragiache (2002) illustrate this very point on the banking system level. They show that moral hazard arising from generous deposit insurance increases the probability of banking crises, and Gropp et al. (2001), and Dam and Koetter (forthcoming) offer support for this idea on the bank level. The former focuses on disparate effects arising from bailouts of protected banks and their competitors. Their result indicates that bailouts increase risk-taking among the protected banks' competitors. Similarly, Dam and Koetter (forthcoming) demonstrate that a higher probability of being bailed out increases German banks' risk-taking significantly.

In simple terms, the expectation of being bailed out, coming in the form of blanket guarantees, emergency lending from the central bank, capital support, or being nationalized reduces banks' anxiety from avoiding the bad state of having the charter revoked (Mailath and Mester, 1994), so that they eventually compete more aggressively.

We now review the four different policy responses in more detail. Subsection B discusses measures during the containment phase of crises, and Subsection C focuses on measures taken during the resolution phase.

B. Policy responses: Containment phase

Blanket guarantees. A common policy response designed to stall bank runs is to provide blanket guarantees for bank liabilities in general and deposits in particular. Those guarantees extend well beyond the coverage levels of existing deposit insurance schemes. Since bank runs can quickly destabilize payment systems and trigger fire sales of bank assets, guarantees are regularly used to restore confidence into the banking system during the containment phase. Laeven and Valencia (2008a) present evidence that announcements of blanket guarantees, if credible, help restore confidence in banking systems.⁶

Theory offers a clear indication for the effect of blanket guarantees. On the bank level, Hakenes and Schnabel (2010) show that guarantees affect both protected banks and their competitors. They highlight that guarantees reduce margins and charter values of the protected banks' competitors which arises from more aggressive competition from banks that can refinance at subsidized rates. This pushes competitor banks to behave more competitively. We argue blanket guarantees have a similar effect. They reduce refinancing costs for all banks, but they simultaneously also increase moral hazard incentives, resulting in more aggressive competition (Gropp and Vesala, 2004).

⁶ Note that we only consider full blanket guarantees, i.e., blanket guarantees that affect liabilities at all banks.

Liquidity support. The provision of liquidity support plays an important role in the containment phase (Gorton and Huang, 2004; Schnabel, 2009).⁷ The underlying premise is that extending loans to troubled banks may be less costly than no intervention at all. Richardson and Troost (2009) provide empirical evidence to support this claim. Exploiting a quasi-experimental setting from the Federal Reserve districts Atlanta and St. Louis from the 1930s they illustrate that monetary intervention can be an effective tool to allow banks to survive episodes of stress: Emergency lending to distressed institutions not only raises their probability for survival but also helps sustain lending, avoids contraction of commerce, and it facilitates economic recovery. During the recent crisis, liquidity support was again part of policy maker's first line of defense and exceeded historical levels by far (Laeven and Valencia, 2008a). Moreover, liquidity support could be obtained between 2007 and 2009 via a broader range of instruments under weaker collateral requirements and even non-banks were supported.⁸

Theoretical considerations in the context of liquidity support all relate to moral hazard and discuss whether the central bank should act as a lender of last resort. Freixas (1999) shows that, in equilibrium, the lender of last resort should not support all banks because rescues are too costly. However, in instances when either large banks (the too big to fail phenomenon) or a large number of banks are in distress (the too many to fail phenomenon), supporting the large bank or all distressed banks is the regularly observed choice of action. Acharya and Yorulmazer (2007, 2008) arrive at similar conclusions, and Brown and Dinc (2011) offer empirical support. Both the too big to fail, and the too many to fail effect incentivize banks to invest in risky assets, suggesting moral hazard and competitive distortions.

Relatedly, another strand of the literature looks at the effects of easy monetary conditions on bank risk-taking, achieved through lower policy rates or quantitative easing. When the cost of funds is lowered for a prolonged period of time arising from monetary policy announcements or liquidity support, the incentives of banks to monitor borrowers are reduced and financial institutions will search for yields and switch to riskier assets, thus leading to higher risk-taking (Rajan, 2005; Dell'Ariccia and Marquez, 2006) which would also be reflected in and more aggressive pricing of loans.

C. Policy responses: Resolution phase

Recapitalization. An important step during the resolution phase is the provision of capital support (e.g., Berger et al., 2010; Giannetti and Simonov, 2010; Hoshi and Kashyap, 2010; Duchin and Sosyura, 2011). Recapitalizations usually come in the form of common and preferred stock provided by the government. The capital injections also go hand in hand with write offs of losses against shareholders' equity. Occasionally, recapitalizations also occur via assumption of liabilities, government bonds, and the government investing in subordinated bank debt. The basic effect of recapitalizations is that any bank that received such capital support signals the bank is too important to fail.

Recent theories illustrate that recapitalizations cause distortions in banking systems (Diamond, 2001; Farhi and Tirole, 2012). Diamond (2001) highlights the distortion created by a government if it commits to recapitalizing banks because doing so makes banks always anticipate rescue packages.

⁷ Historically, liquidity support was one of the main policy tools to deal with banking distress. Schnabel (2009) shows that deposit outflows in distressed banks during the German twin crisis of 1931 decline once these banks receive liquidity support. Her finding illustrates that the link between bank characteristics and deposit flows is weaker as a result of government interventions, consistent with the presence of moral hazard.

⁸ For instance, the Federal Reserve allowed primary brokers access to the discount window, and acquired asset-backed securities. In addition, new liquidity support facilities such as the Federal Reserve's Commercial Paper Facility and the Bank of England's Asset Purchase Facility were introduced.

Similarly, Farhi and Tirole (2012) show that transfer policies adopted by governments such as recapitalizations have the potential to sow the seeds of the next crisis as they impose deferred cost on society by incentivizing banks to operate with risky balance sheets. They explicitly highlight that “refusing to adopt a risky balance sheet then lowers banks’ rate of return. It is unwise to play safely while everyone else gambles” (Farhi and Tirole, 2012, p. 62). Hoshi and Kashyap (2010) also acknowledge the potential for moral hazard, and the corresponding distortions that recapitalizations can create. In line with this prediction, Duchin and Sosyura (2011), and Black and Hazelwood (2011) uncover evidence that banks engage in risk-shifting, both studies report increasingly risky loan originations upon receipt of TARP money, pointing towards more aggressive lending practices.

Nationalizations. Once an institution has been identified as distressed, total or partial nationalizations are common and the government acquires the majority of equity stakes in the distressed financial institutions. In some crises, nationalizations take place at a large scale and all major banks are taken into government ownership. As with recapitalizations, a nationalization indicates the bank is considered to be too important to fail.

Numerous studies document undesirable effects arising from government ownership of banks.⁹ Shleifer and Vishny (1994), and Iannotta et al. (2007) show that banks owned by governments have greater moral hazard incentives. Thus, nationalizing distressed banks results effectively in a bailout of all creditors and guaranteeing debt of all banks in the future. Along similar lines, Acharya and Kulkarni (2010) argue that (implicit or explicit) guarantees on state-owned banks provided by the government yield an uneven playing field, and generate excessive risk-taking by private banks. This relationship is likely to increase banking competition. Recent evidence from large European banks from Iannotta et al. (2011) reinforces these concerns.

We acknowledge that the two latter measures do not necessarily affect all banks equally. However, we only focus on significant recapitalizations that are recorded during banking crises recorded in the database by Laeven and Valencia (2008a, 2008b, 2010). This fact mitigates concerns that the empirical results regarding the effects of recapitalizations and nationalizations below are spurious in nature.

II. Effects of government interventions on banking competition

We employ two alternative measures of competition: the Lerner index (a pricing indicator of competition), and the net interest margin. Since the analyses below are performed on the banking system level, we use the average Lerner index and the average net interest margin per country per year in our regressions.

The Lerner index captures market power by calculating the markup of product prices and marginal costs of production. We use 181,830 bank-year observations for 21,988 banks in 138 countries to compute this index as detailed in Appendix II. The bank data are obtained from BankScope, a commercial data provider. BankScope is the limiting factor for the sample period.

The Lerner index is a widely used measure of competition in banking (e.g., Koetter, Kolari, and Spierdijk, forthcoming). As an alternative way to measure competition, we use the net interest margin because competition in traditional banking activities that dominate less developed banking systems is best reflected by the spread between lending and deposit taking activities. Since our dataset contains numerous emerging market economies, relying on the net interest margin provides a sensitivity check for the inferences drawn with the Lerner index. Further, net interest margins

⁹ La Porta et al. (2002) highlight that government ownership of banks is associated correlates negatively with financial development and reduces growth of per capita income and productivity, and Sapienza (2004) and Dinc (2005) show that government-owned banks are prone to interference by politicians.

provide a good indication for the efficiency of financial intermediation which has substantial effects for economic growth (Rajan and Zingales, 1998). Also, in additional analyses in Section V below, we examine whether the effects of government interventions affect loan or deposit market competition. Therefore, we need a competition measure that can easily be decomposed into loan and deposit rates. Finally, Gropp et al. (2011), in their analysis of the effect of public bailout guarantees, show that the channel making of protected banks' competitors more aggressive, runs via interest margins.

Our two competition indicators do not contain necessarily the same type of information. Movements in the net interest margins reflect better the evolution of competition in traditional loan and deposit markets. On the other hand, the Lerner index – by including non-interest (off-balance-sheet and fee) income and non-interest (operating) costs – is more suited to measure competition in broader banking activities. The two measures of competition are not significantly correlated at conventional levels, and the coefficient of correlation is -0.043.

The key explanatory variables are coded as binary variables that take the value of one in the year the intervention was announced and in the subsequent years if a country was still affected by the intervention as detailed by Laeven and Valencia (2008a, 2008b, 2010). Our approach is identical to the coding of such interventions suggested by Dell'Ariccia et al. (2008).

Containment measures such as blanket guarantees are proxied by a dummy variable that takes the value of one or zero otherwise. In total, we register 11 instances where countries issued blanket guarantees during the period 1996-2010. Liquidity support is also defined as a binary variable that takes the value of one when the monetary authority extends emergency loans and zero otherwise. This dummy variable takes on the value of one if liquidity support is at least 5 percent of deposits and liabilities to nonresidents in terms of GDP. Typically, liquidity support offered by the central bank can come along with a reduction of reserve requirements.¹⁰ Similarly, restructuring measures like the incidence of recapitalizations are captured by a dummy that takes the value of one if banks were recapitalized. Our measure is restricted to significant recapitalizations, defined as recapitalizations whose costs exceed 3 percent of GDP. The data set registers 34 recapitalizations over the entire sample period. Finally, we capture the occurrence of nationalizations by a binary variable that takes the value of one when banks were nationalized and 0 otherwise. All takeovers of the government of systemically important institutions, and instances where the government takes a majority stake in the capital of financial institutions are classified as nationalizations. Our data shows 27 cases where countries nationalized their banks.

A. Preliminary inspection of the data

Prior to assessing the effects in a multivariate framework with the difference in difference estimator, we embark upon an initial analysis and investigate whether changes in competition following the government interventions vary across different countries.

Specifically, we demonstrate separately for each country that implemented blanket guarantees, liquidity support, recapitalizations, and nationalizations the change in the average Lerner index in Figure 1, and in the net interest margin in Figure 2, with the corresponding change for all countries in the control group over the same period. Each panel in Figure 1 and 2 illustrates the separate effect of the respective government action. The countries with interventions are represented by a triangle with the name of the country underneath, and the countries in the control group are depicted by a square. For example, the authorities in Thailand provided the banking system with a blanket guarantee during the banking crisis in 1997 (shown at the bottom left-hand corner in Figure 1 in the panel with blanket guarantees). In that year, the Lerner index dropped by 0.14 in Thailand,

¹⁰ We identify four episodes where a reduction in reserve requirements accompanied measures of liquidity support by the monetary authority. Removing those four episodes in our subsequent regressions below does not qualitatively alter our inferences.

suggesting a substantial increase in competition. At the same time, the square above illustrates the countries in the control group (defined as countries not having experienced a financial crisis and not being subject to blanket guarantees), experienced an increase in the average Lerner index by 0.04, indicating less competition.

[FIGURE 1: The effects of government interventions on Lerner indices]

The empirical patterns are striking. This illustration highlights already that the majority of countries experience reductions in Lerner indices and in net interest margins following government interventions. The increase in competition occurs primarily after recapitalizations and liquidity support, and nationalizations of banks also seem to reduce net interest margins in the majority of countries that relied on such actions. However, the two diagrams also suggest that the competition-increasing effects are not uniform. Several countries such as Thailand, Ukraine, Ecuador, the Russian Federation, and Croatia experience declines in Lerner indices and in net interest margins, whereas other countries that are also struck by crises such as Germany, Latvia, and Belgium do not post declines in competition, suggesting the effects of government actions may be either amplified or mitigated depending on other characteristics, such as the prevailing conditions in a banking system prior to enactment of these measures, or the institutional and legal framework.¹¹ We explore these issues in Section E and in Section III below in greater detail.

[FIGURE 2: The effects of government interventions on net interest margins]

B. Identification strategy

We now turn to difference in difference estimations that exploit exogenous cross-country and cross-year variation in different types of government interventions into banking systems to examine the causal effects of interventions on competition.

Difference in differences estimation allows comparing treatment countries, i.e., countries whose banking systems experienced interventions of the type mentioned above with a set of countries in a control group both before and after the treatment. The control group consists of countries that did not have such interventions (i.e., non-crisis countries) during the sample period.

Our estimator considers the time difference of the group differences, i.e., it accounts for omitted variables that affect treated and untreated countries alike. For instance, Basel II and Basel III may coincide with changes in competition in banking systems, but as such changes affect banks in a similar manner, the estimator only attributes the additional changes in competition to the intervention. Difference in difference estimators are increasingly used in the banking literature (e.g., Schaeck et al., 2012).

Our regression setup is as follows:

$$C_{it} = \alpha + \beta I_{it} + \rho X_{it} + A_s + B_t + \varepsilon_{it} \quad (1)$$

The dependent variable C_{it} denotes competition in country i during year t .

The regressions include vectors of country (A) and year dummy variables (B) to capture cross-country heterogeneity and year fixed effects, respectively. The country-fixed effects net out any time-invariant unobserved country-specific factors that impact competition. In short, these country-fixed effects capture any political, legal, historical, institutional, and geographic differences across countries. The year-fixed effects difference away any trend that affects both treatment and control

¹¹ In unreported tests, we confirm these inferences when we i) exclude all countries that experienced the recent crisis (defined as crises starting in 2007 or later); ii) exclude countries that had multiple crises during the sample period, and iii) when we omit countries that also experienced currency crises.

group countries over time such as changes in contestability of banking markets, changes in the yield curve, and long-term trends in consumer behavior. We also include a set of dummies for eight regions, and dummies for World Bank Income Categories.¹² The vector X is a set of time-varying country-level control variables explained in more detail below, and ε_{it} is the error term.

Our coefficient of interest is β , the dummy variable that equals one in the years affected by the intervention (blanket guarantee, liquidity support, recapitalization, nationalization), denoted by the variable I , or zero otherwise. The slope of β provides information about the effect of government intervention on competition. Note that our two measures of competition are decreasing in competition. Hence, a positive slope coefficient β in our regressions suggests that government interventions decrease banking competition, whereas a significantly negative slope coefficient signals an increase in competition resulting from the government interventions.

The vector of control variables X contains determinants of banking competition as identified in the literature (Claessens and Laeven, 2004; Demirguc-Kunt and Martinez-Peria, 2010). Specifically, we use the variables GDP growth, inflation, and real GDP per capita, obtained from the World Bank's World Development Indicators, to account for differences in the macroeconomic environment. Claessens and Laeven (2004) have shown that market structure, captured by concentration, can significantly affect competition. We therefore also consider banking market concentration, using a Herfindahl-Hirschman index (HHI) based on asset market shares that we calculate using BankScope.¹³ Since we compare Herfindahl indices across different markets, we also include total banking system assets (ln) to account for banking system size (Breshanan, 1989). Finally, to control for differences in the legal environment, contract enforcement, property rights, and society's confidence into the judiciary which all affect bank business conduct, we include the Rule of Law index from Kaufmann, Kraay, and Mastruzzi (2009). The index is increasing in the Rule of law, and is normalized ranging between -2.5 and +2.5.

