

Bank bailouts, competition, and the disparate effects for borrower and depositor welfare

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Abstract

We investigate how government interventions into banking systems such as blanket guarantees, liquidity support, recapitalizations, and nationalizations affect banking competition. This debate is important because the pricing of banking products has implications for borrower and depositor welfare. Exploiting data for 124 countries that witnessed different policy responses to 41 banking crises, and using difference-in-difference estimations, we present the following key results: (i) Government interventions reduce Lerner indices and net interest margins. This effect is robust to a battery of falsification and placebo tests, and the competitive response also cannot be explained by alternative forces. The competition-increasing effect on Lerner indices and net interest margins is also confirmed once the non-random assignment of interventions is accounted for using instrumental variable techniques that exploit exogenous variation in the electoral cycle and in the design of the regulatory architecture across countries. (ii) Consistent with theoretical predictions, the competition-increasing effect of government interventions is greater in more concentrated and less contestable banking sectors, but the effects are mitigated in more transparent banking systems. (iii) The competitive effects are economically substantial, remain in place for at least 5 years, and the interventions also coincide with an increase in zombie banks. Our results therefore offer direct evidence that the mechanism by which government interventions contribute to banks' risk-shifting behavior as reported in recent studies on the bank level runs via competition. (iv) Government interventions disparately affect bank customers' welfare. While liquidity support, recapitalizations, and nationalizations improve borrower welfare by reducing loan rates, deposit rates decline. Our empirical setup allows quantifying these disparate effects.

Keywords: Banking competition; government interventions; bailouts; zombie banks; borrower and depositor welfare

JEL Classification: G28, G21, C32

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

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“[...] 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)

1. Introduction

Banking systems have been profoundly reshaped by the financial crisis and the concomitant policy responses. The two quotes above illustrate growing concerns by policymakers and academics about the effects on competition arising from massive interventions in banking markets.

In recent years, governments and other authorities designated with the regulation of financial institutions introduced blanket guarantees, extended liquidity support, injected capital, and nationalized banks on an unprecedented scale (Laeven and Valencia (2008, 2010, 2012); Hoshi and Kashyap (2010); Bayazitova and Shivdasani, (2012); Phillipon and Schnabl (2013)).¹ During tranquil periods, the competitive effects of rescue operations tend to be only relevant for a limited number of distressed institutions and their immediate competitors (Gropp, Hakenes and Schnabel (2011)). However, banking crises result in massive policy responses that affect large numbers of institutions with possible implications for banks’ competitive conduct over longer periods of time.²

While a growing body of literature has started examining the unintended effects of government bailouts on risk-taking on the micro level (Cordella and Yeyati (2003); Berger, Bouwman, Kick and Schaeck (2010); Gropp, Gruendl, and Guettler (2011); Gropp, Hakenes, and Schnabel (2011); Duchin and Sosyura (2012a)), little effort has been devoted to their effects on competition. However, this question is critical because the role of the government in banking systems lies at the heart of the design of financial systems (Song and Thakor (forthcoming)). Our paper contributes to this debate.

We first raise the issue of how the responses to crises such as blanket guarantees, liquidity support, recapitalizations, and nationalizations affect competition in banking. How can such interventions affect competition? Distortions are primarily attributed to supplanted market discipline which reduces banks’ funding costs. Gropp, Hakenes, and Schabel (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 incentives. In turn, the protected banks’ competitors

¹ Acharya and Yorulmazer (2007) show that when the number of bank failures is large, regulators find it optimal to rescue distressed institutions.

² Examples for responses to crises that affect all banks are blanket guarantees and the provision of central bank liquidity support. During the current crisis, such measures have been adopted. Laeven and Valencia (2008) show the global financial landscape has undergone major transformations. Banks from the U.S. and Europe that used to dominate global banking have become smaller in terms of market capitalization, and banks from countries unaffected during the crisis are now among the largest institutions in the world.

become more aggressive because their charter values are eroded. Another argument relates to moral hazard. Gropp, Gruendl, and Guettler (2011) and Berger et al. (2010) suggest bailouts increase moral hazard as monitoring incentives are distorted, resulting in loans being originated to risky borrowers, inflated loan volumes, and inadequate loan pricing, respectively. Duchin and Sosyura (2012a) offer further evidence: Loans originated by banks that participated in the Troubled Asset Relief Program (TARP) are riskier, and these banks shift assets into riskier categories.³ However, other theories point out that bailouts increase charter values. Cordella and Yeyati (2003) emphasize that the charter-value effect of bailouts reduces risk-taking which suggests less aggressive conduct. These arguments highlight that it is far from clear how the competitive landscape changes in the aftermath of bailouts. Ultimately, the effect of bailouts on competition therefore remains an empirical question we address in this paper. To the extent that competition changes following government aid, our work helps understand the mechanism by which interventions contribute to risk-shifting behavior on the bank level.

The question of how competition is affected is also important for other reasons. Mispricing of products can have consequences for consumer welfare. Guarantees can entrench the institutions, assisted mergers of large banks increase concentration and signal that these banks are ‘*too-big-to-fail*’ (Beck et al. (2010)).⁴ Moreover, entry barriers have risen as a consequence of tighter regulation (Andresen (2011)). In turn, prices of services provided by bailed institutions may be affected. Competitors may benefit *indirectly* because crises are stalled, or *directly* because they are creditors of the rescued bank. Others suggest rescues influence credit supply and liquidity creation. These effects can spill over into the real economy (Norden, Rosenboom, and Wang (forthcoming)).

These considerations beg a second question: How do these policy responses impact consumer welfare? In particular, what are the effects on borrowers and depositors? We address this by investigating the effects of blanket guarantees, liquidity support, recapitalizations, and nationalizations separately on competition in loan and deposit markets. In addition, we then explore the ramifications for provision of credit and access to finance.

For our empirical tests, we exploit a vast array of information about interventions in banking systems. Our dataset contains 41 crises (29 systemic and 12 borderline cases) for the period 1996 to 2010. We account for two types of interventions in the containment phase (blanket guarantees and liquidity support), and two in the resolution phase (recapitalizations and nationalizations).

³ Policymakers share this concern. The former Fed Chairman Paul Volker argues that bailouts constitute an “unintended and unanticipated extension of the official safety net” (Testimony, House Financial Services Committee on October 1, 2009).

⁴ Hakenes and Schnabel (2010) note that the German government was criticized by the European Commission for the competitive effects that may arise from the rescue of Commerzbank.

To examine the effects of these measures, we exploit the variation across countries across time and use difference-in-difference estimation for our main analysis. The widespread use of blanket guarantees, liquidity support, recapitalizations, and nationalizations provides a natural setting to identify the effects of such interventions. While our illustration below shows that interventions are orthogonal with respect to the pre-existing competitive environment, banking systems that revert to such actions during crises subsequently display different competitive conduct. In contrast, countries in a control group that do not experience interventions display no changes in competition despite exhibiting similar trends. Therefore, difference-in-difference estimation allows establishing causal effects arising from interventions for two competition measures: Lerner indices and net interest margins.

Our key finding is that liquidity support, recapitalizations, and nationalizations increase competition, reflected in lower Lerner indices, and in declining net interest margins. A long-run analysis illustrates that both competition measures remain below the level they had in the announcement year of the interventions. Moreover, the effects remain invariant when high income economies and when emerging market economies are excluded from our tests. We can also rule out that the competitive response to these policy measures constitutes a response to systemic banking crises, and there is no reason to believe that compressed interest income during crises, low monetary policy rates, structural adjustment programs by the International Monetary Fund, and the recent crisis drive the results. Propensity score methods as well as instrumental variable techniques that account for the non-random assignment of interventions using exogenous variation in the electoral cycle and in the design of regulatory architecture also reinforce our results. In extensions, we first explore whether the effect of interventions depends on the initial conditions in the banking sector in terms of market structure, contestability, and moral hazard. The competition-increasing effect is larger in concentrated and less contestable banking systems. However, deposit insurance offsets the impact of interventions. Second, we test whether disclosure requirements and charter values amplify or mitigate the effects. While interventions have competition-increasing effects in countries with less transparency, charter values do not play a role. To examine the force behind the increase in competition, we also analyze whether bailouts correlate with the occurrence of economically unviable zombie banks. Liquidity support and recapitalizations indeed go hand in hand with zombie banks and their market shares.