Table I presents summary statistics and data sources of the variables we use in the empirical analysis. The average Lerner index for our regression sample is 0.25 and it ranges between 0.03 (highly competitive) and 0.62. The net interest margins is, on average, 8.7 percent in our regression sample and its coefficient of variation is nearly one (i.e., the standard deviation is as large as the mean).

[TABLE I: Summary statistics]

Relying on a difference in difference estimator comes with the assumption that assignment to treatment, i.e., assignment of blanket guarantees, liquidity support, recapitalizations, and nationalizations, is plausibly exogenous with respect to competition (Meyer, 1995). In other words, the existing competitive conditions in each country's banking system are not the driving force behind the four government interventions we focus on.

[FIGURE 3: Timing of government interventions and average Lerner index]

[FIGURE 4: Timing of government interventions and average net interest margin]

Visual inspection of Figures 3 and 4 that illustrate the relation between the occurrence of blanket guarantees, liquidity support, recapitalizations, and nationalizations, and the Lerner index and net interest margins suggests that the government interventions are orthogonal with respect to the competitive conditions that prevail in the years prior to the policy responses. Even during the recent

¹² The eight regions are Europe and Central Asia, Middle East and North Africa, Sub-Saharan Africa, South Asia, East Asia and Pacific, High-income non-OECD, Latin America and Caribbean, and Other countries. The income categories are high-income, lower-middle income, upper-middle income, and low-income,

¹³ Note that our inferences are not affected if we use the 5-bank concentration ratio as an alternative concentration measure in our regressions presented in Section II. C below.

crisis, both Lerner indices and net interest margins varied considerably across countries that subsequently experienced government interventions.

In Table II, we offer complementary econometric evidence for the exogeneity of the policy responses. The correlation coefficients between the average level of competition prior to these government interventions and the year in which the intervention is observed are very low, and they are not consistent in terms of the direction. These correlations are also insignificant at conventional levels.

Next, we estimate Cox proportional hazards that provide information about the hazard of blanket guarantees, liquidity support, recapitalizations, and nationalizations. Unlike probit models, proportional hazard models do not impose distributional assumptions on the data, and they offer insights into the conditional rather than the unconditional probability of a government intervention. In the Cox models, our key explanatory variable is the average level of competition in the years prior to the policy response, and we also include the vector of control variables mentioned above.

For the Cox model, we focus on the time from the beginning of our sample period in 1996 to the occurrence of the government interventions. The hazard rate $h(t)$ in equation (2) represents the likelihood that a government intervention is observed at time t in country i , given that the country did not intervene into its banking system until t . In employing duration analysis, we have a choice if we want to impose a structure on the hazard function. Since we have no reason to assume that there is duration dependence in the data (see also Figures 3 and 4), we rely on a Cox model that does not impose a certain shape on the hazard function.¹⁴ The model takes the basic form

$$h(t|x_i)=h_0(t)exp(x_i\beta_x) \quad (2)$$

where $h_0(t)$ denotes the baseline hazard which has no parametrization, and β_x is the vector of parameters, including the key variables for the occurrence of government interventions, estimated from the data.¹⁵

As a final check for the exogeneity of the government interventions, we also estimate probit models that offer insights into the unconditional probability of observing blanket guarantees, liquidity support, recapitalizations, and nationalizations. The probit regressions model the occurrence of a policy response as a function of the one year lagged competition measures and the control variables as follows

$$Pr(y=1|x_i)=\beta x_{i,t-1}+\varepsilon_i \quad (3)$$

Thus, in both models a positive coefficient on the competition measure increases the hazard (probability) of a government intervention. All models include the vector of control variables discussed above.

Panel A of Table II reports the results with the Lerner index, and Panel B shows the coefficients obtained when the net interest margin is the dependent variable. Across the two panels and irrespective of the type of estimation method, the competition measures are not significant at conventional levels in any one of the regressions. Government interventions during banking crises are not related to the prevailing competitive conditions in banking systems.

[TABLE II: Duration and probit models]

¹⁴ Note that our duration model could impose a particular structure on the baseline hazard function. That is, we could assume positive, constant, or negative duration dependence using a Weibull model. However, since we have no reason to assume duration dependence in the data we refrain from doing so in this research.

¹⁵ In this model, the explanatory variables shift the underlying hazard function up or down but it is not necessary to specify a functional form for the baseline hazard, reflecting proportionality.

C. Main results

Table III presents our main results obtained with the difference in difference estimator to establish the effects of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations onto the Lerner index in Panel A and the net interest margin in Panel B. Following Bertrand, Duflo, and Mullainathan (2003), we cluster standard errors on the country level to allow for correlation in the error terms over time within countries. All regressions are performed on annual data, and we drop countries that experienced multiple banking crises, although the results are not affected when these countries are included in the regressions.¹⁶

While several countries simultaneously adopted such measures in the past, we run separate regressions for each one of the four different forms of government interventions because we are interested in the individual effect of each policy response to banking crises. Doing so allows us to establish the relative importance of each type of intervention.

[TABLE III: The effect of government interventions on banking competition]

All coefficients that capture policy responses exhibit a negative sign for the effects on the Lerner index and on the net interest margin.

Liquidity support assumes significance at conventional levels, suggesting the provision of emergency liquidity support enhances competition. On the other hand, resolution measures also show negative coefficients but only recapitalizations exhibit statistical significance.

We illustrate the effect in terms of their economic magnitude using Indonesia, a country where liquidity support was provided and banks were recapitalized as an example. Indonesia is located at the 25th percentile of the distribution of the Lerner index in 2002 with a Lerner index of 0.167. Having had liquidity support for distressed banks, the banking systems experienced an increase in competition to the level of Ghana, located at the 14th percentile of the distribution in 2002 with a Lerner index of 0.132. Similarly, recapitalizations of Indonesian banks reduce the Lerner index to 0.126, equivalent to the level of competition in Belgium which is located at the 12th percentile. These calculations illustrate the competitive distortions also matter in terms of their economic magnitude.

Only policy responses in the resolution phase enter the regressions in Panel B significantly negatively. Recapitalizations and nationalizations enhance competition.

The key result that policy responses such as liquidity support, recapitalizations, and nationalizations give rise to market distortions by incentivizing banks to compete more fiercely resembles the results reported in recent research by Gropp et al. (2011) at the micro level. They illustrate that bailouts reduce margins of protected institutions' competitors and encourage them to compete aggressively. Our findings provide complementary evidence for competitive distortions on the aggregate level.

Another key finding is the lack of significance of blanket guarantees in Table III (and also in most of the robustness tests below in Table IV). Anecdotal evidence suggests that blanket guarantees per se may not be credible for a number of reasons. Guarantees which are not accompanied by other policy measures may not be credible, and foreign creditors tend to ignore such guarantees. Further, some countries introduced tax policies that undermined blanket guarantees at the time the blanket guarantee was announced, e.g., in Ecuador. The absence of an effect may also have to do with the fact that in some countries, e.g., in Thailand and Ireland, blanket guarantees exceed the country's GDP, questioning the sovereigns' ability to service such commitments.

Among the control variables, we show that larger financial systems are typically more competitive. Indicators of macroeconomic performance tend to have a significant effect on the net

¹⁶ The Russian Federation and Ukraine experienced multiple crises during the sample period.

interest margin. Specifically, net interest margins decline in countries with higher growth rates and lower rates of inflation. Market structure, measured by the asset share of the largest five banks in the system, has no significant relationship with our two measures of banking competition. We acknowledge that the sign of the coefficient suggests that more concentrated banking systems are more competitive. This finding implies that concentration and competition measure different characteristics of the system.

In the regressions above, each one of the four different types of interventions enters the regressions separately because we are interested in the unconfounded effect of each individual type of intervention. However, we do not claim that these interventions occur independently from each other.¹⁷ For instance, blanket guarantees are likely to reduce the need for emergency lending by the central bank via the provision of liquidity support to the banking system over the long run, but Laeven and Valencia (2010) show that most policy responses occur within a few months of each other. They demonstrate that recapitalizations occur within less than 5 months of the announcement of liquidity support during the recent crisis. In unreported tests, we employ a dummy variable that takes on the value of one if multiple measures have been enacted simultaneously, and confirm our inferences. In addition, in further unreported tests, we also obtain qualitatively similar results if we do not include control variables. These regressions are available upon request.

We acknowledge that a common shock, i.e., a banking crisis itself, rather than the interventions we examine in this study can influence the way banks compete (Acharya and Mora, 2012).¹⁸ However, several countries that experienced crises did not revert to these government actions, and, as shown above, not all policy responses consistently display the same effect.¹⁹ If the government interventions simply serve as a proxy for banking crises, they would display identical effects. Clearly, this is not the case. Furthermore, the crisis durations are relatively short (average duration 3.09 years) whereas most of the intervention measures such as blanket guarantees, recapitalizations and nationalizations remain in place over longer periods of time. For instance, blanket guarantees lasted 78 months in Indonesia, and 89 months in Japan and in Thailand, respectively. On average, blanket guarantees remain in place for 5.2 years, and the public sector also retained its equity participation for over 10 years (Laeven and Valencia, 2010). The effects of these interventions are therefore likely to go beyond the effect of the crisis itself.

Finally, we conduct empirical tests to confront a set of alternative explanations. The first test replicates our main regressions on a sample that excludes all countries that are classified as having experienced systemic crises and we only consider government interventions that occurred in countries with borderline crises (not reported). This test substantially reduces the number of policy responses we can investigate, but we still obtain significant competition-increasing effects for liquidity support and recapitalizations, suggesting that we can rule out that the effects we attribute to the government interventions simply capture the presence of systemic banking crises.²⁰ Our second test excludes countries that are subject to structural adjustment programs by the International Monetary Fund. These programs are often associated with emergency loans by the International Monetary Fund and aim to increase a country's competitiveness, including guidelines

¹⁷ Appendix III shows a correlation matrix for the four variables for government interventions.

¹⁸ Acharya and Mora (2012) demonstrate that banks in the U.S. scramble for deposits during the recent episode of liquidity stress in the banking system.

¹⁹ The countries that experienced crises but did not rely on blanket guarantees, liquidity support, recapitalizations and nationalizations are China, Iceland, Nicaragua, Philippines, and the Slovak Republic.

²⁰ Note that we do not have sufficient observations in countries that experienced borderline crises to run regressions with blanket guarantees and nationalizations. In countries with borderline crises, our regressions rely on eight instances of liquidity support and on seven cases of recapitalizations. The tests are available upon request.

for steps towards more liberal economic policies. To rule out that these programs drive the increase in banking competition, we collect data on structural adjustment programs, and omit countries that were subject to these programs in unreported tests. Our coefficients of interest remain very similar in these analyses. Finally, we examine if our results simply reflect a too big to fail effect. This effect posits that systemically important banks, typically the largest and most interconnected ones, can engage in reckless competition because of the perceived responsibility of the government to rescue them. To rule out that our findings represent a too big to fail effect, we exclude countries whose average Herfindahl-Hirschman index is above the 90th percentile of the distribution ($HHI > 0.55$). This analysis reduces the sample size by 10 percent but leaves the significance level of the key variables of interest unchanged (not reported).²¹

D. Robustness tests

We offer five robustness tests in this section. Note that our regressions include all control variables but we suppress these coefficients to preserve space.

First, we are concerned that our results are driven by small countries with volatile macroeconomic conditions in our dataset. This group of countries includes Andorra, the Bahamas, Bermuda, Cambodia, Cayman, Monaco, Netherlands Antilles, San Marino, and Uzbekistan. Some of these countries are offshore financial centers while others are small-sized economies and they may represent outliers that can lead to misleading inferences for the results reported in Table III.

The difference in difference estimates for the sample excluding offshore financial sectors and small economies are shown in Table IV. We again find that all policy responses that assumed significance in Table III display a negative coefficient and retain their statistical significance.

[TABLE IV: Robustness – Subsamples]

Second, approximately half of all the crises and the corresponding policy responses occurred in high income economies. These countries typically have more sophisticated regulatory frameworks than low income economies. To rule out that our results are driven by these high income economies, we remove them from the sample. Table IV shows that blanket guarantees also exhibit a weakly significant, competition-increasing effect, and we find a similar effect for recapitalizations in Panel A. The effect on net interest margins is even stronger when high income economies are omitted: With the exception of blanket guarantees, the three other policy responses compress net interest margins. This and the preceding test indicate that our results are not driven by countries with volatile macroeconomic conditions or countries that operate relatively sophisticated regulatory frameworks that allow swift policy responses to large-scale banking distress.

Third, we replicate the regressions on a subsample that excludes emerging markets as a complementary test to the estimations that exclude high income economies. These regressions, also shown in Table IV, lend further support to our inferences. The competition-increasing effect on Lerner index arising from blanket guarantees is confirmed, and so is the effect of recapitalizations. For the net interest margins, we find that liquidity support, recapitalizations, and nationalizations have a negative and significant sign.

Fourth, we use a tough test to establish that the causal effect of the interventions can only be observed in periods when an intervention takes place. To this end, we generate placebo treatments by forwarding the interventions by one period. In this case, an insignificant placebo treatment effect

²¹ The results of these additional tests are available upon request. Argentina, Bulgaria, Dominican Republic, Ecuador, Indonesia, Korea, Philippines, Russian Federation, Thailand, Turkey, Uruguay, and Venezuela were subject to structural adjustment programs by the International Monetary Fund. The regressions that aim to rule out the too big to fail effect are insensitive with respect to the cut off value for the Herfindahl-Hirschman index. Irrespective of whether we use the 85th, 90th, or 95th percentile, we obtain competition-increasing effects for the government interventions.

suggests that the significant relationships uncovered in Table III are indeed causally related to the aforementioned government actions. Our falsification exercise in Table V fails to detect significant relationships between the placebo treatments and the Lerner index in Panel A and the net interest margin in Panel B, suggesting that the policy responses are indeed responsible for the observed increase competition.

[TABLE V: Robustness - Placebo regressions]

Above, we acknowledged that the policy actions do not occur randomly which gives rise to a selection problem. In our final robustness check, we address this problem using propensity score matching methods based on a nearest-neighbor procedure since the lack of random assignment can bias our coefficients (Rosenbaum and Rubin, 1983; Heckman, Ichimura, and Todd, 1997).

The propensity score matching method carefully constructs control groups of countries that have a similar probability of experiencing government interventions but no such event takes place. Specifically, the propensity score is defined as the probability of being subject to blanket guarantees, liquidity support, recapitalizations, or nationalizations, conditional on preintervention characteristics.²²

Calculation of the propensity scores relies on four probit models with blanket guarantees, liquidity support, recapitalizations, and nationalizations as dependent variables. The predicted probabilities from the probit models, referred to as propensity scores, are then used to match each country-year observation to a corresponding set of observations from the control group of countries from the same geographic region and World Bank income group category using the absolute value of the difference between the propensity scores as a decision criterion. The nearest neighbor matching technique then restricts the set of relevant matches to those whose propensity scores fall in the common support of both groups. To evaluate the sensitivity of our findings, we present in Table VI the corresponding treatment effects with and without a further set of control variables, consisting of the control variables we also use in the difference in difference estimations (banking system size, GDP growth, Rule of law, inflation, real GDP per capita, and the Herfindahl-Hirschman index for banking system concentration).²³ We separately report the treatment effects when we have 2 or 4 countries in the control group.

[TABLE VI: Robustness – Propensity scores]

²² The propensity score estimator computes the unobserved outcome for each country because we are faced with a problem of missing data. The idea is to estimate the untreated outcome for country i . Assuming that observing a policy response is random for countries that have similar characteristics prior to the policy action, we calculate the average outcome of a set of similar countries that do not have these government measures to estimate the untreated outcome. In other words, for each country i , the estimator imputes the missing outcome by finding a set of countries with similar characteristics that did not receive treatment, whereby treatment is defined as blanket guarantees, liquidity support, recapitalizations, or nationalizations. For instance, for every country that issued blanket guarantees, the nearest-neighbor matching technique chooses a group of untreated countries with propensity scores closest to the treatment country propensity score. Then, the estimator calculates an arithmetic average of the change in competition of these untreated countries.

²³ To illustrate the similarities between the countries in the treatment and control group following the propensity score matching process, we plot the distribution of the two competition measures and the control variables banking system size (ln), GDP growth, Rule of law, inflation, Real GDP/capita, and concentration in Appendix IV based on 2 countries in the matched control group. These plots demonstrate that our matching process results in very similar distributions for GDP growth, Real GDP/capita between the treatment and control groups, and we also observe similar patterns for Rule of law and concentration. In contrast, the distributions in the patters for the Lerner index and the net interest margin differ considerably between treatment and control groups.