The analysis of how interventions affect consumer welfare decomposes interest margins into loan and deposit rates. While deposit rates decline, suggesting that interventions supplant market discipline and harm depositors, borrowers gain because loan rates are reduced. These tests also allow quantifying the effects. Our final analysis demonstrates interventions are positively associated with credit provision but this effect comes at the cost of reduced access to finance.

We proceed as follows. Section 2 discusses the data, and Section describes 3 the identification strategy, and the main results. Section 4 explores the roles of transparency and charter values, and we also examine how interventions correlate with the presence of zombie banks. Section 5 reports on the effect of interventions on consumer welfare. Section 6 offers concluding remarks.

2. Data and overview about policy responses to banking crises

Data for 41 banking crises are obtained from Laeven and Valencia (2008, 2010, 2012) for the period 1996-2010. Of those crises, 29 are classified as systemic crises and 12 are episodes of borderline crises.⁵ A country is classified as having a crisis if the banking system exhibited signs of stress (bank runs, losses, and liquidations) and, additionally, if significant interventions can be observed. Interventions are considered significant if significant guarantees, liquidity support (5% of deposits and liabilities to nonresidents), recapitalizations with public funds (exceeding 3% of GDP), and significant nationalizations took place. The information for the policy responses is taken from Laeven and Valencia (2010, 2012). Appendix I presents details.⁶

Crises responses consist of an initial phase concerned with containing liquidity strain, protecting liabilities, and limiting effects from fire sales. The containment phase results in wide-ranging liquidity support, and guarantees on banks' liabilities, and, less frequently deposit freezes and bank holidays. Subsequently, balance sheet restructuring takes center stage: banks are resolved, recapitalized, nationalized, and unviable ones exit the market. While deposit freezes and bank holidays are short-lived with no prediction as to how they affect competition, other policy responses translate into precise predictions. We constrain our analysis to interventions where theory offers clear indications for competition: blanket guarantees, liquidity support, recapitalizations, and nationalizations.

The common theme that links these different manifestations of bailouts is moral hazard. The idea that bailouts are a source of risk-shifting opportunities is undisputed (Farhi and Tirole (2012)). 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 this literature also apply in the context of our study. Acharya (2011) argues similarly. He shows that short-termist governments - thanks to the opaqueness of their balance sheet - exploit moral hazard opportunities in the financial system to boost activity and ignore the risks associated with these actions. Either by extending guarantees or promoting risky lending, the government allows competition at the expense of

⁵ Laeven and Valencia (2010) do not offer a definition for borderline cases. They classify countries that "*almost met*" the definition of a systemic crisis as borderline cases.

⁶ Governments also engage in other interventions, e.g., deposit freezes and bank holidays. As we discuss below, these measures do not translate into predictions for competitive effects.

instability of the financial system down the line. Thus, bailouts impose the costs associated with the “day of reckoning” on future generations.

Using deposit insurance, Merton (1977) and Demirguc-Kunt and Detragiache (2002) show that moral hazard increases risk-taking and the probability of banking crises, respectively. Gropp, Gruendl, and Guettler (2011), Gropp, Hakenes, and Schnabel (2011), and Dam and Koetter (2012) offer further support. The former two studies show that guarantees increase risky lending, and that bailouts increase risk-taking among protected banks’ competitors. Dam and Koetter (2012) highlight that higher bail-out probabilities increase risk-taking. Put simply, the expectation of bailouts reduces the anxiety from avoiding the bad state of having the charter revoked (Mailath and Mester (1994)).

Blanket guarantees. A common response to stall runs are blanket guarantees. Such guarantees go beyond deposit insurance coverage levels. Since bank runs can destabilize payment systems and trigger fire sales, guarantees are used to restore confidence during the containment phase.⁷

Theory offers clear predictions for the effect of guarantees. Hakenes and Schnabel (2010) show that guarantees affect protected banks and their competitors. They stress that guarantees reduce margins and charter values of the protected banks’ competitors which arises from more aggressive competition from banks that refinance at subsidized rates. This pushes competitor banks to behave more competitively. Blanket guarantees have a similar effect. They reduce refinancing costs, but they simultaneously also increase moral hazard, resulting in more aggressive competition.

Liquidity support. The provision of liquidity support plays an important role in the containment phase (Gorton and Huang (2004)). The premise is that extending loans to troubled banks is less costly than no intervention at all. Richardson and Troost (2009) illustrate that monetary intervention can be an effective tool to allow banks to survive stress: Emergency lending to distressed banks raises their probability for survival and helps sustain lending.

Theoretical work in this area relates to moral hazard and discusses whether the central bank should act as a lender of last resort. Freixas (1999) shows that the lender of last resort should not support all banks because rescues are costly. However, when large banks (the *too-big-to-fail* phenomenon) or large numbers of banks are in distress (the *too-many-to-fail* phenomenon), supporting the large bank or all distressed banks is the preferred action. Both the *too-big-to-fail*, and the *too-many-to-fail* effect incentivize banks to invest in risky assets, suggesting moral hazard.

Unlike the two interventions during the containment phase, the interventions during the resolution phase are observed on the bank level. However, since we focus on large-scale interventions and effects

⁷ We only consider full blanket guarantees, i.e., blanket guarantees that affect liabilities at all banks.

for the industry as a whole, we continue to analyze the effects of recapitalizations and nationalizations on the aggregate level. This is justified given our focus on crisis episodes with large numbers of such interventions. Moreover, during crises recapitalizations and nationalizations send strong signals to the markets about future regulatory behaviour which make banks anticipate future bailouts that distort ex ante incentives (Acharya and Yorulmazer (2007); Bayazitova and Shivdasani (2012); Keister (2012)).⁸

Recapitalizations. A cornerstone during the resolution phase is the provision of capital support (e.g., Bayazitova and Shivdasani (2012); Duchin and Sosyura (2012a); Giannetti and Simonov (2013)). Recapitalizations come typically in the form of common or preferred stock.

Recent theories illustrate that recapitalizations cause distortions. Diamond (2001) states that government commitments to recapitalizations make banks anticipate bailouts. Similarly, Farhi and Tirole (2012) show that recapitalizations can sow the seeds of the next crisis as they impose deferred cost on society by incentivizing banks to operate with risky balance sheets. They 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)).

Nationalizations. Once a bank is identified as distressed, nationalizations are common and the government acquires a majority equity stake in the banks. In some crises, nationalizations take place at a large scale and all major banks are taken into state ownership.

Numerous studies document undesirable effects from government ownership.⁹ Shleifer and Vishny (1994) show that government-owned banks have moral hazard incentives, suggesting that nationalizations result effectively in a bailout of all creditors and guaranteeing bank debt. Similarly, Acharya and Kulkarni (2010) argue that guarantees on state-owned banks yield an uneven playing field, and generate excessive risk-taking.

3. Effects of government interventions on banking competition

We employ two alternative measures of competition: the Lerner index, and the net interest margin. Since our analyses are performed at the banking system level, we use the average Lerner index and the average net interest margin per country per year.

⁸ Appendix II offers evidence from the bank level to complement the main findings on the aggregate level. Using a hand-collected sample of 589 recapitalizations and 26 nationalizations during the recent crisis, we estimate how individual banks’ Lerner indices and net interest margins react to recapitalizations and nationalizations using matched samples. Our tests confirm the competition-increasing effect of recapitalizations and nationalizations on the competition measures, except for the effect of nationalizations on net interest margins.

⁹ LaPorta, Lopez-de-Silanes, and Shleifer (2002) show government ownership of banks reduces financial development, and Dinc (2005) shows that government-owned banks are prone to political interference.

The Lerner index captures market power by calculating the markup of prices above marginal costs. We use 181,830 bank-year observations for 21,988 banks in 124 countries to compute this index (Appendix III). The bank data are obtained from BankScope. BankScope is the limiting factor for the sample period. The Lerner index is a widely used measure of competition (e.g., Koetter, Kolari, and Spierdijk (2012)). By including non-interest (off-balance-sheet and fee) income and non-interest (operating) costs, the Lerner index is better suited to capture competition in broader banking activities. As an alternative, we use the net interest margin because competition in traditional 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 markets, relying on the net interest margin provides a sensitivity check. Further, Gropp, Hakenes, and Schnabel (2011), in their analysis of the effect of public bailout guarantees, show that the channel making protected banks' competitors more aggressive runs via interest margins. The two measures are not significantly correlated, the coefficient is -0.014.

The key explanatory variables are coded as binary variables that take the value of one in the year the intervention was announced and in subsequent years if a country was still affected by the intervention as detailed by Laeven and Valencia (2008, 2010, 2012). Our approach is identical to the coding suggested by Dell'Ariccia, Detragiache, and Rajan (2008). We register 11 blanket guarantees between 1996 and 2010. The dummy for liquidity support takes on the value one if liquidity support provided by the central bank is at least 5% of deposits and liabilities to nonresidents/GDP (34 instances). Our dummy for recapitalizations is restricted to significant recapitalizations, defined as recapitalizations whose costs exceed 3% of GDP. We register 32 recapitalizations. We code takeovers of systemically important banks and instances where the government takes a majority stake in banks' equity capital as nationalizations. Our data shows 26 cases of nationalizations.

3.1 Preliminary inspection

In a preliminary data inspection, we demonstrate separately for each country that announced 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. We also show the corresponding change for all 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. For example, Thailand issued a blanket guarantee in 1997 (shown at the bottom left-hand corner in Figure 1 in the panel with blanket guarantees). In this year, the Lerner index dropped by 0.14. At the same time, the control group (defined as countries not having

experienced a crisis and not being subject to blanket guarantees), experienced an increase in the Lerner index by 0.04.

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

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

The empirical patterns are striking. Most countries experience reductions in Lerner indices and in net interest margins following interventions. The increase in competition occurs primarily after recapitalizations and liquidity support, and nationalizations also reduce margins. However, the effects are not uniform. While Thailand and Ecuador display declines in Lerner indices and in net interest margins, other countries such as Germany do not post such declines, suggesting the effects of interventions are amplified or mitigated depending on other characteristics, e.g., the conditions in a banking system prior to these measures. We explore these issues in detail in Section 3.7 below.

3.2 Identification strategy

We now turn to difference-in-difference estimations which compare treatment countries, i.e., countries whose banking systems experienced interventions with countries in a control group both before and after the treatment. The control group consists of countries that did not have interventions (i.e., non-crisis countries).

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 may coincide with changes in competition, but as such changes affect all banks similarly, the estimator only attributes the additional changes in competition to the intervention. Our regression setup is as follows:

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

where the dependent variable C_{it} denotes competition in country i during year t . The panel structure permits inclusion of dummy variables to eliminate time-varying omitted variables. We include country (A) and year dummy variables (B) to capture cross-country heterogeneity and year-fixed effects. The country-fixed effects net out any time-invariant unobserved country-specific factors. The year-fixed effects difference away trends that affect treatment and control group countries such as changes in contestability, consumer trends, and changes in technology that could reduce Lerner indices and interest margins over time. We also include dummies for World Bank income categories.¹⁰ They account for time-invariant similarities between countries in terms of economic development. The vector X captures time-varying country-level control variables explained below, and ε_{it} is the error term.

¹⁰ The income categories are high-income, lower-middle income, upper-middle income, and low-income.

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

The vector of control variables X contains determinants of competition. GDP growth, inflation, and real GDP per capita account for differences in the macroeconomy. Claessens and Laeven (2004) show that concentration affects competition. We include an asset-based Herfindahl-Hirschman index (HHI). Since we compare HHIs across markets, we also include banking system assets (\ln) to account for the size of the industry (Bresnahan (1989)). To account for the government's role in formulating regulation, we use a regulatory quality index which is increasing in regulatory quality, and is normalized between -2.5 and +2.5 (Kaufmann, Kraay, and Mastruzzi (2009)). Provided that interventions are more pronounced when the banking system plays a bigger role in the economy, we also include a dummy that takes on the value of one if Beck, Clarke, Groff, Keefer, and Walsh (2001) classify a financial system as bank-based, and an index ranging from 1 to 3 that classifies the depth of a banking system by provision of domestic credit (scaled by GDP). We also control for the ratio of loan impairment charges to loans as reductions in interest income during crises can drive down our competition measures. Since many countries adopt multiple interventions, we also control for a dummy for multiple interventions that takes on the value of one if a country experienced more than one intervention. This dummy ensures that the coefficient for the individual intervention is not confounded by the other three interventions excluded from the regression.¹¹ We also use a dummy for assisted mergers. These mergers affect market structure and, indirectly, the way banks compete. Finally, we control for government expenditure consumption as a ratio of GDP to account for governments' ability to bail out banks, and money market rates (\ln) as a proxy for monetary conditions. Table 1 presents summary statistics.

[TABLE 1: Summary statistics]

Difference-in-difference estimations require two assumptions. First, assignment to treatment is plausibly exogenous with respect to competition, suggesting competition is not driving the interventions. Second, in the absence of treatment, changes in competition would have been the same for countries in both treatment and control groups. This is the "parallel trends" assumption.

¹¹ The interventions are highly collinear because they tend to be adopted at the same time (Appendix I). While only 13.5% of crises countries adopt one measure, 25% adopt at least two types of rescue measures; over 31% announce three measures. All four types of interventions are used by 30% of the countries. We cannot include them in the same regression and therefore estimate regressions separately for each type of intervention.

We first examine the exogeneity of the interventions. The correlation coefficients in Panel A and B of Table 2 between the average level of competition prior to the interventions and the announcement year of the interventions are inconsistent in terms of the direction, and they remain insignificant.¹²

Next, we use Cox proportional hazard models to estimate the conditional probability of interventions. Our key explanatory variable captures competition prior to the policy response, and we also include the control variables discussed above. We focus on the time from the start of our sample period to the occurrence of interventions.¹³ The hazard rate $h(t)$ represents the likelihood that an intervention is observed at time t in country i , given that there was no intervention until t . In employing duration analysis, we can impose a structure on the hazard function. Since we have no reason to assume duration dependence in the data, we use a Cox model that does not impose a shape on the hazard function.¹⁴ The model takes the form

$$h(t|x_i)=h_0(t)exp(x_i\beta_x) \tag{2}$$

where $h_0(t)$ denotes the baseline hazard, and β_x is the vector of parameters.¹⁵ A positive coefficient for the competition measure increases the probability (hazard) of interventions.

Panel A of Table 2 reports the results with the Lerner index, and Panel B shows the coefficients for the net interest margin. The competition measures are insignificant. In combination with the correlations between the average level of competition prior to the interventions and the announcement year of the interventions at the top of Table 2, we conclude that interventions are not related to the prevailing competitive conditions. These tests also mitigate concerns related to reverse causality.