The treatment effects presented in Table VI reinforce the previous inferences. Once the non-randomness of the policy actions is considered, blanket guarantees also exhibit a strong and significant competition-increasing effect and this result persists across the two different competition measures. Liquidity support retains its negative sign, although the effect is only significant in Panel A, and it only shows significance in Panel B when control variables are included. While recapitalizations are rendered insignificant in Panel A when control variables are considered, the effects on the net interest margin are both statistically and economically significant, confirming the results from the difference in difference estimations. Nationalizations also display a negative sign, and the effect is also significant in five out of eight tests.

E. Initial conditions of banking systems prior to government interventions

Figures 1 and 2 indicate the different policy responses do affect countries equally. We argue that the initial banking market conditions may play a role in explaining cross-country differences in the effect of government interventions. Specifically, the competitive response to a government action may depend on the conditions in the market prior to the intervention. From a policy perspective, it is also useful to understand if the response of banking competition to government interventions varies in a predictive way to better aid the actions taken by policymakers.

Demirguc-Kunt and Detragiache (2002), Claessens and Laeven (2004), Martinez Peria and Mody (2004), and Dell’Ariccia, Laeven, and Marquez (2010) show that certain characteristics of banking markets such as structure of the industry, contestability, and moral hazard are closely related to competition. These characteristics prior to the government actions are therefore likely to either amplify or mitigate the effects of policy responses on competition.

We illustrate our arguments about the effect of initial conditions as follows: If blanket guarantees boost competition by giving rise to moral hazard incentives if a country had not explicit deposit insurance before the implementation of blanket guarantees, then the effect of blanket guarantees should be greater in countries where no deposit insurance scheme was in place. Foreign banks may also play a role because their presence suggests greater contestability of a banking system. If foreign banks are well represented prior to a wave of nationalizations, the competition-increasing effect of such nationalizations may be relatively limited. Likewise, if a country does not have a contestable banking system prior to a crisis reflected in restrictions on activities and high entry requirements the competition-enhancing effect of liquidity support or recapitalizations is likely to be muted.

For the measurement of market structure, we use the Herfindahl-Hirschman Index based on banks’ asset market shares (Claessens and Laeven, 2004). Information about the penetration of foreign banks, measured by the asset share of foreign-owned institutions, is our first indicator for the contestability of banking systems. Martinez Peria and Mody (2004) illustrate that foreign banks play a major role, especially in emerging markets, and their competitive conduct differs from the behavior of domestic banks.

Contestability can also be approximated with indicators that measure entry barriers as well as restrictions on bank activities (Claessens and Laeven, 2004; Barth, Caprio, and Levine, 2004). We use an entry restrictions index that summarizes the number of documents and/or procedures required to obtain a banking license, the percentage of denied applications for bank licenses, and the minimum capital required. The index ranges between 0 and 8; it is increasing in restrictions. Similarly, we also use an activity restrictions index, which is also increasing in restrictiveness. It takes on values between 4 and 22, and provides information about banks’ ability to engage in activities other than banking (securities, insurance, and real estate), and restrictions on financial conglomerates (e.g., banks owning non-financial firms).

To approximate the presence of moral hazard, we follow Demirguc-Kunt and Detragiache (2002), and rely on a dummy variable that takes on the value one if a country operated a system of explicit

deposit insurance. Exploiting cross-country variation, they show that explicit deposit insurance and more generous deposit insurance scheme design features give rise to moral hazard which supplants market discipline and incentivizes aggressive competition because banks can attract deposits at rates that do not reflect risk. All these indicators are gathered from the World Bank's Banking Regulation and Supervision Survey (Barth, Caprio, and Levine, 2001, 2004).

To calculate the initial conditions for foreign bank ownership, concentration, activity restrictions, and entry restrictions, we take the mean value of these variables in the countries from the treatment group prior to the year the intervention was observed. For the initial conditions of deposit insurance, we code the variable as one if a country had explicit deposit insurance arrangements in place or zero otherwise. Since we need to define the initial conditions also for the countries in the control group, we use a $1:n$ matching procedure that finds at least one country from the set of countries that did not have a crisis in the same year. As further matching criteria, we use World Bank Income Group, and geographic region to ensure we compare countries with comparable levels of economic development.

Table VII reports the results. Each cell in the table represents a single regression, and we only show the interaction term of the intervention variables with the corresponding initial condition. Since these regressions include country-fixed effects the initial condition itself is dropped from the regression. All other coefficients for the control variables are suppressed to preserve space.

Panel A presents the slope coefficients of these interaction terms for the Lerner index regressions and Panel B shows them for the net interest margin regressions.

We first discuss the results for the Lerner index. Regardless the type of government intervention, our tests show that the increase in competition associated with government interventions is significantly greater in magnitude in concentrated markets. For instance, for countries with a Herfindahl index that is one standard deviation above the mean (0.55 vs. 0.32), the additional reduction in the Lerner index associated with the government intervention ranges from 0.05 (liquidity support) to 0.08 (blanket guarantees).

Regarding the presence of foreign banks, we find a robustly positive and significant coefficient regardless of the type of intervention. That is, the negative relation between government interventions and competition is mitigated in countries with higher foreign bank penetration, suggesting the benefits of policy interventions are reduced between 0.03 and 0.06 points in the Lerner index. Activity restrictions have a weaker interaction with government interventions – in fact, it is only significant in the case of recapitalizations. Competition benefits in the banking sector due to recapitalization measures are reaped by banks in less contestable markets (proxied by greater activity restrictions). Entry restrictions, on the other hand, play a more significant role in explaining the relationship between government interventions and competition. The reduction in the Lerner index induced by government interventions is robustly larger in banking systems with more severe entry restrictions. This is true for all government interventions but the extension of liquidity support. When comparing the marginal effect of higher restrictions to entry (an index that is higher by one standard deviation or 1.089) on the impact of government intervention on competition, we find that the reduction in the Lerner index is greater by 0.03 when assessing the effects of recapitalizations and nationalization and 0.06 for blanket guarantees. Finally, the presence of explicit deposit insurance only plays a significant role when assessing the effects on competition of nationalizations. Here we find that explicit deposit insurance mitigates the likely improvement in competition due to nationalization of banks.

These initial conditions do not have such an important role to play for explaining the effect of interventions on competition when the latter is measured by net interest margins in Panel B with the exception of explicit deposit insurance. In this case, the positive interaction coefficient for all interventions (except for blanket guarantees) implies that the deposit insurance may offset (at least

partly) the former effect. The reduction in that marginal contribution due to the presence of explicit deposit insurance ranges between 7.9 percent (nationalizations) and 8.9 percent (recapitalizations).

[TABLE VII: The role of initial banking market conditions]

III. Testing the theories: Transparency and charter values

So far, our analyses point towards competition-increasing effects from government interventions. Several studies offer theoretical predictions for how government bail-outs affect banks' competitive conduct. One set of studies emphasizes the role of transparency in the banking system. Another group of studies posits that competitive distortions depend on banks' charter values. We present the arguments and empirical tests for these theories below. We again suppress the control variables to preserve space.

A. Transparency

The idea that banking system transparency matters for the effect of policy responses to banking crises has been advocated repeatedly (Nier and Baumann, 2006; Hakenes and Schnabel, 2010; Gropp et al., 2011).

The basic premise in these studies is that greater transparency and more disclosure requirements mitigate the effect of bank bailouts which tend to undermine market discipline.²⁴ The argument goes as follows: In a transparent system, depositors can more easily observe bank risk. Therefore, they will discipline the bank if it competes too aggressively and becomes too risky. In contrast, in opaque banking systems, it is more difficult to infer information about banks' condition, so that the effect of market discipline remains muted.

To test these predictions, we create a Transparency index, ranging from 0 to 5 following Barth, Caprio, and Levine (2004). Our index consists of two components. One is a dummy variable that takes on the value one if a compulsory external audit is required and the second component is a bank accounting index that is increasing in the quality of bank accounts. This component considers information about whether the income statement includes accrued or unpaid interest or principal on nonperforming loans and whether banks are required to produce consolidated financial statements. The information for the index is collected from the World Bank Regulation and Supervision Survey.

[TABLE VII: Testing the theory - Transparency]

Table VII tests the effect of transparency by presenting the estimates of the effects of government interventions on competition augmented by a term that interacts each of these policy responses with the transparency index.

Panel A shows the difference in difference estimates of the Lerner index on each of the policy interventions as well as their interaction with the transparency index. These regressions include all control variables. We robustly find that the coefficient of the policy interventions is negative and that the interactions with the transparency index display a positive sign. All coefficients are also statistically significant except for those of the blanket guarantees.

These results underscore that interventions enhance competition by reducing market power as measured by the Lerner index. However, the impact is considerably reduced as transparency disclosure requirements become more stringent, in line with theoretical arguments.

²⁴ Panageas (2010) highlights that market participants reduce their monitoring following a bailout because bailouts constitute a guarantee issued by the government. Ultimately, bailouts give rise to increased bank risk.

Importantly, these estimates allow us to gauge the value of the transparency index under which a competition-increasing effect of government intervention becomes a deteriorating one. That is, over a certain threshold of transparency, the positive effect of government interventions on banking competition would be fully offset and start to deteriorate.

We calculate the impact on the Lerner index of different government interventions in countries with looser transparency (index value of 4 at the bottom quartile) vis-à-vis those with more strict transparency disclosure (index value of 5 at the top quartile). Under such conditions, liquidity support measures are associated with a reduction in the Lerner index of approximately 4 basis points in countries with looser transparency disclosure whereas the impact is almost negligible for countries with stricter transparency. On the other hand, the launch of large-scale government interventions in the financial sector is associated with a decline of nearly 3 basis points in the Lerner index in countries with greater opacity while it large-scale interventions increase the Lerner index by 3 basis points in countries with greater transparency.

B. Charter values

The second set of theories emphasizes the role of charter values. Seminal work by Keeley (1990) highlights that banks with valuable charters have a disincentive to compete aggressively because of the future rents that will be lost in case of failure. Cordella and Yeyati (2003) extend these ideas and propose two offsetting effects on risk-taking bank behavior. The first effect induces moral hazard and leads to excessive risk-taking among banking institutions due to increased competition, and the second one tends to increase the charter value of banks and creates incentives for prudent bank behavior. We refer to this phenomenon as the charter value effect. According to Cordella and Yeyati (2003), the second effect can fully offset the first one, and become the dominant one.

Since the majority of banks in the countries in our sample is not listed, we cannot rely on Tobin's Q, which is typically used as a measure for bank charter value. Instead, we follow the intuition in Hutchinson and Pennacchi (1996) who show that core deposits are informative about a bank's charter value, and approximate charter values with the ratio of current deposits to total deposits, and money market and short-term funding.

[TABLE IX: Testing the theory – Charter values]

To test the effect of charter values, we introduce in Table IX the charter value, measured at the mean bank for each country per year, and an interaction term between each of the government intervention variables and the charter value variable.

While the baseline effect of our proxy for charter values consistently displays a positive coefficient in Panel A and B, it only borders on statistical significance in the net interest margins in two out of four regressions when we examine the effects of blanket guarantees and recapitalizations. We remain cautious interpreting these findings as support for the idea that charter values serve as a disincentive to compete aggressively.

Moreover, inspection of the interaction terms between the proxy for charter values and the different policy responses reinforces that we need to remain cautious. None of the interaction terms, irrespective of whether we use the Lerner index or the net interest margin, assumes significance at conventional levels, further undermining the charter value effect.

IV. Do the competitive distortions persist over time?

We already acknowledged in Section II.C. above that the average duration of the policy measures goes beyond the duration of the banking crises. Moreover, our results obtained with the difference in difference estimator suggest that the effects on competition are likely to remain in place for some time. This section lends further support to the idea that the competitive distortions caused by government interventions have lasting effects and are not reverted easily.

To examine how the policy responses affect competition over the long run, we trace the evolution of average values of Lerner indices and net interest margins in countries that were subject to the four different types of government interventions over the five years following the intervention.²⁵

In addition, we also offer some econometric backup. We construct simple tests consisting of five separate OLS regressions in which the competition variable C (Lerner index, net interest margin) for country i in year t is regressed on one dummy variable I for the government intervention at periods $t+1, \dots, t+5$, respectively, and a vector of country and year dummies to capture the effect of the policy responses over a five-year span

$$C_{it} = \alpha + \beta I^{t+n} + A_s + B_t + \varepsilon_{it} \quad (4)$$

where $n = 1, \dots, 5$. These regressions include vectors of country (A) and year dummy variables (B), and ε_{it} is the error term. Standard errors are again clustered on the country level. For instance, if we obtain in these tests a significant slope coefficient βI^{t+3} , this indicates that the competition-increasing effect we have reported above remain in place also in the third year after the initial announcement of the government intervention.

Figure 5 and Figure 6 plot the evolution of competition over time in countries that witnessed government interventions. The bars shaded in dark represent the level of competition measured by the Lerner index (Figure 5) and by the net interest margin (Figure 6) in the year the government intervention (blanket guarantee, liquidity support, recapitalization, and nationalization) was announced. The light bars illustrate the evolution of the competition indices in the five subsequent years. The slope coefficients from the OLS regressions are denoted by hollow circles, and the dashed lines show the corresponding confidence intervals.

The empirical patterns reinforce our previous analysis. The Lerner indices are consistently below the initial level in the five years following the government interventions in question, and the effects are particularly strong in the first three years, suggesting the distortionary effects on competition unfold very quickly. The regressions lend more support to this idea. The slope coefficients for the dummy variables for the four policy responses are consistently negative, and in many instances they are also significant.

While there is some reversal in the fourth and fifth year when we consider the Lerner index, the effects in Figure 6 highlight that net interest margins experience a hefty drop in the first two years after the policy response (with the exception of countries where blanket guarantees are announced), but they also remain compressed over the following years and there is no reversal. This figure suggests that the longer the time window from the initial government intervention, the lower the net interest margin. While not all of individual dummy variables from the OLS regressions exhibit significance, in the fourth and fifth year, several of them assume significance, suggesting the margin-depressing effects remain in place.

[FIGURE 5: Long-run effects (Lerner index)]

[FIGURE 6: Long-run effects (Net interest margin)]

V. Effects of government interventions on welfare

So far, our analysis was concerned showing the influence of government interventions on producer welfare. This section now turns to our second question, and offers empirical tests to address the issue of how consumer welfare is affected.

²⁵ In the following tests, we exclude countries whose crisis started in 2007 or later. In unreported tests available upon request, we confirm that excluding those countries does not qualitatively alter our inferences.

This analysis proceeds in two steps. In the first step, we examine which parties benefit from the increase in competition. In the second step, we take a broader perspective, and focus on provision of credit and access to finance.

A. Who benefits? Competition in deposit and loan markets

One of the robust stylized facts of our research is that government interventions enhance banking competition by reducing net interest margins.

This result warrants further attention. We now decompose the net interest margin, and examine whether the competition-enhancing effect is driven by higher competition in deposit markets (i.e., higher deposit rates), or greater competitiveness in loan markets, reflected in lower loan rates. This analysis helps understand who benefits from the change in banking competition (Jayaratne and Strahan, 1998). Is it lenders, borrowers, or both? To explore the mechanisms, we run regressions with average deposit rates in Panel A, and average loan rates in Panel B as dependent variables on government interventions and the set of control variables included in our baseline regression in Table X.

Our results do not support the idea that government interventions induce banks to compete more aggressively in deposit markets. On the contrary, we find a negative and significant coefficient for all interventions (except for recapitalizations), suggesting the rescue measures enhance banks' market power in deposit markets. This idea is not far-fetched and is supported by anecdotal evidence. Irish banks, having received a public guarantee in 2008, witnessed deposit inflows during the recent crisis from British customers (Acharya and Mora, 2012). These observations are also in line with theoretical predictions. The value of a bank charter increases as a result of public support due to lower refinancing costs (Keeley, 1990; Gropp et al., 2011).

Panel B, on the other hand, presents the analysis for loan rates. We observe a negative and significant coefficient for liquidity support and nationalizations. Nationalizations are inversely associated with loan rates, a finding similar to the results reported for government ownership of banks. Sapienza (2004) demonstrates that loans originated by state-owned banks in Italy systematically carry lower interest rates than loans originated by private banks, and Black and Hazelwood (2011) also show that small banks in the U.S. that received TARP funds charge lower rates.