[TABLE 2: Exogeneity of interventions and correlations]

We now examine the parallel trends assumption, and focus on competition in the three years prior to interventions. The assumption requires that we observe similar changes in competition between countries whose banking systems witnessed interventions and those in the control group. Importantly, this assumption does not require identical levels of competition between treatment and control groups, they are differenced out by the estimator. Figure 3 illustrates similar patterns that support the existence of parallel trends.

[FIGURE 3: Parallel trends: Behavior of competition measures]

¹² All interventions are positively correlated (Panel C).

¹³ The number of observations in Table 2 changes depending on the regression specification because we drop countries from the sample following the occurrence of an intervention.

¹⁴ In unreported exercises we also use Weibull and exponential distributions but the results remain similar.

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.

3.3 Main results

Table 3 presents our main results for the Lerner index (Panel A) and the net interest margin (Panel B). Following Bertrand, Duflo, and Mullainathan (2004), we cluster heteroskedasticity-adjusted standard errors on the country level to allow for serial correlation in the error terms. All regressions are performed on annual data, and we drop countries with multiple crises (Russia and Ukraine), although the results are not affected when these countries are included.

[TABLE 3: The effect of government interventions on banking competition]

All coefficients that capture policy responses exhibit a negative sign. In Panel A, liquidity support and recapitalizations assume significance at conventional levels, suggesting the provision of liquidity and capital injections increase competition. Panel B confirms the competition-increasing effects for liquidity support, capital injections, and nationalizations.¹⁶

For the Lerner index, we also illustrate the effects in terms of their economic magnitude using Indonesia, a country where liquidity support was provided and banks were recapitalized. Indonesia is located at the 15th percentile of the distribution of the Lerner index in 1997 (0.138). Having had liquidity support, the banking systems experienced an increase in competition to the level of Haiti, located at the 8th percentile with a Lerner index of 0.103.

Blanket guarantees, mostly used in the South East Asian Crisis, remain insignificant. Guarantees that are not accompanied by other measures may not be credible, and foreign creditors tend to ignore them. Further, some countries introduced tax policies that undermined blanket guarantees at the time the guarantee was announced, e.g., Ecuador. The absence of an effect may also reflect the smaller number of blanket guarantees. Moreover, in some countries, such as Ireland, blanket guarantees exceed GDP, questioning the sovereigns' ability to service such commitments.

3.4 Alternative explanations

Next, we confront alternative explanations. A common shock, i.e., a banking crisis, rather than interventions can affect competition. However, some crisis countries did not revert to these government actions, and we show in Figure 3 that our data satisfy the key identification assumption of parallel trends between treatment and control groups. Further, not all coefficients display the same effect. If

¹⁶ Additional tests include a dummy that takes on the value of one if asset management companies or restructuring agencies assume nonperforming assets. These tests leave our inferences unchanged. We also replicate in unreported tests the regressions without the control variables, and we additionally use the Panzar-Rosse (1987) H-Statistic, an alternative competition measure at the system level, as dependent variable. Using WLS to account for the fact that the H-Statistic is obtained from a regression, we observe again competition-increasing effects for the key variables of interest.

interventions simply serve as a proxy for crises, they should display identical effects with similar economic magnitudes. This is not the case. A t-test for the null that the coefficients on the four interventions are equal across the regressions is rejected at the one percent significance level (χ^2 -value: 11.57, p-value: 0.00). Moreover, crisis durations are short (3.03 years) whereas blanket guarantees, recapitalizations and nationalizations remain in place for many years. Blanket guarantees lasted 78 months in Indonesia, and 89 months in Japan. On average, blanket guarantees remain in place for 5.2 years, and the public sector retained its equity participation for over 10 years in Japan. Thus, the effects of interventions are likely to go beyond the effect of the crisis.

Table 4 examines alternative explanations. Our regressions include all control variables but we suppress their coefficients. The first test replicates our main regressions on a sample that excludes countries with systemic crises. We only consider interventions in countries with borderline crises. This test reduces the number of policy responses and the power of our tests, but we still obtain competition-increasing effects for liquidity support and recapitalizations for the Lerner index, suggesting we can rule out that the effects we attribute to the interventions simply capture systemic crises. Likewise, we confirm a negatively significant effect of nationalizations on net interest margins. There are no blanket guarantees in countries with borderline crises.

We offer another falsification test to rule out the concern that any type of crisis affects the evolution of competition between treatment and control groups differently. To this end, we find an event that increases competition but is unrelated to crises and then assign placebo interventions. Specifically, we eliminate the key confounding factor, i.e., crisis observations from our sample, and look for instances where we observe a decline in an index which provides information about restrictions on bank activities (Barth, Caprio, and Levine (2004)). The index increases in restrictiveness, ranging from 3 to 12. It provides information about banks' ability to engage in non-traditional activities (securities, insurance, and real estate), and restrictions on conglomerates. The idea is that a drop in activity restrictions increases competition so that we can analyze if drops in activity restrictions create similar treatment-control group patterns that we uncover in our main tests with the difference that the placebo interventions do not coincide with crises. If the interventions in our main tests simply act as a proxy for a crisis that triggers declines in the Lerner index and in the net interest margin, our placebo interventions will also enter significantly. If not, the placebo interventions will remain insignificant. The placebo interventions are assigned to the first year in which a country experiences a drop in activity restrictions. The durations of these placebo interventions are randomly generated based on the durations of the actual durations of the four interventions. To avoid confounding effects of multiple

reductions in activity restrictions per country, we omit countries with multiple reductions of the index, resulting in 37 placebo interventions. None of these placebo interventions displays a significant effect.¹⁷

Further, we examine if our results reflect that the banks compete fiercely because they are *too-big-to-fail*, or because the entire sector is weak so that regulators always offer bailouts. The former effect posits that systemically important banks, engage in reckless competition because of the perceived responsibility of the government to rescue them. The latter effect suggests that banks have an incentive to herd, and invest in similar assets when many banks are weak. To reflect on the *too-big-to-fail* effect, we exclude countries whose average HHI is above the 95th percentile of the distribution ($HHI > 0.62$). This analysis leaves the key variables unchanged. We address the *too-many-to-fail* effect and omit countries whose average total capital ratio is below the 5th percentile of the distribution (Total capital ratio (average) < 0.05).¹⁸ We again obtain similar coefficients. While these tests cannot rule out that *too-big-to-fail* and *too-many-to-fail* considerations play a role for the observed increase in competition, they mitigate concerns that our results are a simple reflection of these phenomena.¹⁹

[TABLE 4: Robustness – Alternative explanations]

3.5 Further robustness tests

We offer six additional tests. First, we are concerned that our results are driven by high-income economies. Approximately half of all crises and interventions occurred in these countries, and these countries have more sophisticated regulatory frameworks than low-income economies. We remove them from the sample. This test also addresses concerns that the recent crisis drives our results. Table 5 shows that blanket guarantees exhibit a significant competition-increasing effect, and we find a similar effect for recapitalizations in Panel A, while liquidity support is insignificant. The effects on net interest margins remain unchanged. Second, we exclude emerging markets. These tests strengthen our inferences. Third, we rule out that structural adjustment programs by the International Monetary Fund which can increase a country's competitiveness drive our results. We omit countries that had such programs but our coefficients remain similar, with the exception of liquidity support in Panel A and liquidity support and recapitalizations in Panel B but blanket guarantees enter now significantly.

¹⁷ We replicate these tests with including crisis countries. None of the key coefficients assumes significance.

¹⁸ Argentina, Bulgaria, Dominican Republic, Ecuador, Indonesia, Korea, Philippines, Russian Federation, Thailand, Turkey, Uruguay, and Venezuela are International Monetary Fund program countries. The regressions that aim to reflect on the *too-big-to-fail* effect are insensitive with respect to the cut off value for the HHI. Likewise, tests that address the *too-many-to-fail* concern are insensitive towards alternative cutoffs.

¹⁹ As an additional check to investigate whether the competition-reducing effects are simply driven by a shift in levels of monetary policy rates, we examine the correlation of money market rates with the Lerner index and the net interest margin. We obtain conflicting findings. Downward shifts in market rates do not drive our results. While there is a negative correlation between money market rates and the Lerner index, there is a positive association of money market rates with the net interest margin.

Fourth, we generate placebo treatments by pretending the interventions occurred two years prior to the actual intervention. If our identification strategy is correct, an insignificant placebo treatment effect suggests that the relationships in Table 3 are causally related to the government actions. This exercise fails to detect significant relationships.

[TABLE 5: Robustness – Subsamples and placebo treatments]

Above, we mentioned that the policy actions may not occur randomly which gives rise to a selection problem. We address this using propensity score matching methods based on a nearest-neighbor procedure. The lack of random assignment can bias our coefficients (Heckman, Ichimura, Todd (1997)). Subsequently, we also use instrumental variable techniques.

The propensity score method constructs control groups of countries that have a similar probability of experiencing interventions but no event takes place. The propensity score is defined as the probability of being subject to blanket guarantees, liquidity support, recapitalizations, or nationalizations, conditional on pre-intervention characteristics. Calculation of the propensity scores relies on probit models with blanket guarantees, liquidity support, recapitalizations, and nationalizations as dependent variables. The predicted probabilities from the probit models are then used to match each country-year observation to a set of observations from the control group of countries from the same World Bank income group category using the absolute value of the difference between the propensity scores as decision criterion. The nearest neighbor technique restricts the set of matches to those whose propensity scores fall in the common support of both groups. To evaluate the sensitivity of our findings, Table 6 presents treatment effects with one and two countries in the control group. These tests include the control variables used above.²⁰

[TABLE 6: Robustness – Propensity scores]

The treatment effects largely reinforce the previous inferences, and blanket guarantees also exhibit significant effects. Liquidity support retains its negative sign, although the effect is only significant in Panel A. In contrast, recapitalizations and nationalizations are insignificant (yet negative) in Panel A, but the effects on interest margins are both significant.

A limitation of propensity score matching estimators is that they do not control for the effect of unobservables on the selection of countries with interventions. The inferences from this method are therefore still to be taken with a grain of salt. We address this with an instrumental variables approach

²⁰ To illustrate the similarities between the countries in the treatment and control group following the matching process, we plot the distribution of the control variables in Appendix IV. The plots demonstrate that our matching process results in very similar distributions for most control variables.

using a two-stage estimator. We use a linear probability model in the first stage, and we rely on the same set of instruments for all types of interventions. The second stage uses the estimated probabilities.

Our instruments draw from different strands of literature. First, we exploit ideas according to which bailouts occur because of doubts about the accuracy with which investors can assess the value of bank assets. Second, we rely on arguments claiming that the electoral cycle and the political environment play a role for the decision to bail out banks. Third, we use a characteristic of the institutional environment.

Flannery, Kwan, and Nimalendran (2013) highlight interventions into distressed banking systems are founded on the belief that markets are unable to differentiate between sound and unsound institutions during crises. This spike in information asymmetries motivates bailout programs such as the TARP. To capture opacity, we focus on asset composition. Flannery et al. (2013) propose a bank's loan and security portfolio composition are informative about opacity. We therefore home in on different loan categories, scaled by net loans. Loans are separated into residential mortgage loans, other consumer and retail loans, corporate and commercial loans, and other loans. While residential mortgage loans and consumer and retail loans are standardized and should reduce opacity, corporate and commercial loans are difficult to value. We expect them to increase opacity and correlate positively with interventions. The remaining lending categories are grouped together as other loans. For security portfolio composition, we focus on available for sales and held to maturity securities, scaled by total securities. While the former are marked at fair value and should reduce opacity and the likelihood of interventions, the latter are reported at amortized cost, and make the balance sheet more opaque. Brown and Dinc (2005) show most bailouts occur 7-12 months after elections, whereas the period before an election reduces the likelihood of interventions. Two instruments capture the electoral cycle. The first one is a dummy that takes on the value of one in the year a parliamentary election takes place, and the second one provides information about the time (in years) since the last parliamentary election.²¹ Both variables should correlate negatively with interventions.²² A further instrument provides information about the orientation of the largest government party. We use a dummy that takes on the value of one if the largest government party has a right-wing orientation. Governments led by such parties focus on market-oriented policies to increase their chances of re-election (Bortolotti and Faccio (2009)). Moreover, their partisan orientation impacts bailout propensities. While left-wing governments are keen to intervene into the economy to preserve jobs, right-wing governments tend to oppose such actions (Garrett and Lange (1991)). Our last instrument is an index about prompt

²¹ We collect this information from *Parties and Elections in Europe*, the *Center on Democratic Performance (Election results archive)*, and from *Electionresources.org*. The website sources are <http://www.parties-and-elections.de/index.html>, <http://cdp.binghamton.edu/era/countries/>, and http://electionresources.org/data/index_en.html.

²² Duchin and Sosyura (2012b) document an important role of political connections for bank bailouts. They show that politically connected banks are more likely to be recapitalized under the TARP.

corrective power. It captures legal requirements that establish levels of bank solvency deterioration that trigger regulatory enforcements (e.g., interventions, cease and desist orders) and the scope of supervisors in applying such powers. The index increases in corrective power, ranging from 0 to 6. We expect a more powerful regulator to press for and quickly implement bailout packages in times of crises as corrective powers would otherwise reduce the need for large scale bailouts during tranquil periods.

The tests in Panel A of Table 7 confirm the previous results. While the sample size shrinks due to the availability of political covariates, we obtain negatively significant coefficients for liquidity support and recapitalizations for the Lerner index, and we confirm significant effects for all interventions but blanket guarantees for net interest margins. All coefficients are larger than the ones reported in Table 3. Panel B shows the results for the first stage. All instruments are significant in at least one of the four first stage regressions, except for other consumer and retail loans, and they exhibit the anticipated sign. The Hansen J-Statistic for the null that the instruments are uncorrelated with the error cannot reject their exogeneity. All first stage F-Tests are above the rule of thumb of ten, and the Kleibergen-Paap tests reject the presence of weak instruments. For all specifications, we obtain statistics above the tabulated critical values for a size bias of ten % relative to OLS. At the bottom of the table, we show the partial R2 associated with the instruments. We run the 1st stage regressions without the instruments and compute the partial R2 as the difference between 1st stage regressions that include the instruments and those which exclude the instruments. The resulting partial R2 values range between 11 and 20 %, and these figures represent increases of between 67 and 307% relative to the 1st stage regressions without the inclusion of instruments, suggesting our instruments are strong.

[TABLE 7: Robustness – Instrumental variables]

3.6 Do the competitive effects persist over time?

We acknowledged above that the average duration of the policy measures goes beyond the duration of the banking crises. We now lend further support to the idea that the competitive effects are not reversed, and trace average values of Lerner indices and net interest margins in countries that were subject to the interventions over the five years following their announcement. The dark bars represent the level of competition in the announcement year of the intervention in Figure 4. The light bars track the competition indices in the five subsequent years. The Lerner indices remain below the initial level in the years following the interventions, and the effects are particularly strong in the first three years. While there is some reversal in the fourth and fifth year when we consider the Lerner index, interest margins experience a hefty drop in the first two years (with the exception of blanket guarantees), and remain compressed.

[FIGURE 4: Long-run effects]

3.7 Initial conditions of banking systems prior to government interventions

Figures 1 and 2 indicate the policy responses do not affect all countries equally. To better understand these heterogeneities, we now investigate whether the initial market conditions play a role for these cross-country differences. From a policy perspective, it is useful to understand if the competitive response to interventions varies in a predictive way to aid the actions taken by policymakers.