These effects are likely to differ across the type of financial system. In a bank based financial system, we would expect to observe stronger effects from the government interventions than in a market based financial system because substitutes for deposit and loan services are more readily available in the latter type of financial system. The lower panel in Table X reports the coefficients of interest separately for subsamples of market and bank based financial system, based on the classification of financial systems by Beck et al. (2000). This decomposition largely confirms our conjecture that the effects are more pronounced in bank based financial systems. With the exception of a weakly significant and positive effect of recapitalizations in market based financial systems on loan rates, we find that both magnitude and significance levels are higher for the coefficients in bank based financial systems in the regressions that focus on loan rates.

In sum, these slope coefficients point towards a disparate effect of government interventions. While they tend to create market power for banks in deposit markets, they simultaneously induce banks to compete more fiercely in loan markets.²⁶ On balance, the competition-enhancing effect in

²⁶ Such disparate effects are not uncommon. Jayaratne and Strahan (1998) examine the effects of increased competition following deregulation in U.S. banking on deposit and loan rates. They uncover no effect of increased competition on deposit rates but at the same time observe increased credit market competition which benefits borrowers. Similarly, Park and Pennacchi (2009) illustrate countervailing effects in loan and deposit markets following market-extension mergers by banks in the U.S. While large multi-market

loan markets therefore seems to offset the competition-reducing effect in deposit markets, resulting in a competition-increasing effect overall.

[TABLE X: Competition in deposit and loan markets]

B. Provision of credit and access to banking services

Ultimately, financial intermediaries *raison d' être* is to mobilize savings, evaluate projects, and allocate funds to borrowers to facilitate economic growth (King and Levine, 1993).

Typically, during episodes of crises when governments initiate interventions, lending contracts because banks become increasingly risk-averse and tighten up underwriting standards (Kaminsky and Reinhart, 1999; Dell’Ariccia and Marquez, 2006; Ivashina and Scharfstein, 2010). At the same time, demand effects may play a role as well in dire economic environments, and such demand effects would also be reflected in reduced lending.

A question that naturally arises, therefore, is whether the distortions in competition that arise from the government interventions we study here also have implications for access to finance. Our line of enquiry builds upon a growing literature on the effects of competition on access to finance (e.g., Beck, Demirgüç-Kunt, and Maksimovic; 2004; Cetorelli, 2004; Karceski et al., 2005; Cetorelli and Strahan, 2006; Rice and Strahan, 2010), and work on how banking crises affect access to credit (e.g., Ongena et al., 2003; Dell’Ariccia et al., 2008; Chava and Purnanandam, 2011).

As stressed in the introduction, if government interventions, via their effect on competition, reduce the number of suppliers of banking services, access to banks may become more difficult, and outreach declines, potentially resulting in lower firm output and declining growth. Such considerations are important in particular in countries where informationally opaque small and medium-sized firms dominate the industry structure. Alternatively, if these interventions increase competition, credit may become more easily available, and outreach will increase.

Theory offers several predictions about the effect of banking competition on access to financing. On the one hand, banks’ propensity to lend and invest in information production may be more limited in competitive environments because competition reduces the possibility that banks can recoup the costs involved in building and nurturing long-time relationships with borrowers (Petersen and Rajan, 1995). In this case, we anticipate competition to be inversely related to access to finance. On the other hand, the more dominant view suggests that competition tends to be associated with lower loan rates which makes credit more affordable and also increases lending and access to finance. Moreover, existing bank-borrower relationships can also play a role. Cestone and White (2003) show that banks exhibit a reduced willingness to lend to new borrowers in uncompetitive markets because their existing lending relationships are highly valuable.

For the empirical tests, we focus on the flow of domestic credit to the private sector to gauge how the interventions influence bank lending, and we subsequently home in on access to finance. Access to finance is approximated with bank branch density, and a further test focuses on bank density itself. Our final set of regressions explores whether bank assets are redistributed following government actions to examine the nexus between access to finance and industry structure. Although our regressions control for GDP growth to account for demand-side effects as in Black and Strahan (2002), a full-fledged analysis that disentangles credit demand from credit supply effects is beyond the scope of this paper. Yet, the difference in difference regressions here offer insights into

bank presence enhances competition in loan markets and benefits borrowers, it harms competition in deposit markets.

empirical associations that can aid policy responses. We consequently refrain from drawing causal inferences in this section.²⁷

Panel A of Table XI shows our regressions with Domestic credit provided by the banking sector (% of GDP) as dependent variable, Panel B reports the coefficients when Bank branches per 100,000 adults is the dependent variable, and Panel C shows the results when the number of commercial banks, scaled by population is the dependent variable. The latter test uses a natural logtransformation for the dependent variable.

All measures (except for blanket guarantees) are successful in maintaining the flow of credit. Central bank liquidity support, bank recapitalizations, and nationalizations help propping up the financing conditions, reflected in increasing domestic credit provided by the banking sector.

Some caveats warrant attention, and we now confront several alternative explanations directly.

A potential concern with this inference is that higher provision of credit is due to liberalization of banking systems that often coincides in developing economies with the aftermath of a crisis (Demirguc-Kunt et al., 2006). To reflect on this problem, we retrieve information on the Chinn-Ito index which provides information about the openness of capital account transactions (Chinn and Ito, 2006).²⁸ We remove countries from the sample that experienced a banking crisis whose Chinn-Ito index in the period after the crisis is higher than in the period prior to the crisis, suggesting the country in question liberalized its financial system by reducing capital controls. While the sample size is reduced by about 18 percent in these tests, the coefficients of interest remain qualitatively unchanged. Consequently, we can rule out that liberalization is the driving force behind the increase in credit provision.

Further, we acknowledge in Section II.C. above that banking crises often coincide with structural adjustment programs by the International Monetary Fund. These programs require countries to increase their competitiveness. To confront this explanation, we remove countries that were subject to these programs. Our result remains virtually unchanged.

Another possible problem arises from lending targets imposed on rescued banks. Anecdotal evidence during the recent crisis suggests bailouts coincide with instructions to banks to meet their responsibility to lend (Black and Hazelwood, 2011). If this is the case, we are faced with an omitted variable problem, and our coefficients of interest may display a significantly positive sign but the reason for the effect may not be the effect of liquidity support, recapitalizations, or nationalizations but rather an instruction to lend. To deal with this issue, we remove countries where the authorities recapitalized or nationalized banks and where the proportion of government owned banks increased relative to the period prior to the recapitalization or nationalization. The intuition is that government owned banks are more prone to instructions to lend than other banks (Sapienza, 2004; Dinc, 2005). These regressions do not qualitatively alter our inferences.

A final potential concern relates to foreign currency loans. During crisis episodes, currency revaluations are often observed and the increase in credit provision could simply reflect this phenomenon. We therefore remove countries that experienced currency crises (defined as nominal depreciation of the currency of at least 30 percent that is also at least a 10 percent increase in the

²⁷ The key issue is that banking crises have potential to trigger declines in aggregate demand, which would also result in reductions in firm investment which shows up in less demand for bank credit. Moreover, aggregate uncertainty increases during crises so that firms delay investment decisions into the future, and banks cut back lending (Dell’Ariccia et al., 2008).

²⁸ The Chinn-Ito index is the first principal component of four variables providing information about the existence of multiple exchange rates; restrictions on current account transactions; restrictions on capital account transactions; and requirements to surrender of export proceeds. Higher values indicate a country is more open to cross-border capital transactions.

rate of depreciation compared to the year before) from the dataset. Doing so leaves our inferences about the beneficial effect on credit provision unchanged.

While the four factors above would bias credit upwards, we believe that our coefficients are likely to be downward biased because nonperforming loans are regularly shifted onto asset management companies as part of the restructuring operations of distressed banking systems. The regression results and additional details about the countries that are excluded in these four tests that home in on alternative explanations are relegated to Appendix V.

We next focus on access to banking services. Panel B and C underscore that those interventions come at a cost in terms of access to banking services, all measures significantly reduce bank branch density, and even bank density itself correlates negatively with liquidity support and nationalizations. By reducing access to financial services, government interventions seem to redirect the greater flow of credit away from borrowers that rely on direct access to banks and bank branches. Typically, smaller firms and potential new entrants typically tend to rely more on bank credit than larger and mature firms (Cetorelli and Strahan, 2004). Limited access to banking services is therefore likely to disproportionately affect these smaller firms. Although our regressions so far do not directly test for such a reallocation of funds, the results point towards a reallocation of bank credit towards larger firms where access to banking facilities in terms of geographical proximity is less important than it is for small and informationally opaque borrowers.²⁹

[TABLE XI: Provision of credit and access to finance]

C. Redistribution of banking assets

We address the reallocation issue our final set of tests in Table XII more directly because changes in bank market structure can also affect nonbanking industries. While we are not aware of theories that offer predictions for the effects of blanket guarantees and liquidity support on industry structure, studies by La Porta et al. (2002) and Sapienza (2004) offer a political view of government ownership suggesting that public recapitalizations and nationalizations have potential to affect industry structures. This research predicts government owned banks politicize the capital allocation process and favor larger borrowers. Therefore, nationalizations and recapitalizations with taxpayer money can trigger reallocation effects in the banking industry.

For these tests, we use two alternative measures of banking system concentration. The Herfindahl-Hirschman index used as a control variable in the preceding regressions, and the 5-bank concentration ratio based on asset market shares as an alternative measure of market structure. We regress these two concentration measures on the variables that provide information about the four different policy responses. These regressions have the same set of control variables as have our other regressions with the concentration variable omitted as a control variable.

Panel A shows that nationalizations are weakly significant and display a positive sign for the coefficient, suggesting that nationalizations go hand in hand with increased concentration as predicted by theories about the politicization of government owned banks. The other three types of government interventions remain insignificant at conventional levels.

One of the key features of the Herfindahl-Hirschman index is that it captures the entire distribution of industry assets. However, some of the government interventions such as nationalizations and recapitalizations such as the ones witnessed during the recent crisis primarily

²⁹ This statement is reinforced by Berger, Demsetz, and Strahan (1999). They report small firms and potential entrepreneurs obtain funding predominantly from local banks, suggesting that the relevant market for banking services demanded by such borrowers is local in nature.

affect the largest banks.³⁰ A concentration measure that focuses explicitly on the largest banks is therefore more likely to react to these policy responses. We therefore replace the Herfindahl-Hirschman index with an asset-based 5-bank concentration ratio in Panel B. The effects of the government interventions are now becoming more obvious.

Blanket guarantees and nationalizations are significantly positively associated with increased concentration. This indication lends further support to our argument that assets are being reallocated towards large banks.

We emphasize that we do not make claims to causality in this Section V here because we do not rely on an identification strategy as above that exploits exogenous variation in the treatment variables. Further, we also remain cautious drawing too strong inferences since our coefficients are based on aggregate data on the country level, rather than on a bank-or even loan and deposit contract level that would be better suited to address the specific questions about whether depositors or lenders benefit from the government intentions.

Nevertheless, we believe that these results offer some important insights into industry dynamics that are triggered by government interventions. Specifically, the findings suggest these interventions have non-negligible implications for small firms which are regularly more dependent on financing from small and medium-sized banks. For instance, Sapienza (2002) illustrates that larger banks reduce loan supply to small borrowers following bank mergers, and Beck et al. (2004) show that greater bank concentration correlates positively with financing obstacles for smaller firms. Consequently, such firms are likely to find it harder to grow in such an environment because larger banks' lending technologies are primarily focused on large and transparent borrowers (Berger et al., 2005).

[TABLE XII: Redistribution of industry assets]

VI. Concluding remarks

The policy responses associated with banking crises such as blanket guarantees, liquidity support by central banks, recapitalizations, and nationalizations of banks have fundamentally changed banking systems. In particular, the recent global financial crisis has elicited unprecedented interventions by governments into banking systems. We do not question the necessity of these policy responses to banking crises.

However, these interventions also beg the question if and how these policy measures affect banking competition. This is important because of the long-run effect of competition on the pricing of banking products, and, more broadly defined, on consumer welfare. The objective of this paper is to address these questions.

Exploiting difference in difference estimations on a large sample of 138 countries that recorded 34 systemic and 12 borderline banking crises and numerous different policy responses to those crises for the period 1996 – 2010, we offer the following key insights:

First, we present evidence of a strong effect of government interventions (as a response to banking crises) on banking competition. We can empirically dismiss reservations by policy makers that government interventions reduce banking competition. Instead, we show that emergency loans for liquidity support, recapitalizations, and nationalizations increase the competitiveness of banks. This finding is obtained irrespective of the competition measure we employ here, a Lerner index of market power, and the net interest margin. Our examination of the long-run effects of these policy

³⁰ Typical examples are for instance the recapitalizations and nationalizations of Commerzbank in Germany, Royal Bank of Scotland in the UK, and Citigroup in the U.S.

measures indicates that the competitive distortions remain in place for the five years following these interventions, suggesting the incentives for banks are changed following rescue operations.

Overall, we acknowledge that the experiments we perform with the difference in difference setup leave open the possibility that that any other policy response that coincides with the four types of government interventions we study in the specific year in the specific country could drive our inferences. However, our results survive a battery of robustness checks that directly confront alternative explanations. Sensitivity checks in which we replicate our main findings on subsamples where we exclude small countries and off-shore financial centers, emerging markets, and high income economies helps us rule out that sample selection problems drive our inferences, and we can also rule out that the changes in competition are attributable to the presence of a systemic crisis, or that structural adjustment programs by the International Monetary Fund or the too big to fail effect are driving force behind our finding. In addition, a further test using placebo interventions verifies that the competition-increasing effect of government interventions can only be observed in the years the interventions actually take place, indicating indeed causality. Propensity score matching methods that address the non-randomness of government actions also widely reaffirm our inferences. These effects are also substantial in terms of their economic magnitude.

Second, the initial conditions in banking systems prior to the government interventions in terms of structure, contestability, and scope for moral hazard tend to affect the role of government interventions. Specifically, we show that the effects of government interventions on competition are amplified in countries with more concentrated banking systems, lower contestability (reflected in lower foreign bank penetration and more stringent barriers to entry), and in countries without explicit deposit insurance schemes.

Third, we offer further empirical tests following theoretical predictions that suggest important roles for bank transparency and charter values for the effect of government interventions. Consistent with a series of studies advocating transparency and disclosure requirements would mitigate the effect of interventions on banking competition, we show a weaker impact of liquidity support, recapitalizations, and nationalizations in countries that have more stringent disclosure requirements. In contrast, predictions that higher bank charter values induce less aggressive competition in banking do not find support in our data.

Our final analysis focuses on welfare effects on consumers. Here, we address the question of who benefits from the increase in banking competition. To this end, we decompose the competition-increasing effect on net interest margins into separate effects on deposit and loan rates. We uncover a disparate effect. While the results are relatively weak in terms of statistical significance, the findings indicate that the reductions in net interest margins are primarily driven by increased credit market competition arising from liquidity support and nationalizations whereas government actions do not increase competition for deposits. Rather, deposit rates are reduced as a result of blanket guarantees, liquidity support, and nationalizations. In other words, borrowers are the beneficiaries from these actions while depositors are harmed, and this effect is stronger in bank based financial systems.

In addition, we examine financial outreach (i.e., credit provision), and access to finance (i.e., bank and bank branch density). We show that government interventions expand the outreach of the financial system – credit flows are not disrupted, rather provision of credit is positively associated with government interventions, and we can rule out the alternative explanation that liberalization of financial systems following a banking crisis drives the increased availability of credit. However, this beneficial effect comes at a cost of limiting access to banking services. These findings point towards larger amounts of credit provided to the economy are being reallocated away from under-served segments of the market. We make no claims to causality in these tests because of the difficulties involved with disentangling demand and supply side effects, but these findings are

insensitive towards a series of alternative explanations. Thus, these analyses offer important insights into empirical patterns.

While we acknowledge that the individual types of interventions we study in this paper do not necessarily occur independently from each other, they unanimously point towards competition-increasing effects. Clearly, the increases in competition following government actions are not necessarily desirable.

Therefore, the empirical patterns reported here carry important implications for policymaking. Consistent with recent evidence on the micro level in banking by Gropp et al. (2011), our results underscore that competitive conduct in banking following episodes of distress is conditional on the policy responses taken by the government. Ex ante, governments should therefore devote more attention to the moral hazard implications arising from these interventions and consider appropriate sunset clauses at the time when these policy measures are announced. Consequently, the benefits from restoring confidence in banking systems need be balanced against the long-run distortions for competition.

We also show that government interventions have non-negligible ramifications for consumer welfare, and all types of interventions have potential to sow the seeds of future banking problems. If banks compete more fiercely due to readily available rescue packages, they may ultimately increase risk-taking. As a first step towards addressing the distortionary effects, policymakers should therefore aim to reduce the duration of the government interventions. We also cannot rule out that these government actions give rise to a misallocation of funds to large borrowers while small, informationally opaque borrowers are faced with greater obstacles obtaining financing. Policymakers need to consider appropriate steps that counterbalance these effects on credit supply to these types of borrowers.

Additional research is required to explore how these competitive distortions can be reversed. For instance, it appears important to establish what types of exit strategies are appropriate for nationalized banks? Which types of sunset clauses mitigate competitive distortions that are associated with other forms of government interventions? How can supplanted market discipline be restored? Similarly, how can the risk-shifting to taxpayers be limited in future episodes of banking strain, and what can be done to reduce bailout expectations? We leave these questions as a challenge for future research.

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Appendix I: Crises and government interventions

The table provides an overview about countries with banking crises, based on the classification in Laeven and Valencia (2008a, 2008b, 2010) and information from WEO. We also report the government responses to these crises. Countries marked with * are borderline crises.

Panel A: Overview						
Country	Crisis		Government interventions			
	Start	End	Blanket guarantee	Liquidity support	Recapitalization	Nationalization
Argentina	2001	2003		2001	2001	2001
Austria	2008	-		2008	2008	2008
Belgium	2008	-		2008	2008	2008
Bulgaria	1996	1997		1996	1996	1996
China	1998	1998				
Colombia	1998	2000		1998	1998	1998
Croatia	1998	1999			1998	1998
Czech Republic*	1996	2000			1996	
Denmark	2008	-	2008	2008	2008	2008
Dominican Republic	2003	2004		2003		
Ecuador	1998	2002	1998	1998	1998	1998
France*	2008	-		2008	2008	
Germany	2008	-	2008	2008	2008	2008
Greece*	2008	-		2008	2008	
Hungary*	2008	-		2008	2008	
Iceland	2008	-				
Indonesia	1997	2001	1997	1997	1997	1997
Ireland	2008	-	2008	2008	2008	2008
Jamaica	1996	1998	1996	1996	1996	1996
Japan	1997	2001	1997		1997	1997
Kazakhstan*	2008	-		2008	2008	
Korea	1997	1998	1997	1997	1997	1997
Latvia	2008	-		2008	2008	2008
Luxembourg	2008	-		2008	2008	2008
Malaysia	1997	1999	1997	1997	1997	1997
Mongolia	2008	-		2008	2008	2008
Netherlands	2008	-		2008	2008	2008
Nicaragua	2000	2001				
Philippines	1997	2001				
Portugal*	2008	-		2008		2008
Russian Federation	1998	1998		1998		1998
Russian Federation*	2008	-		2008	2008	
Slovak Republic	1998	2002				
Slovenia*	2008	-		2008		
Spain*	2008	-		2008		
Sweden*	2008	-		2008	2008	
Switzerland*	2008	-		2008	2008	
Thailand	1997	2000	1997	1997	1997	1997
Turkey	2000	2001	2000	2000	2000	2000
Ukraine	1998	1999		1998		
Ukraine	2008	-		2008	2008	2008
United Kingdom	2007	-		2007	2007	2007
United States	2007	-		2007	2007	2007
Uruguay	2002	2005		2002	2002	2002
Vietnam	1997	1997			2002	

Panel B: Time distribution		Government interventions			
	Number of countries with crises	Blanket guarantee	Liquidity support	Recapitalization	Nationalization
2010	23	0	0	0	0
2009	23	0	0	0	0
2008	22	3	20	17	11
2007	2	0	2	2	2
2006	0	0	0	0	0
2005	1	0	0	0	0
2004	1	0	0	0	0
2003	3	0	1	0	0
2002	4	0	1	1	1
2001	7	0	1	1	1
2000	9	1	1	1	1
1999	10	0	0	0	0
1998	13	1	4	3	4
1997	9	5	4	6	5
1996	3	1	2	3	2

Appendix II: Lerner index

The Lerner index is a widely used measure of competition in banking (e.g., Koetter et al., forthcoming).

The index captures the degree of market power of a bank by calculating the divergence between product prices and marginal costs of production. The mark-up of output prices over marginal cost is illustrated as follows

$$L_{kt} = \frac{p_{kt} - mc_{kt}}{p_{kt}} \quad (\text{A.1})$$

where p_{kt} denotes the output price of bank k at time t (total revenue, interest and non-interest, divided by total assets) and mc_{kt} is the marginal cost obtained by differentiating a translog cost function

$$\begin{aligned} \ln(C_{kt}) = & \alpha_k + \sum_{i=1}^2 \beta_i \ln(Q_{kt})^i + \sum_{i=1}^3 \gamma_i \ln(Z_{i,kt}) + \sum_{i=1}^3 \delta_i \frac{\ln(Q_{kt}) \ln(Z_{i,kt})}{2} + \sum_{i=1}^3 \sum_{j=1}^3 \delta_{ij} \frac{\ln(Z_{i,kt}) \ln(Z_{j,kt})}{2} + \\ & + \lambda_1 \tau_t + \lambda_2 \tau_t^2 + \lambda_3 \tau_t \ln(Q_{kt}) + \lambda_4 \tau_t \ln(Z_{1,kt}) + \lambda_5 \tau_t \ln(Z_{2,kt}) + \lambda_6 \tau_t \ln(Z_{3,kt}) + \xi_{kt} \end{aligned} \quad (\text{A.2})$$

where C is total operating plus financial costs, Q represents total assets, Z_1 is the ratio of interest expenses to total deposits and money market funding (*proxy* for input price of deposits), Z_2 is the ratio of personal expenses to total assets (*proxy* for input price of labor), and Z_3 is the ratio of other operating and administrative expenses to total assets (*proxy* for input price of equipment/fixed capital). The term μ_k denotes bank-level fixed effects. The cost equation specified above includes trend terms that capture cost-reducing technological changes over time. The estimation of the cost function in (A.2) is undertaken under the restrictions of symmetry and linear homogeneity in the price of inputs. Note that the results do not change if these constraints are lifted.

The Lerner index, L , takes values between 0 and 1, whereby higher values indicate more market power (and, hence, less competition). Calculation of the Lerner index is based on data for all commercial, savings, and cooperative banks for the years 1996 – 2010. The bank data are obtained from BankScope. In total, 181,830 bank-year observations for 21,988 banks in 138 countries are used to compute the index.

Summary statistics

The table presents the number of observations, means, and standard deviations for the variables used to calculate the Lerner index. All bank level data are obtained from BankScope.

Variable	Observations	Mean	S.D.	Min	Max
Total assets (ln)	181,830	5.716	2.196	-4.900	19.469
Total costs (ln)	181,830	2.779	2.156	-7.301	16.754
Interest expenses/Total deposits, money markets and short-term funding	181,830	-3.634	0.800	-11.838	3.399
Personal expenses/Total assets	181,830	-4.260	0.579	-11.415	-0.452
Operating and administrative expenses/Total assets	181,830	-4.390	0.693	-11.331	0.372

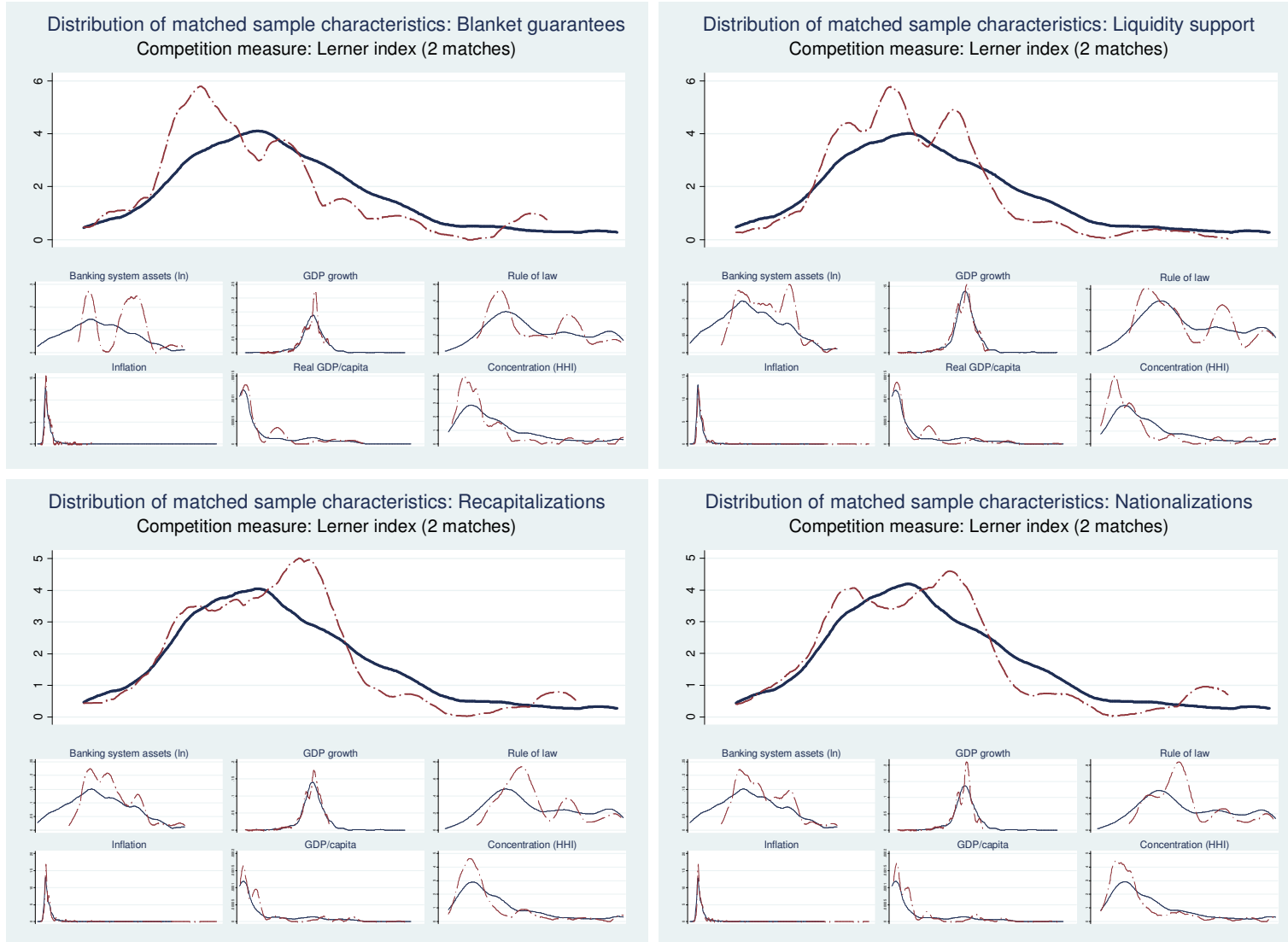
Appendix III: Correlations between government interventions

We show correlations between the four dummy variables for government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations), and present t-statistics in parentheses. *** p<0.01; ** p<0.05, * p<0.1.

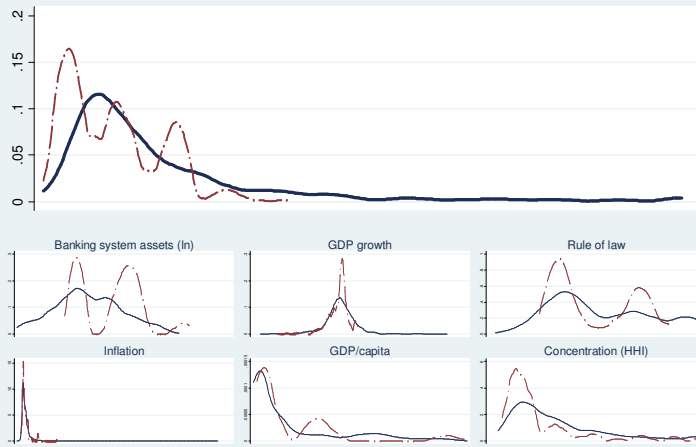
	Blanket guarantee	Liquidity support	Recapitalizations
Blanket guarantee	1		
Liquidity support	0.5874*** (0.00)	1	
Recapitalizations	0.6554*** (0.00)	0.7861*** (0.00)	1
Nationalizations	0.7071*** (0.00)	0.8268*** (0.00)	0.8631*** (0.00)

Appendix IV: Distribution of competition measures and control variables

We plot the distribution of the Lerner index and the net interest margin at the top of each panel, and the control variables banking system size (ln), GDP growth, Rule of law, inflation, Real GDP/capita, and concentration for the treatment and control groups for the matched samples for the government interventions blanket guarantees, liquidity support, recapitalizations, and nationalizations at the bottom of each panel. The panels show the distributions with two countries in the control group. The solid line represents countries in the treatment group and the dashed line represents the distribution of the variables from countries in the control group.



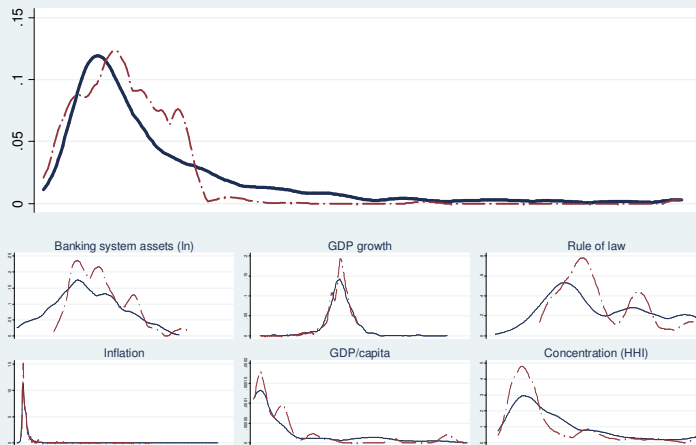
Distribution of matched sample characteristics: Blanket guarantees
 Competition measure: Net interest margin (2 matches)



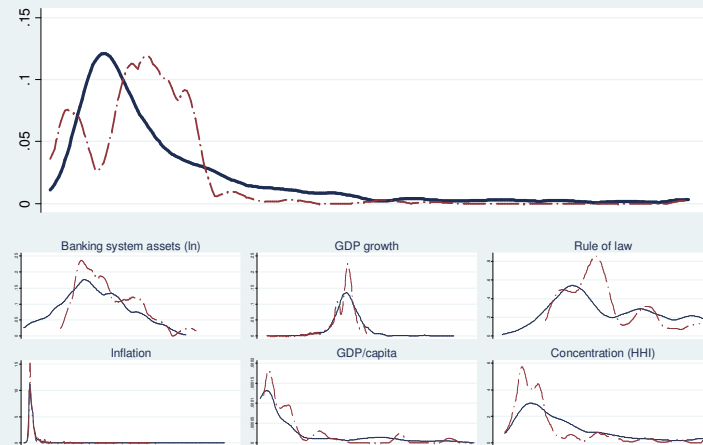
Distribution of matched sample characteristics: Liquidity support
 Competition measure: Net interest margin (2 matches)



Distribution of matched sample characteristics: Recapitalizations
 Competition measure: Net interest margin (2 matches)



Distribution of matched sample characteristics: Nationalizations
 Competition measure: Net interest margin (2 matches)



Appendix V: Alternative explanations for the effect of government interventions on credit provision

The table presents difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on consumer welfare, measured by (domestic) credit provided by the banking sector relative to GDP to address alternative explanations. The vector of control variables (not shown) contains banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Panel A relies on the Chinn-Ito index of financial liberalizations which focuses on capital account openness as a measure of liberalization. To rule out that liberalization drives the increase in credit provision, we remove countries that experienced a banking crisis whose liberalization index in the period after the crisis lies above the value of the liberalization index prior to the crisis. Panel B removes IMF program countries (Argentina, Bulgaria, Dominican Republic, Ecuador, Greece, Hungary, Iceland, Indonesia, Ireland, Korea, Rep., Latvia, Mongolia, The Philippines, Russian Federation, Thailand, Turkey, Ukraine, Uruguay, and Venezuela). Panel C addresses the phenomenon that government owned banks are more prone to be instructed to lend. Here, we remove countries where the authorities recapitalized or nationalized banks and where the proportion of government owned banks increased relative to the period prior to the crisis (Argentina, Austria, Denmark, France, Hungary, Latvia, Netherlands, and Switzerland). Panel D removes countries with currency crises (Argentina, Bulgaria, Dominican Republic, Ecuador, Indonesia, Malaysia, Philippines, Russian Federation, Thailand, Korea, Turkey, Ukraine, and Uruguay). Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Dependent variable	<i>Domestic credit to private sector (% GDP)</i>			
Panel A: Countries with liberalized capital accounts (Chinn-Ito index) removed				
Blanket guarantee	14.727 (1.26)			
Liquidity support		17.748*** (3.31)		
Recapitalizations			12.154** (2.41)	
Nationalizations				16.032** (2.50)
Control variables	Yes	Yes	Yes	Yes
Observations	1641	1641	1641	1641
R-squared	0.935	0.938	0.936	0.936
Number of interventions	9	29	29	22
Panel B: IMF program countries removed				
Blanket guarantee	11.265 (0.50)			
Liquidity support		25.405*** (3.54)		
Recapitalizations			16.655** (2.44)	
Nationalizations				22.401** (2.57)
Control variables	Yes	Yes	Yes	Yes
Observations	1473	1473	1473	1473
R-squared	0.952	0.956	0.954	0.954
Number of interventions	5	18	19	14
Panel C: Countries that had increase in government owned banks after nationalizations and recapitalizations removed				
Blanket guarantee	6.509 (0.61)			
Liquidity support		15.027** (2.59)		
Recapitalizations			9.402* (1.70)	
Nationalizations				13.313** (2.08)
Control variables	Yes	Yes	Yes	Yes
Observations	1627	1627	1627	1627
R-squared	0.942	0.944	0.942	0.943
Number of interventions	10	28	26	23
Panel D: Countries with currency crises removed				
Blanket guarantee	25.621 (1.43)			
Liquidity support		22.503*** (3.50)		
Recapitalizations			15.151** (2.49)	
Nationalizations				21.111*** (2.66)
Control variables	Yes	Yes	Yes	Yes
Observations	1552	1552	1552	1552
R-squared	0.945	0.948	0.946	0.946
Number of interventions	5	22	23	16

Table I
Summary statistics

The table presents summary statistics, observations, means, standard deviations, minima, maxima, and the data sources.