Demirguc-Kunt and Detragiache (2002), Claessens and Laeven (2004), Martinez Peria and Mody (2004), and Beck, de Jonghe, and Schepens (forthcoming) show that characteristics of banking markets such as structure, contestability, and moral hazard are related to competition. Thus, these characteristics are likely to either amplify or mitigate the effects of policy responses.

We illustrate our arguments about the effect of initial conditions as follows: If blanket guarantees boost competition by giving rise to moral hazard if a country had no deposit insurance before the announcement of blanket guarantees, then the effect of such 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. If foreign banks are well represented prior to nationalizations, the competition-increasing effect may be relatively limited. Likewise, if a country does not have a contestable banking system prior to a crisis reflected in activity restrictions and high entry barriers, the competition-enhancing effect of liquidity support is likely to be muted.

We use the HHI to measure market structure (Claessens and Laeven (2004)). Foreign bank penetration, measured by the share of foreign-owned institutions, is our first indicator for contestability. Martinez Peria and Mody (2004) show that foreign banks' conduct differs from the behavior of domestic banks. Contestability is also reflected in entry barriers and activity restrictions (Claessens and Laeven (2004)). The entry restrictions index summarizes the procedures required to obtain a bank license, the percentage of denied applications for licenses, and the minimum capital required. The index ranges between 0 and 8; it is increasing in restrictions. We capture activity restrictions with the activity restrictions index described in Section 3.4. To approximate moral hazard, we rely on a dummy that takes on the value one if a country has explicit deposit insurance. To calculate initial conditions for concentration, foreign ownership, activity restrictions, and entry restrictions, we take the mean value of these variables in the countries from the treatment group prior to the announcement year of the intervention. For the initial conditions of deposit insurance, we code the variable as one if a country had explicit deposit insurance in place or zero otherwise. Since we need to define the initial conditions also for 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. As a further criterion, we use World Bank income categories to ensure comparing countries with similar levels of economic development.

[TABLE 8: The role of initial banking market conditions]

Each cell in Table 8 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.

We first discuss the results for the Lerner index. The increase in competition is significantly greater in magnitude in concentrated markets. Figure 1 reinforces this point. Concentration in Japan is low with a HHI of 0.097. In this market, we observe an increase in the Lerner index relative to the control group. Likewise, the concentration indices for Malaysia (0.101) and Ireland (0.289) are also below the mean, suggesting that the effect blanket guarantees is mitigated there. Regarding the presence of foreign banks, we find a positively significant coefficient, except for blanket guarantees. The negative relation between interventions and competition is mitigated in countries with higher foreign bank penetration because those institutions are not intervened. Figure 1 illustrates this phenomenon. Ireland and Latvia exhibit high foreign bank presence (0.63 and 0.66% of banks are foreign owned; sample mean 0.36%). Upon announcement of liquidity support, Lerner indices increase relative to the control groups. Activity restrictions have a weaker interaction with interventions – they are only significant for recapitalizations and nationalizations. Increases in competition from recapitalizations and nationalizations are reaped in less contestable markets. Reductions in the Lerner index induced by interventions tend to be larger in systems with more entry restrictions, except for liquidity support. Deposit insurance only plays a role for the effects of nationalizations. Explicit deposit insurance mitigates the improvement in competition.

The initial conditions play little role for net interest margins in Panel B, reflecting less cross-country variation. The exception is deposit insurance. The interaction term (except for blanket guarantees) implies that the deposit insurance offsets (at least partly) the former effect.

4. Extensions: Transparency, charter values, and the presence of zombie banks

To further understand mitigating or amplifying factors for the effects of bailouts on competition, we offer several extensions that focus on other characteristics of the banking systems in this section.

4.1 Transparency

The idea that transparency plays a role for the effectiveness of policy responses to crises has been advocated repeatedly (e.g., Hakenes and Schnabel (2010); Gropp, Hakenes, and Schnabel (2011)). The basic premise is that transparency mitigates the effects of bailouts which undermine market discipline. In a transparent system, depositors can easily observe risk. Therefore, they will discipline banks if they

compete too aggressively. In contrast, in opaque systems, it is difficult to infer information about the banks' condition, so that the effect of market discipline remains muted. We create a Transparency index, ranging from 0 to 5 following Barth et al. (2004) to test this idea. Our index consists of two components. One is a dummy that takes on the value of 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. 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 statements. The first subpanel in Table 9 tests the effect of transparency by presenting the effects of interventions on competition augmented by a term that interacts each of these policy responses with the transparency index. The number of observations is reduced in these tests due to data availability. The coefficients of interventions enter negatively, and the interactions with the transparency index display positive signs. All coefficients are significant except for those of the blanket guarantees for the Lerner index. Thus, the impact of interventions is reduced as transparency disclosure requirements become more stringent.

[TABLE 9: Extensions – Transparency and bank charter values]

4.2 Charter values

Others studies emphasize charter values. Keeley (1990) highlights that banks with valuable charters have little incentive to compete because future rents will be lost in case of failure. Cordella and Yeyati (2003) propose two offsetting effects. The first effect induces moral hazard and leads to risk-taking among banks, and the second one increases the charter value and creates incentives for prudent behavior. We refer to this as the charter value effect. According to Cordella and Yeyati (2003), the second effect can offset the first one, and become the dominant one. Since the majority of banks in our sample are not listed, we cannot use Tobin's Q, typically used to measure charter value. Instead, we follow Hutchinson and Pennacchi (1996) who show core deposits reflect charter values. We approximate charter values with the ratio of current deposits to total deposits, and money market and short-term funding. Table 9 introduces in the second subpanel charter values, measured at the mean bank for each country per year, and an interaction term between the interventions and the charter value. The baseline effect of charter values displays a positive, yet insignificant effect, and the interaction terms also fail to assume significance. These findings do not support the idea that charter values are a disincentive to compete.

4.3 Zombie banks

Interventions can delay the orderly exit of insolvent banks which enables them to continue as a going concern although they are economically unviable. By allowing these banks to remain in business, the

shakeout of these banks is suppressed. In turn, such zombie banks can originate loans with large upside potential. Limited liability in combination with the government support puts zombie banks in a no-lose situation and incentivizes them to compete aggressively (Kane (1990)).

Analyzing whether interventions correlate with the presence of zombie banks requires classifying them into viable and unviable ones, i.e., zombies that have an economic net worth below zero. We cannot use market values to measure net worth as most banks in our sample are not listed. Instead, we calculate tangible capital (Kroszner and Strahan (1996)). Specifically, we compute tangible capital as common equity minus intangible assets. Intangible assets consist of good will, other intangibles, and deferred tax assets. Next, we code a dummy that takes on the value one if tangible capital scaled by total assets is negative to identify zombies. This measure is more conservative than regulatory capital. In a final step, we calculate three indicators for zombie banks: the number of zombie banks/total number of banks, and we also calculate their market shares for loans and deposits for each country per year. Figure 5 illustrates the evolution of zombie banks for the five years following the interventions. While the number of zombies increases in the year following the interventions and then starts declining, zombies that are not dismantled are able to increase market shares. In the second year after the announcement of the interventions, zombie banks' market shares increase from less than 2% to up to 9% in the case of blanket guarantees. Nearly on tenth of the banks in these countries is economically unviable two years after the government initiated the rescue measures. For liquidity support, recapitalizations, and nationalizations, zombie banks' market shares increase to up to 5% in the second and third year following the announcement of the government measures.