Variable	Observations	Mean	S.D.	Min	Max	Source
<i>Dependent variables</i>						
Lerner index	2007	0.249	0.118	0.026	0.616	BankScope, authors' calculations
Net interest margin	1451	8.683	8.289	0.014	48.937	World Bank Development Indicators
Domestic credit provided by the banking sector/GDP	1562	63.497	55.941	-5.752	285.778	World Bank Development Indicators
Bank Branches per 100,000 of adults	529	20.591	18.254	0.829	91.639	Beck, Demirguc-Kunt, and Honohan (2009)
Banks/per 100,000 of adults	1278	7.075	75.428	0.006	1151.282	Beck, Demirguc-Kunt, and Honohan (2009)
Deposit rate	1490	8.418	9.616	0	147.125	World Bank Development Indicators
Lending rate	1414	16.726	17.150	0	291.059	World Bank Development Indicators
Concentration (assets, Herfindahl-Hirschman Index)	1740	0.320	0.23	0.041	1	BankScope, authors' calculations
Concentration (CR ₅)	1552	0.795	0.173	0.270	1	BankScope, authors' calculations
<i>Key variables of interest</i>						
Blanket guarantee	2007	0.059	0.236	0	1	Laeven and Valencia (2010)
Liquidity support	2007	0.118	0.322	0	1	Laeven and Valencia (2010)
Recapitalizations	2007	0.126	0.331	0	1	Laeven and Valencia (2010)
Nationalizations	2007	0.110	0.313	0	1	Laeven and Valencia (2010)
<i>Control variables</i>						
Total banking system assets (ln)	1740	9.84	2.736	4.588	16.986	BankScope, authors' calculations
GDP growth	1740	4.185	4.232	-17.954	34.5	World Bank Development Indicators
Rule of Law index	1740	0.097	0.989	-1.906	2.014	Kaufmann, Kraay, and Mastruzzi (2010)
Inflation	1740	0.072	0.131	-0.089	2.449	World Bank Development Indicators
Real GDP/capita	1740	8156.832	10884.6	111.312	56388.99	World Bank Development Indicators
Concentration (assets, Herfindahl-Hirschman Index)	1740	0.320	0.23	0.041	1	BankScope, authors' calculations
Foreign-owned banks (assets in %)	1626	36.129	30.593	0	100	Barth et al. (2001, 2004)
Government-owned banks (assets in %)	1650	18.201	22.772	0	98.1	Barth et al. (2001, 2004)
Activity restrictions index	1341	13.553	3.376	4	22	Barth et al. (2001, 2004)
Entry restrictions index	1364	7.439	1.089	0	8	Barth et al. (2001, 2004)
Explicit deposit insurance	1358	0.662	0.472	0	1	Barth et al. (2001, 2004)
Transparency index	1168	4.5	0.653	2	5	Barth et al. (2001, 2004)
Charter value	1559	0.790	0.165	0.086	1	BankScope, authors' calculations
Small country dummy	2007	0.061	0.240	0	1	Authors' calculations
Emerging market country	2007	0.164	0.371	0	1	World Bank Development Indicators
High income economy dummy	2007	0.372	0.483	0	1	World Bank Development Indicators
Chinn-Ito index	1849	0.610	1.571	-1.843	2.477	Chinn and Ito (2006)
IMF program country	2007	0.137	0.344	0	1	Laeven and Valencia (2010)
Currency crisis	1978	0.610	1.571	0	1	Laeven and Valencia (2010)

Table II

Testing the exogeneity of government interventions: Cox proportional hazards and probit models

The table presents correlation coefficients between the year in which the government interventions (blanket guarantees, liquidity support, significant recapitalizations, and nationalizations) can be observed and the average level of competition, measured by the Lerner index in Panel A and by the net interest margin in Panel B prior to these government interventions. We also show Cox proportional hazards (Cox PH) and probit models to verify that blanket guarantees, liquidity support, significant recapitalizations, and nationalizations are exogenous with respect to competition. The Lerner index is the dependent variable in Panel A, and we replicate these regressions with the net interest margin in Panel B. Our sample period is 1996 – 2010. In the Cox proportional hazard models, the dependent variable denotes the hazard of observing blanket guarantees, liquidity support, significant recapitalizations, or nationalizations, and in the probit model the dependent variable takes on the value one if blanket guarantees, liquidity support, significant recapitalizations, or nationalizations took place, or zero otherwise. In the Cox proportional hazards model, a country is dropped from the analysis once it experienced the intervention of interest. The vector of control variables includes (not shown) banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. In the probit model, all control variables are lagged by one period. Country, year, region, and income category dummies included. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered on the country level.

Panel A: Lerner index									Panel B: Net interest margin							
	Blanket guarantee		Liquidity support		Recapitalizations		Nationalizations		Blanket guarantee		Liquidity support		Recapitalizations		Nationalizations	
Correlation coefficient	-0.027		-0.093		0.052		0.014		0.117		-0.170		-0.228		-0.086	
	Cox PH	Probit	Cox PH	Probit	Cox PH	Probit	Cox PH	Probit	Cox PH	Probit	Cox PH	Probit	Cox PH	Probit	Cox PH	Probit
Competition	1.539 (0.66)	0.429 (0.45)	-2.050 (-1.16)	-0.829 (-1.33)	-2.175 (-1.08)	-1.135 (-1.48)	-3.320 (-1.23)	-1.567 (-1.62)	-0.032 (-0.92)	-0.012 (-0.65)	-0.030 (-0.53)	-0.009 (-0.54)	-0.002 (-0.05)	0.005 (0.36)	-0.016 (-0.48)	0.000 (0.03)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1498	1574	1427	1574	1391	1574	1425	1574	1150	1188	1103	1188	1063	1188	1091	1188

Table III

Difference in difference regressions: The effect of government interventions on banking competition

The table presents difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on competition, measured by the Lerner index in Panel A and by the net interest margin in Panel B. We control for banking system size, measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
Total banking system assets (ln)	-0.020**	-0.020**	-0.020**	-0.020**	-2.239**	-2.190**	-2.213**	-2.185**
	(-2.06)	(-2.06)	(-2.10)	(-2.06)	(-2.37)	(-2.35)	(-2.38)	(-2.37)
GDP growth	0.001	0.001	0.001	0.001	-0.113**	-0.116**	-0.127**	-0.123**
	(1.07)	(0.99)	(0.90)	(1.09)	(-2.01)	(-2.10)	(-2.10)	(-2.08)
Rule of Law index	-0.001	-0.003	-0.001	-0.001	-1.217	-1.527	-1.387	-1.373
	(-0.05)	(-0.15)	(-0.06)	(-0.04)	(-0.60)	(-0.73)	(-0.67)	(-0.66)
Inflation	0.014	0.014	0.014	0.015	11.780***	11.899***	11.915***	11.992***
	(0.44)	(0.46)	(0.46)	(0.49)	(3.68)	(3.70)	(3.71)	(3.70)
Real GDP/capita	-0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000	0.000
	(-0.72)	(-0.60)	(-0.60)	(-0.72)	(1.23)	(1.22)	(1.18)	(1.10)
Concentration (HHI)	-0.031	-0.031	-0.030	-0.031	-0.558	-0.457	-0.317	-0.280
	(-1.46)	(-1.46)	(-1.41)	(-1.43)	(-0.50)	(-0.42)	(-0.30)	(-0.26)
Blanket guarantee	-0.028				-0.203			
	(-1.24)				(-0.10)			
Liquidity support		-0.035**				-2.950		
		(-2.38)				(-1.59)		
Recapitalizations			-0.040***				-3.508**	
			(-2.62)				(-2.12)	
Nationalizations				-0.010				-4.420**
				(-0.58)				(-2.14)
Observations	1740	1740	1740	1740	1335	1335	1335	1335
R-squared	0.234	0.236	0.237	0.233	0.747	0.750	0.751	0.752
Number of interventions	11	36	34	28	7	21	21	18

Table IV
Robustness – Subsamples: The effect of government interventions on banking competition

The table presents robustness tests that exclude the smallest countries in the dataset (Andorra, Bahamas, Bermuda, Cambodia, Cayman, Monaco, Netherlands Antilles, San Marino, and Uzbekistan), tests that exclude high income countries as defined by the World Bank (Australia, Austria, Bahamas, Bahrain, Belgium, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Kuwait, Latvia, Luxembourg, Macao, Malta, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Qatar, Saudi Arabia, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, U.S., and the U.K.), and tests that exclude emerging markets (Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Russian Federation, South Africa, Taiwan, Thailand, Turkey, and United Arab Emirates). Panel A reports results of difference in difference regressions with the Lerner index, Panel B uses the net interest margin as dependent variable. Our regressions control for banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

	Panel A: Lerner index				Panel B: Net interest margin			
Subsample: Small countries excluded								
Blanket guarantee	-0.027 (-1.16)				-0.187 (-0.10)			
Liquidity support		-0.032** (-2.20)				-2.949 (-1.58)		
Recapitalizations			-0.037** (-2.46)				-3.508** (-2.11)	
Nationalizations				-0.007 (-0.44)				-4.419** (-2.13)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1714	1714	1714	1714	1320	1320	1320	1320
R-squared	0.236	0.238	0.238	0.235	0.745	0.748	0.749	0.750
Number of interventions	11	36	34	28	7	21	21	18
Subsample: High income countries excluded								
Blanket guarantee	-0.058* (-1.68)				-1.223 (-0.44)			
Liquidity support		-0.033 (-1.28)				-5.311* (-1.99)		
Recapitalizations			-0.043* (-1.70)				-6.220*** (-2.89)	
Nationalizations				-0.019 (-0.74)				-6.887*** (-2.84)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1120	1120	1120	1120	876	876	876	876
R-squared	0.261	0.261	0.262	0.260	0.706	0.713	0.715	0.717
Number of interventions	6	17	15	14	5	15	13	13
Subsample: Emerging markets excluded								
Blanket guarantee	-0.021 (-0.70)				-3.020 (-1.39)			
Liquidity support		-0.041** (-2.59)				-3.638 (-1.51)		
Recapitalizations			-0.042** (-2.61)				-5.351** (-2.46)	
Nationalizations				-0.015 (-0.79)				-5.597** (-2.31)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1434	1434	1434	1434	1078	1078	1078	1078
R-squared	0.238	0.241	0.241	0.238	0.692	0.696	0.700	0.699
Number of interventions	6	26	24	19	3	12	12	10

Table V

Robustness - Placebo regressions: The effect of government interventions on banking competition

The table presents robustness tests based on placebo treatments tests using difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on competition, measured by the Lerner index in Panel A and by the net interest margin in Panel B. To generate placebo treatment effects, we forward the interventions by one period. An insignificant placebo treatment effect in Table V suggests the significant effects presented in Table III are causally related to government interventions. Our regressions control for banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
Blanket guarantee (placebo)	-0.027 (-0.97)				0.296 (0.20)			
Liquidity support (placebo)		-0.021 (-1.46)				-2.406 (-0.95)		
Recapitalizations (placebo)			-0.020 (-1.20)				-3.242 (-1.37)	
Nationalizations (placebo)				-0.000 (-0.02)				-3.430 (-1.25)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1708	1707	1706	1707	1303	1302	1301	1302
R-squared	0.236	0.238	0.238	0.237	0.759	0.769	0.770	0.770
Number of interventions	11	32	32	25	7	17	19	15

Table VI

Propensity score matching methods: Effects of government interventions on banking competition

The table presents estimates of the treatment effects of blanket guarantees, liquidity support, recapitalizations, and nationalizations on banking competition, measured via Lerner indices in Panel A, and via net interest margins in Panel B using propensity score matching methods based on nearest neighbor matches. This technique uses probit models to estimate the probability of a blanket guarantee, liquidity support, recapitalizations, and nationalizations for the propensity scores. The matching variables are year, geographic region, and World Bank income region. To evaluate the sensitivity of these estimations, we show the treatment effects estimates with and without control variables. The vector of control variables consists of banking system size, measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. We present results for nearest neighbor matches with 2 and 4 matching countries in the control group. Robust z-statistics in brackets. *** p<0.01; ** p<0.05, * p<0.1.