[FIGURE 5: Evolution of zombie banks]

Table 10 illustrates that liquidity support and recapitalizations are weakly significantly positively related to the number of zombie banks (Panel A). Thus, while recapitalizations increase net worth, they seem insufficient to eradicate zombie banks. This finding, however, does not manifest itself in larger market shares as shown in Panel B and C where the effects remain indistinguishable from zero.²³ Panel D offers further support for the idea that zombie banks evolve simultaneously with interventions. We find a strictly monotonous relationship between the number of interventions and zombie banks. While this simultaneity could also reflect the intensity of a crisis, Panel E shows that the largest increase in competition coincides in most instances with the greatest presence of zombie banks. This could be interpreted as suggestive evidence that zombie banks are a driving force for the increase in competition.

[TABLE 10: Presence of zombie banks]

²³ Note that the tests about the presence of zombie banks are run on a reduced sample because some of the countries do not report the components we require to compute the tangible capital ratio.

5. Effects of government interventions on welfare

So far, we documented the influence of interventions on producer welfare. This section now tests how consumer welfare is affected.

5.1 Who benefits? Competition in deposit and loan markets

We next examine whether the effect is driven by competition in deposit or in loan markets. This analysis helps understand who benefits from the change in competition. Regressions are run with average deposit and average loan rates as dependent variables in Table 11. Panel A shows that liquidity support, recapitalizations, and nationalizations enhance deposit market power. Anecdotal evidence support this: Irish banks, supported in 2008, witnessed deposit inflows from abroad (Acharya and Mora (2012)). The analysis for loan rates in Panel B points towards rate-reducing effects for liquidity support and recapitalizations. Nationalizations also reduce loan rates, similar to the results reported for government ownership. Sapienza (2004) shows loans originated by state-owned banks carry lower rates, and Black and Hazelwood (forthcoming) show that TARP banks charge lower rates. These tests illustrate the disparate effects of interventions.²⁴ The competition-enhancing effect in loan markets offsets the effect in deposit markets, resulting in a competition-increasing effect overall.

To illustrate the implications for consumer welfare, we compare the largest and smallest coefficients in loan markets, using nationalizations in Indonesia in 1997 with an aggregate stock of loans of 58,611.95mn USD and aggregate deposits of 53,859.20mn USD as an example. At best, nationalizations reduce the average loan rate from 0.218 to 0.152 which increases borrower welfare by 3,868.39mn USD. However, depositors are worse off by 3,069.97mn USD due to the reduction in deposit rates from 0.200 to 0.143 resulting in a net increase in consumer welfare of 798.41mn USD (3,868.39 - 3,069.97mn USD) for nationalizations. This is the upper bound. On the other hand, recapitalizations reduce the average loan rate to 0.170 (increase in borrower welfare 2,813.37mn USD) while deposit rates drop to 0.159, giving rise to a loss in depositor welfare by 2,208.23mn USD. The lower bound for the welfare gain in Indonesia is therefore 605.15mn USD.²⁵

[TABLE 11: Welfare effects]

5.2 Provision of credit and access to banking services

²⁴ Such disparate effects are not uncommon. 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 bank presence enhances competition in loan markets, it harms competition in deposit markets.

²⁵ The components of the Lerner index marginal cost (obtained by differentiating the Translog cost function, Appendix III) and the product price (total revenue scaled by total assets) are significantly negatively associated with interventions: Prices are reduced and marginal costs decline. Results are available upon request.

Ultimately, banks' *raison d'être* is to mobilize savings, evaluate projects, and allocate funds. During crises governments intervene, and lending typically contracts because banks become risk-averse and tighten underwriting standards (Ivashina and Scharfstein (2010); Puri, Rocholl, and Steffen (2011)). A question that arises is whether the competitive effects have implications for access to finance. This enquiry builds on the literature on the effects of competition on access to finance (e.g., Karceski, Ongena, and Smith (2005); Cetorelli and Strahan (2006)), and work on crises and credit (e.g., Ongena, Smith, and Michalsen (2003); Chava and Purnanandam (2011)). If interventions -through their effect on competition- reduce the number of banks, and curtail access, then firm output declines and growth rates decelerate. Theory predicts that banks' propensity to lend and invest in information may be limited in competitive environments because competition reduces the possibility that banks recoup the costs involved in building borrower relationships (Petersen and Rajan (1995)). In this case, we anticipate competition to be inversely related to access to finance. On the other hand, the dominant view is that competition reduces loan rates which makes credit more affordable and increases access.

We now test how interventions correlate with lending, and then home in on access to finance. Access to finance is approximated with bank branch density. Although our regressions control for GDP growth to account for demand-side effects as in Black and Strahan (2002), a full analysis that disentangles demand and supply is beyond this paper.²⁶ Thus, in this section, we refrain from causal inferences. Panel C of Table 11 shows regressions with Domestic credit provided by the banking sector (% of GDP) as dependent variable. All measures (except for blanket guarantees) are positively associated with credit provision.²⁷ Panel D shows bank branch density correlates negatively with all interventions. By reducing access, interventions reallocate credit away from small and medium-sized borrowers that typically rely on direct access. Thus, interventions disproportionately affect smaller firms because geographic proximity is less important for large firms.

²⁶ The key issue is that crises can trigger declines in demand, which would result in reductions in firm investment which shows up in less demand for credit.

²⁷ Appendix V examines alternative explanations. Higher credit provision may reflect liberalization following a crisis (Demirguc-Kunt, Detragiache, and Gupta (2006)). We omit crisis countries whose Chinn-Ito index following a crisis is higher than prior to the crisis (Chinn and Ito (2006)). The index provides information about capital account openness. The coefficients remain similar. Further, crises can coincide with structural adjustment programs by the IMF. We remove countries subject to these programs, but the results remain similar. Another problem arises from lending targets imposed on banks as bailouts may coincide with instructions to lend. If this is the case, our coefficients may be significant but the reason may not be the intervention but rather an instruction to lend. We remove countries with recapitalizations or nationalizations where the proportion of government-owned banks increased relative to the period prior to these actions as government-owned banks are more prone to instructions to lend (Dinc (2005)). Only liquidity support remains significant, suggesting directed lending matters. A last concern relates to foreign currency loans. Crises often result in currency revaluations and the increase in credit provision could reflect this phenomenon. Omitting countries with currency crises leaves our results unchanged.

6. Concluding remarks

This paper analyzes how blanket guarantees, liquidity support, recapitalizations, and nationalizations during crises affect banking competition. We also study the effects of these interventions for consumer welfare in terms of loan and deposit pricing and access to finance. Our work builds on a growing literature that examines the intended and unintended consequences of government aid for the banking sector. Unlike these studies which focus on risk-taking on the micro level following bailouts using single-country datasets, we test aggregate effects using a sample of 124 countries.

The key result suggests that reservations by policymakers that interventions undermine banking competition can be dismissed: Liquidity support, recapitalizations, and nationalizations reduce Lerner indices and net interest margins. These effects are amplified in more concentrated and less contestable banking systems, and in the absence of deposit insurance. However, transparency mitigates the effects. While our regressions leave open the possibility that other policy responses that coincide with the interventions could drive these inferences, a battery of checks that confront alternative explanations and account for possible non-random assignment of interventions suggest the effects are causal in nature. Consistent with evidence from the bank level by Gropp, Hakenes, and Schnabel (2011), and Duchin and Sosyura (2012a), our findings underscore that banks' conduct following government aid is conditional on the government measures. The evidence from the studies on the micro level in combination with our findings indicates that the mechanism by which government aid increases risk-taking runs via competition.

Our analysis of consumer welfare effects points towards disparities. Reductions in interest margins are primarily driven by increased credit market competition, suggesting that borrowers benefit from liquidity support, recapitalizations, and nationalizations, whereas deposit rates are reduced. To illustrate the net impact for consumer welfare, we estimate the upper bound (based on nationalizations) for the net welfare gain for Indonesia, a country that experienced government interventions in 1997, to be 798.41mn USD. The lower bound (based on recapitalizations) is 605.15mn USD. These welfare effects are substantial in magnitude. With a GDP of 238.408bn USD in 1997, these effects are equivalent to 0.33 and 0.25% of the Indonesian GDP, respectively.