Panel A: Lerner index				Panel B: Net interest margin	
Blanket guarantee	<i>Matches (n=2)</i>	-0.031**	-0.032**	-4.810***	-3.603***
	<i>z-statistic</i>	(-2.41)	(-2.14)	(-6.95)	(-4.11)
	<i>Control variables</i>	No	Yes	No	Yes
	<i>Matches (n=4)</i>	-0.024*	-0.027*	-5.090***	-3.615***
	<i>z-statistic</i>	(-1.89)	(-1.89)	(-7.30)	(-4.38)
	<i>Control variables</i>	No	Yes	No	Yes
Liquidity support	<i>Matches (n=2)</i>	-0.032**	-0.027**	-0.278	-1.406*
	<i>z-statistic</i>	(-2.26)	(-2.29)	(-0.27)	(-1.74)
	<i>Control variables</i>	No	Yes	No	Yes
	<i>Matches (n=4)</i>	-0.027**	-0.024**	-0.616	-1.433*
	<i>z-statistic</i>	(-2.00)	(-2.22)	(-0.63)	(-1.91)
	<i>Control variables</i>	No	Yes	No	Yes
Recapitalizations	<i>Matches (n=2)</i>	-0.032***	-0.010	-1.872**	-2.576***
	<i>z-statistic</i>	(-2.96)	(-0.95)	(-2.42)	(-4.22)
	<i>Control variables</i>	No	Yes	No	Yes
	<i>Matches (n=4)</i>	-0.027***	-0.010	-2.278***	-2.767***
	<i>z-statistic</i>	(-2.65)	(-1.02)	(-3.19)	(-4.65)
	<i>Control variables</i>	No	Yes	No	Yes
Nationalizations	<i>Matches (n=2)</i>	-0.028**	-0.013	-1.102	-1.886***
	<i>z-statistic</i>	(-2.25)	(-0.99)	(-1.37)	(-2.66)
	<i>Control variables</i>	No	Yes	No	Yes
	<i>Matches (n=4)</i>	-0.025**	-0.013	-1.365*	-2.046***
	<i>z-statistic</i>	(-2.05)	(-1.08)	(-1.78)	(-3.01)
	<i>Control variables</i>	No	Yes	No	Yes
	<i>Observations</i>	2007	1740	1457	1335

Table VII

The role of initial banking market conditions for the effect of government interventions on banking competition

The table presents slope coefficients obtained from difference in difference regressions of the effect of the interactions of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations with the initial conditions foreign bank ownership, concentration, activity restrictions, entry restrictions, and the presence of explicit deposit insurance on competition. Each cell in the table represents a single regression and we suppress all other coefficients to preserve space. All regressions include the control variables banking system size (measured by the natural logarithm of banking system assets), GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, and real GDP per capita. Since our regressions include country fixed effects, the initial condition of concentration (measured by an asset based Herfindahl-Hirschman index) is dropped in these regressions. Panel A shows the results when competition is measured using the Lerner index, and Panel B presents the findings when competition is measured using the net interest margin. Since the difference in difference estimator requires a control group for which the initial conditions have to be defined, we use a 1:n matching procedure that matches a country that recorded any one of these government interventions with a group of comparable countries based on the criteria: year, World Bank income region, and geographic region. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index	Market structure	Contestability	Contestability	Contestability	Moral hazard
Government intervention interacted with	Concentration (HHI) <i>(initial conditions)</i>	Foreign bank ownership <i>(initial conditions)</i>	Activity restrictions index <i>(initial conditions)</i>	Entry restrictions index <i>(initial conditions)</i>	Explicit deposit insurance <i>(initial conditions)</i>
Blanket guarantee × Column variable	-0.350*** (-6.89)	0.002*** (4.08)	-0.013 (-1.13)	-0.063*** (-4.12)	0.086 (0.82)
Liquidity support × Column variable	-0.222*** (-3.37)	0.001** (2.14)	-0.005 (-1.17)	-0.021 (-1.52)	0.048 (1.13)
Recapitalizations × Column variable	-0.291*** (-5.10)	0.001** (2.01)	-0.008* (-1.89)	-0.028** (-2.01)	0.065 (1.48)
Nationalizations × Column variable	-0.273*** (-3.04)	0.001* (1.84)	-0.005 (-1.11)	-0.025* (-1.83)	0.072* (1.69)
Panel B: Net interest margin					
Blanket guarantee × Column variable	-2.794 (-0.44)	0.097 (0.55)	0.755 (0.84)	1.587* (2.00)	-2.236 (-1.54)
Liquidity support × Column variable	0.361 (0.05)	-0.012 (-0.24)	-0.665 (-1.17)	1.074 (0.39)	8.350* (1.98)
Recapitalizations × Column variable	0.333 (0.04)	0.008 (0.17)	-0.800* (-1.92)	-0.074 (-0.04)	8.902** (2.56)
Nationalizations × Column variable	-2.759 (-0.31)	-0.014 (-0.16)	-0.780 (-1.16)	-0.063 (-0.03)	7.904* (1.87)

Table VIII

Testing the theory: Government interventions and transparency of banking systems

The table presents difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on competition, measured by the Lerner index in Panel A and by the net interest margin in Panel B. The Transparency index consists of two components one is a dummy variable that takes on the value one if a compulsory external audit is required and the second component is an accounting index that is increasing in the quality of bank accounts. The vector of control variables (not shown) contains banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
Transparency index	-0.013 (-1.39)	-0.017 (-1.62)	-0.015 (-1.55)	-0.016 (-1.63)	-0.662** (-1.99)	-0.921*** (-2.87)	-0.781** (-2.54)	-0.890*** (-2.80)
Blanket guarantee	-0.197 (-0.96)				0.398 (0.12)			
Blanket guarantee × Transparency	0.041 (0.83)				0.158 (0.18)			
Liquidity support		-0.193** (-2.47)				-13.621*** (-3.01)		
Liquidity support × Transparency		0.039** (2.28)				3.127*** (3.72)		
Recapitalizations			-0.228** (-2.29)				-14.219* (-1.71)	
Recapitalizations × Transparency			0.044* (1.87)				3.321* (1.81)	
Nationalizations				-0.208** (-2.34)				-15.496*** (-3.81)
Nationalizations × Transparency				0.047** (2.29)				3.223*** (3.43)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1168	1168	1168	1168	881	881	881	881
R-squared	0.308	0.310	0.311	0.310	0.813	0.815	0.814	0.815
Number of interventions	9	27	26	22	5	14	15	13

Table IX

Testing the theory: Government interventions and bank charter values

The table presents difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on competition, measured by the Lerner index in Panel A and by the net interest margin in Panel B. We approximate bank charter values by the ratio of current deposits to total deposits and money market and short-term funding. The vector of control variables (not shown) contains banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
Charter value	0.011 (0.40)	0.017 (0.56)	0.015 (0.51)	0.012 (0.39)	4.469* (1.97)	3.711 (1.66)	4.258* (1.85)	4.049* (1.77)
Blanket guarantee	-0.006 (-0.14)				-0.842 (-0.36)			
Blanket guarantee × Charter value	-0.053 (-0.47)				-1.305 (-0.33)			
Liquidity support		-0.011 (-0.40)				-3.962 (-1.56)		
Liquidity support × Charter value		-0.068 (-1.06)				4.955 (1.29)		
Recapitalizations			-0.020 (-0.75)				-2.892 (-1.52)	
Recapitalizations × Charter value			-0.056 (-0.87)				0.075 (0.02)	
Nationalizations				0.007 (0.26)				-4.137* (-1.71)
Nationalizations × Charter value				-0.036 (-0.58)				1.209 (0.39)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1653	1653	1653	1653	1248	1248	1248	1248
R-squared	0.245	0.248	0.248	0.244	0.765	0.768	0.768	0.769
Number of interventions	10	34	32	26	6	19	19	16

Table X
Welfare effects of government interventions into banking systems: Deposit and loan rates

The table presents difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on average deposit rates in Panel A, and on average loan rates in Panel B. The subpanels show the regression coefficients separately for bank based and market based financial systems (based on the classification by Dermiguc-Kunt and Levine, 2000). The vector of control variables (not shown) contains banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Deposit rates					Panel B: Loan rates													
Blanket guarantee	-14.459** (-2.04)								-4.332 (-0.76)									
Liquidity support			-5.008* (-1.90)									-5.516* (-1.79)						
Recapitalizations							-3.125 (-1.18)									-3.407 (-1.61)		
Nationalizations																	-6.679* (-1.83)	
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Observations	1490	1490	1490	1490	1490	1490	1490	1490	1414	1414	1414	1414	1414	1414	1414	1414	1414	
R-squared	0.787	0.781	0.778	0.782	0.787	0.782	0.782	0.782	0.716	0.718	0.717	0.717	0.719	0.719	0.719	0.719	0.719	
Number of interventions	8	23	23	19	8	23	23	19	7	24	24	24	21	7	24	24	21	
Financial system type									Financial system type									
	Bank based	Market based	Bank based	Market based	Bank based	Market based	Bank based	Market based	Bank based	Market based	Bank based	Market based	Bank based	Market based	Bank based	Market based	Bank based	Market based
Blanket guarantee	-11.681 (-1.36)	-6.414*** (-3.01)																
Liquidity support			-4.488* (-1.87)	-0.592 (-0.43)														
Recapitalizations					-1.631 (-0.82)	-0.682 (-0.43)												
Nationalizations							-4.678* (-1.75)	-3.091 (-1.16)										
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1130	360	1130	360	1130	360	1130	360	1041	373	1041	373	1041	373	1041	373	1041	373
R-squared	0.738	0.955	0.739	0.951	0.735	0.951	0.739	0.952	0.677	0.941	0.682	0.941	0.679	0.941	0.683	0.941	0.683	0.941
Number of interventions	3	5	14	9	14	9	13	6	3	4	14	10	14	10	14	10	14	7

Table XI

Welfare effects of government interventions into banking systems: Credit provision and access to finance

The table presents difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on consumer welfare, measured by domestic credit provided by the banking sector relative to GDP in Panel A, bank branch density per 100,000 of adults in Panel B, and the logtransformed number of commercial banks, scaled by population in Panel C. The vector of control variables (not shown) contains banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, real GDP per capita, and an asset based Herfindahl-Hirschman index to capture banking system concentration. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Domestic credit provided by banking sector (% of GDP)					Panel B: Bank Branches/Population				Panel C: Number of banks/Population			
Blanket guarantee	4.588 (0.33)				-5.847*** (-4.59)				-0.123 (-1.01)			
Liquidity support		13.423*** (2.67)			-1.974* (-1.73)				-0.138* (-1.73)			
Recapitalizations			9.729** (2.08)		-2.162* (-1.85)				-0.132 (-1.66)			
Nationalizations				11.633** (2.02)	-2.635** (-2.01)				-0.169** (-2.23)			
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1743	1743	1743	1743	614	614	614	614	1321	1321	1321	1321
R-squared	0.939	0.941	0.940	0.940	0.981	0.981	0.981	0.981	0.972	0.972	0.972	0.972
Number of interventions	11	36	34	28	3	21	18	14	10	28	29	24

Table XII

Redistribution of industry assets: Government interventions into banking systems and banking market concentration measures

The table presents difference in difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on concentration, measured by a Herfindahl-Hirschman index based on assets in Panel A, and on the 5-bank concentration ratio in Panel B. The vector of control variables contains banking system size measured by the natural logarithm of banking system assets, GDP growth in percent, a Rule of law index (ranging from -2.5 to +2.5), inflation, measured by log changes in the consumer price index, and real GDP per capita. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, region, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Concentration (HHI)					Panel B: Concentration (CR₅)			
Total banking system assets (ln)	-0.024 (-1.41)	-0.024 (-1.41)	-0.024 (-1.41)	-0.024 (-1.40)	-3.386*** (-2.84)	-3.438*** (-2.89)	-3.385*** (-2.85)	-3.343*** (-2.83)
GDP growth	-0.001 (-0.54)	-0.001 (-0.45)	-0.001 (-0.38)	-0.000 (-0.28)	-0.023 (-0.21)	-0.036 (-0.33)	-0.019 (-0.17)	-0.012 (-0.11)
Rule of Law index	-0.010 (-0.21)	-0.009 (-0.18)	-0.009 (-0.19)	-0.008 (-0.16)	0.125 (0.03)	0.140 (0.04)	-0.023 (-0.01)	0.012 (0.00)
Inflation	0.105** (2.09)	0.106** (2.13)	0.106** (2.14)	0.106** (2.16)	9.340*** (2.88)	8.916*** (2.64)	9.000*** (2.70)	9.024*** (2.77)
Real GDP/capita	0.000* (1.95)	0.000* (1.94)	0.000* (1.92)	0.000* (1.90)	0.001** (2.20)	0.001** (2.19)	0.001** (2.17)	0.001** (2.19)
Blanket guarantee	-0.024 (-0.43)				6.651* (1.88)			
Liquidity support		0.011 (0.40)				1.293 (0.57)		
Recapitalizations			0.021 (0.69)				3.041 (1.34)	
Nationalizations				0.058* (1.80)				5.138** (2.13)
Observations	1761	1761	1761	1761	1552	1552	1552	1552
R-squared	0.546	0.546	0.546	0.548	0.732	0.731	0.732	0.733
Number of interventions	11	36	34	28	10	34	31	26

Figure 1

The effects of government interventions on Lerner indices

Figure 1 illustrates for countries that announced blanket guarantees, liquidity support, recapitalizations, and nationalizations the change in the Lerner index and the corresponding change for countries in the control group over the same period. Countries with interventions are represented by a triangle, and countries in the control group are depicted by a square.

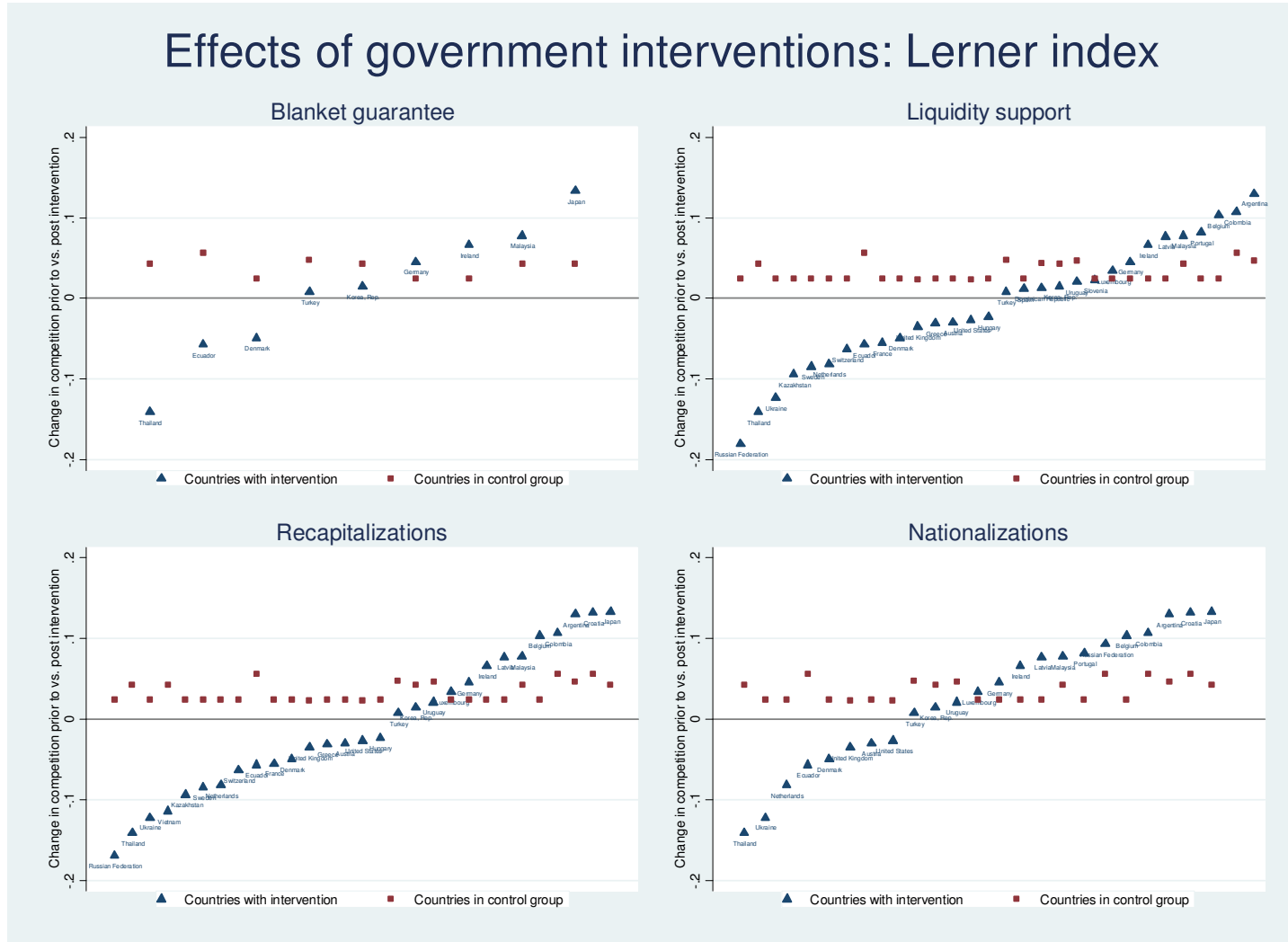


Figure 2

The effects of government interventions on net interest margins

Figure 2 illustrates for countries that announced blanket guarantees, liquidity support, recapitalizations, and nationalizations the change in the net interest margin and the corresponding change for countries in the control group over the same period. Each panel illustrates the effect of the respective government action. Countries with interventions are represented by a triangle, and countries in the control group are depicted by a square.

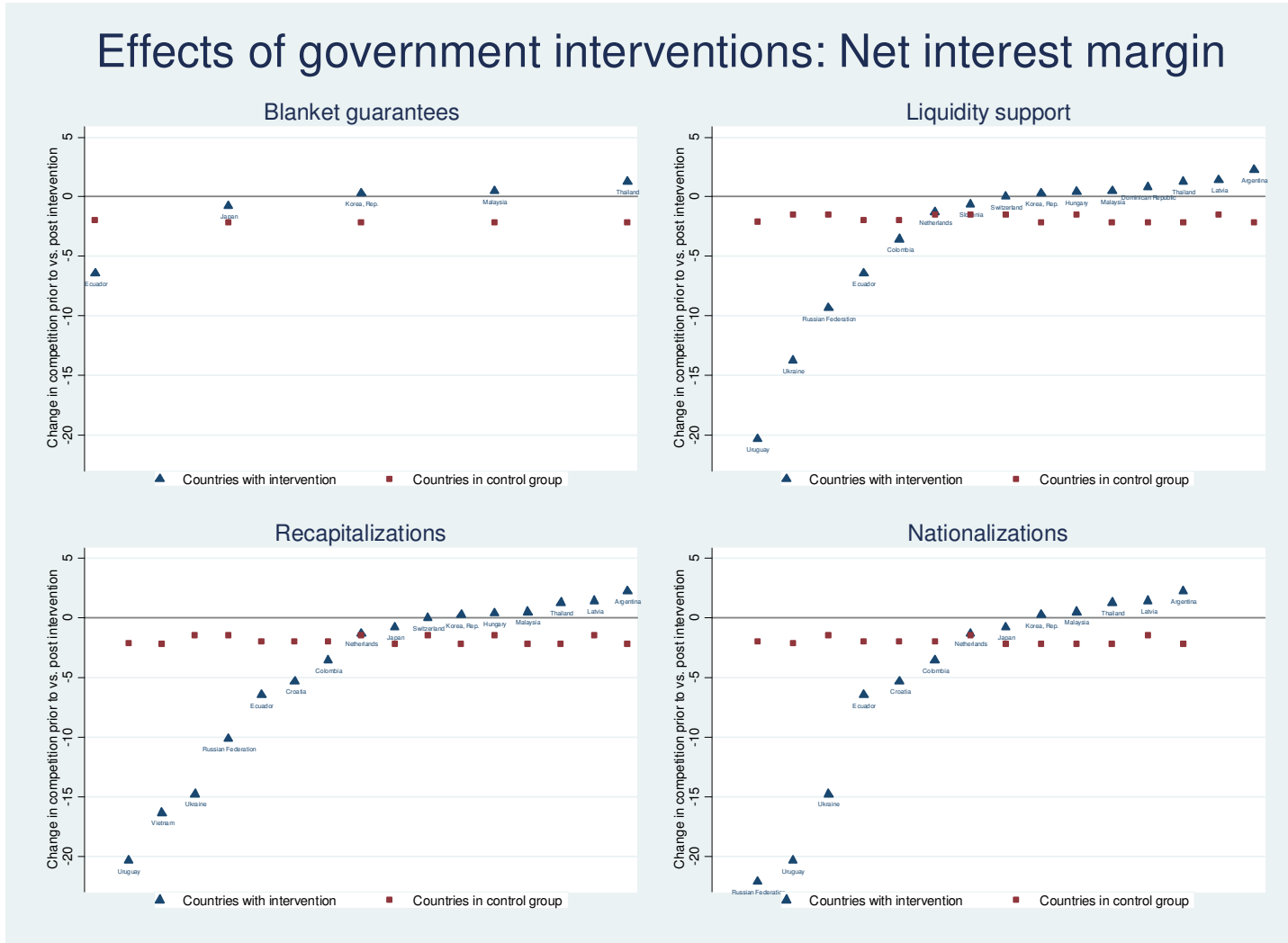


Figure 3

Timing of government interventions and initial level of banking competition (Average Lerner index)

Figure 3 shows the year of government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations) and the competitive conditions, reflected in average Lerner indices, that existed in these countries prior to the interventions.

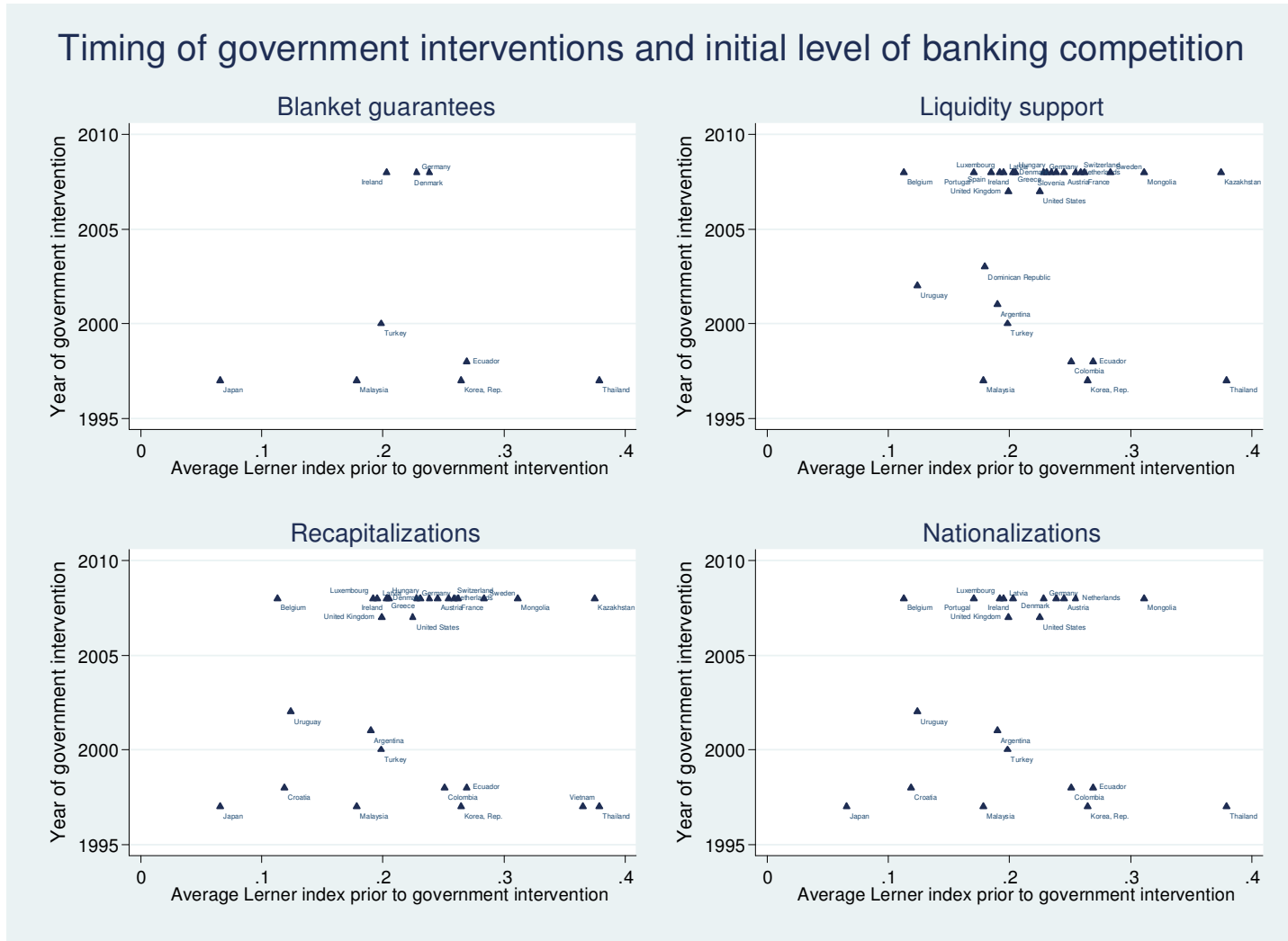


Figure 4

Timing of government interventions and initial level of banking competition (Average net interest margin)

Figure 4 shows the year of government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations) and the competitive conditions, reflected in average net interest margins, that existed in these countries prior to the interventions.

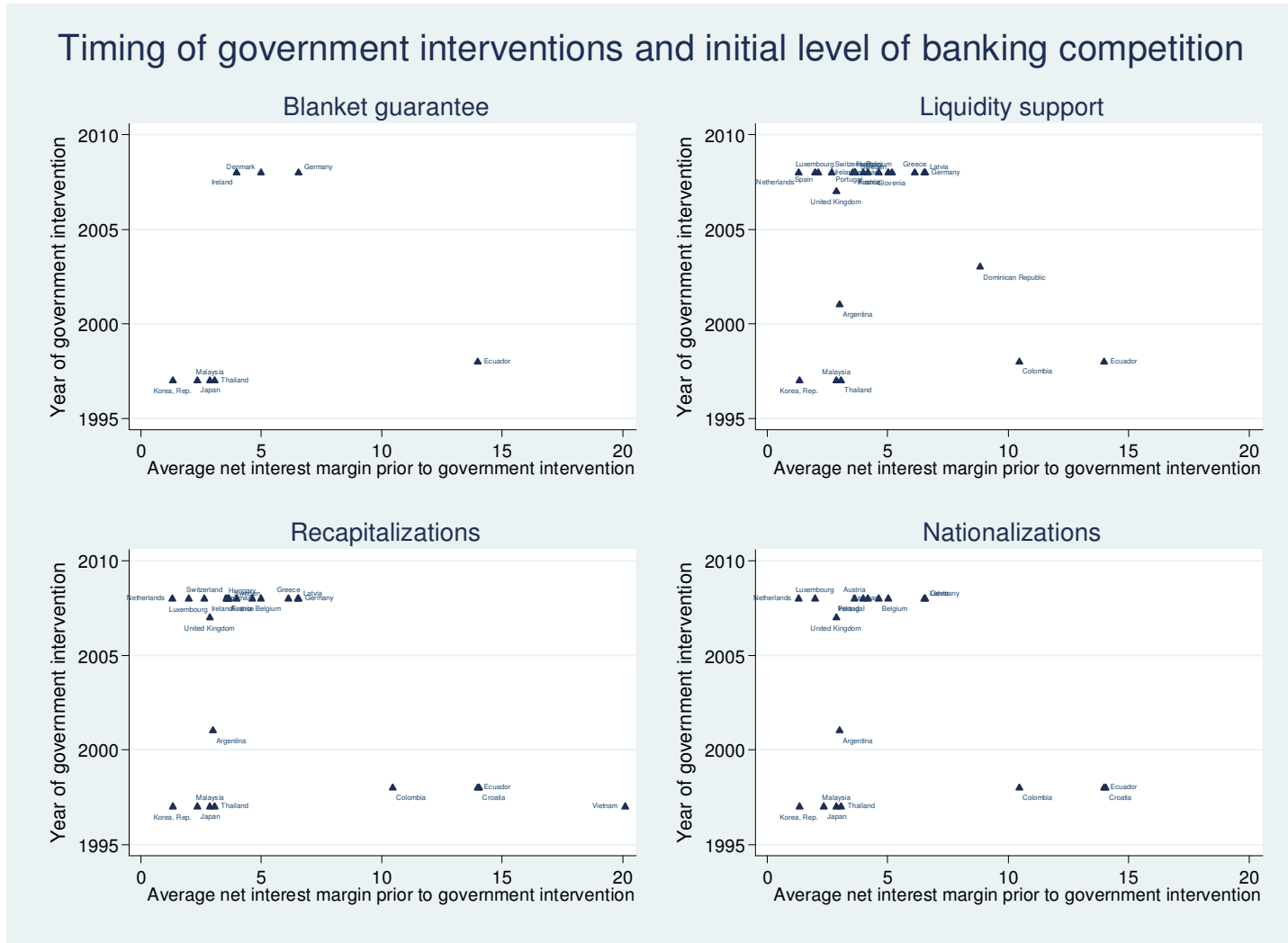


Figure 5

Long-run effect of government interventions on competition (Lerner index)

Figure 5 illustrates the evolution of Lerner indices following government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations) over the following five years. The dark bar shows the level of competition measured by the Lerner index in the year the government intervention was announced, and the light bars illustrate the evolution of Lerner indices in the five subsequent years. To further demonstrate the long-run effects, we estimate five OLS regressions of the Lerner index on a set of country and year dummies, and a dummy variable for the occurrence of a government intervention at $t+1$, ..., $t+5$, respectively. The hollow circles represent the corresponding slope coefficients of the government intervention from time $t+1$ to $t+5$, and the dashed lines show the corresponding confidence interval.

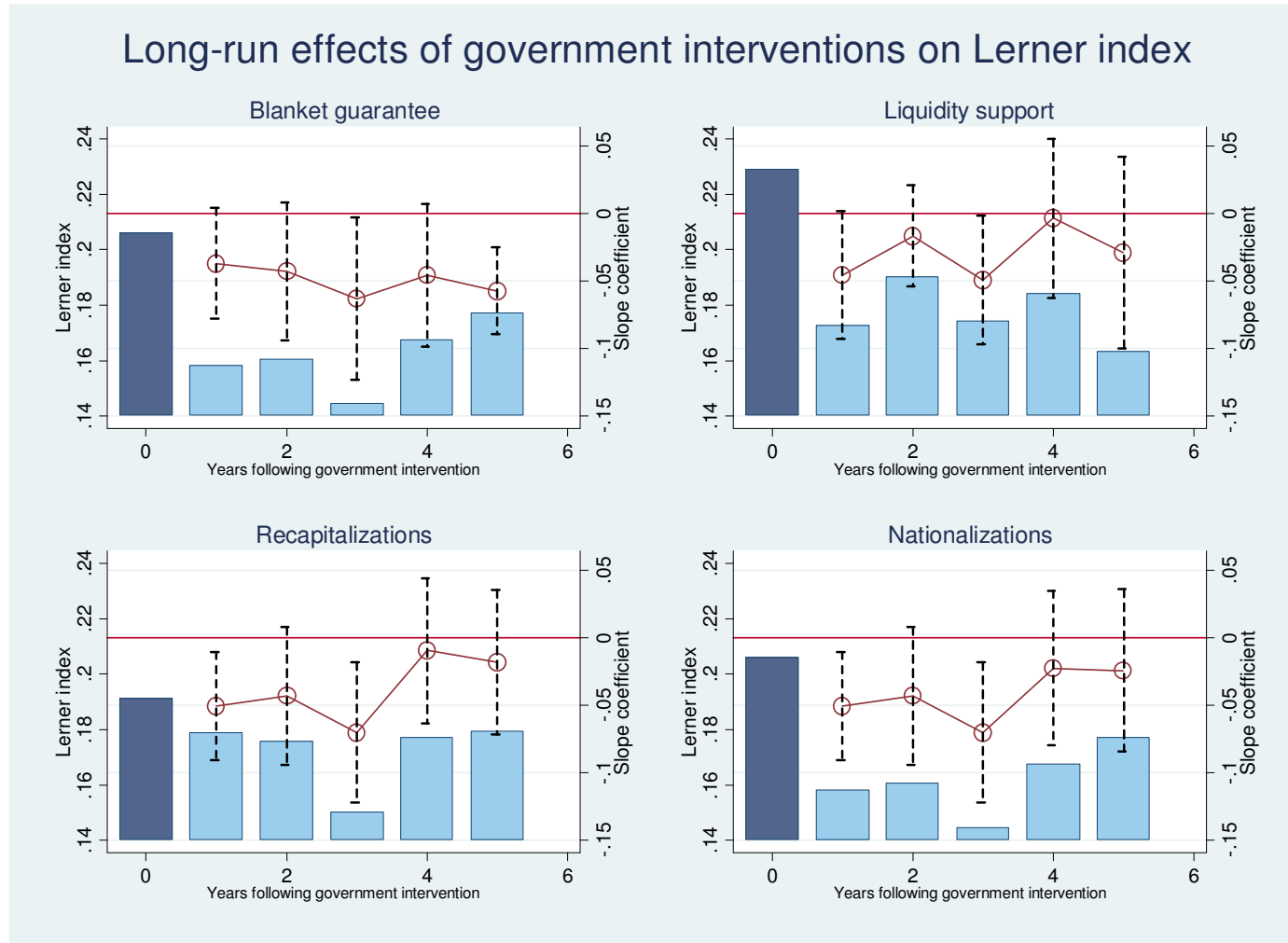


Figure 6

Long-run effect of government interventions on competition (Net interest margin)

Figure 6 illustrates the evolution of net interest margins following government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations) over the following five years. The dark bar shows the level of competition measured by the net interest margin in the year the government intervention was announced, and the light bars illustrate the evolution of net interest margins in the five subsequent years. To further demonstrate the long-run effects, we estimate five OLS regressions of the net interest margin on a set of country and year dummies, and a dummy variable for the occurrence of a government intervention at $t+1$, ..., $t+5$, respectively. The hollow circles represent the corresponding slope coefficients of the government intervention from time $t+1$ to $t+5$, and the dashed lines show the corresponding confidence interval.