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Table 1
Summary statistics

Variable	N	Mean	Min	Max	S.D.	Source
<i>Dependent variables</i>						
Lerner index	1687	0.247	0.026	0.616	0.117	BankScope, authors' calculations
Net interest margin	1687	0.064	-0.272	0.489	0.087	BankScope, authors' calculations
Domestic credit provided by the banking sector/GDP	1687	0.641	-0.057	2.857	0.565	World Bank Development Indicators
Bank Branches per 100,000 of adults (ln)	598	2.508	-0.545	4.402	1.159	Beck, Demirgüç-Kunt, and Honohan (2009)
Deposit rate	1456	0.084	0	0.807	0.089	World Bank Development Indicators
Loan rate	1393	0.166	0	2.910	0.163	World Bank Development Indicators
<i>Other variables</i>						
Blanket guarantee	1687	0.069	0	1	0.255	Laeven and Valencia (2010, 2012)
Liquidity support	1687	0.136	0	1	0.343	Laeven and Valencia (2010, 2012)
Recapitalizations	1687	0.145	0	1	0.353	Laeven and Valencia (2010, 2012)
Nationalizations	1687	0.127	0	1	0.333	Laeven and Valencia (2010, 2012)
GDP growth	1687	0.042	-0.179	0.345	0.042	World Bank Development Indicators
Inflation	1687	0.074	-0.089	2.449	0.133	World Bank Development Indicators
Real GDP/Capita	1687	7669.311	111.312	41211.11	10259.77	World Bank Development Indicators
Concentration (assets, Herfindahl-Hirschman Index)	1687	0.321	0.041	1	0.229	BankScope, authors' calculations
Assisted mergers	1687	0.014	0	1	0.120	Laeven and Valencia (2010, 2012)
Total banking system assets (ln)	1687	9.837	4.588	16.986	2.748	BankScope, authors' calculations
Regulatory quality index	1687	0.230	-2.110	2.225	0.876	Kaufmann et al. (2009)
Bank-based financial system	1687	0.759	0	1	0.427	Beck et al. (2001)
Financial development indicator	1687	1.987	1	3	0.831	World Bank Development Indicators, authors' calculations
Loan impairment charges/Loans	1687	0.015	-0.274	0.390	0.027	BankScope, authors' calculations
Multiple interventions	1687	0.026	0	1	0.161	Laeven and Valencia (2010, 2012)
Government consumption expenditure/GDP	1687	0.393	0.043	22.144	1.855	World Bank Development Indicators
Money market rate (ln)	1687	1.470	-7.013	5.010	1.933	World Bank Development Indicators
Foreign-owned banks (assets in %)	1588	0.356	0	1	0.302	Barth et al. (2001, 2004)
Activity restrictions index	1313	6.771	3	12	1.785	Barth et al. (2001, 2004)
Entry restrictions index	1332	7.427	0	8	1.099	Barth et al. (2001, 2004)
Explicit deposit insurance	1326	0.658	0	1	0.474	Barth et al. (2001, 2004)
Transparency index	1142	4.498	2	5	0.656	Barth et al. (2001, 2004)
Charter value	1506	0.796	0.086	1	0.158	BankScope, authors' calculations
Emerging market country	1687	0.181	0	1	0.385	World Bank Development Indicators
High income economy dummy	1687	0.342	0	1	0.474	World Bank Development Indicators
Chinn-Ito index	1628	0.638	-1.843	2.477	1.567	Chinn and Ito (2006)
IMF program country	1687	0.159	0	1	0.366	Laeven and Valencia (2010, 2012)
Currency crisis	1674	0.007	0	1	0.087	Laeven and Valencia (2010, 2012)
Number of zombie banks/Total number of banks	1528	0.010	0	1	0.046	BankScope, authors' calculations
Loan market share of zombie banks	1528	0.010	0	0.317	0.047	BankScope, authors' calculations
Deposit market share of zombie banks	1528	0.010	0	0.328	0.047	BankScope, authors' calculations
Residential mortgage loans/Net loans	929	0.153	0	1	0.419	BankScope, authors' calculations
Other consumer and retail loans/Net loans	929	0.197	0	1	0.559	BankScope, authors' calculations
Corporate and commercial loans/Net loans	929	0.336	0	1	0.546	BankScope, authors' calculations
Other loans/Net loans	929	0.296	0	1	0.929	BankScope, authors' calculations
AFS securities/Total securities	929	0.604	0	1	0.564	BankScope, authors' calculations
HTM securities/Total securities	929	0.280	0	1	0.036	BankScope, authors' calculations
Election year	929	0.210	0	1	0.408	Parties and Elections, Center on Democratic Performance, Electionresources.org
Time since last election	929	2.510	0	13	2.392	Parties and Elections, Center on Democratic Performance, Electionresources.org
Government party with right-wing orientation	929	0.326	0	1	0.469	Parties and Elections, Center on Democratic Performance, Electionresources.org
Prompt corrective power	929	2.452	0	6	2.491	Barth et al. (2004)

Table 2
Testing the exogeneity of government interventions and correlations

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. In addition, we also present Cox proportional hazard (Cox PH) models to verify that blanket guarantees, liquidity support, significant recapitalizations, and nationalizations are exogenous with respect to competition. In the Cox proportional hazard models, the dependent variable denotes the hazard of observing blanket guarantees, liquidity support, significant recapitalizations, or nationalizations. Our sample period is 1996 – 2010. A country is dropped from the analysis once it experienced the intervention of interest. The vector of control variables (not shown) includes GDP growth, inflation, real GDP per capita, an asset based Herfindahl-Hirschman index to capture banking system concentration, a dummy that takes on the value of one if assisted mergers took place, banking system size measured by the natural logarithm of banking system assets, a regulatory quality index, a dummy variable that indicates whether the country's financial system is bank-based, an index ranging from 1 to 3 for the level of financial development (based on domestic credit in % of GDP), the ratio of loan impairment charges to loans, a dummy that takes on the value of one if a country announced multiple interventions, the ratio of government expenditure consumption to GDP, and money market rates (ln) as a proxy for monetary policy. Country, year, and income category dummies are included. Robust t-statistics in parentheses. Panel C shows correlations between the four dummy variables for government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations). *** 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	-0.037	-0.214	0.002	-0.097	-0.119	-0.417	-0.514	-0.425
	Cox PH	Cox PH	Cox PH	Cox PH	Cox PH	Cox PH	Cox PH	Cox PH
Competition	-0.218 (-0.05)	-0.718 (-0.30)	-1.705 (-0.60)	-3.063 (-0.84)	1.826 (1.12)	-1.649 (-1.12)	0.591 (0.37)	0.411 (0.26)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1430	1363	1327	1361	1430	1363	1327	1361

Panel C: Correlation matrix for government interventions			
	Blanket guarantee	Liquidity support	Recapitalizations
Blanket guarantee	1		
Liquidity support	0.595*** (0.00)	1	
Recapitalizations	0.663*** (0.00)	0.780*** (0.00)	1
Nationalizations	0.717*** (0.00)	0.822*** (0.00)	0.859*** (0.00)

Table 3
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 GDP growth, inflation, real GDP per capita, an asset based Herfindahl-Hirschman index to capture banking system concentration, , banking system size measured by the natural logarithm of banking system assets, a regulatory quality index, a dummy variable that indicates whether the country's financial system is bank-based, an index ranging from 1 to 3 for the level of financial development (based on domestic credit in % of GDP), the ratio of loan impairment charges to loans, a dummy that takes on the value of one if a country announced multiple interventions, a dummy that takes on the value of one if assisted mergers took place, the ratio of government expenditure consumption to GDP, and money market rates (ln) as a proxy for monetary policy. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
GDP growth	0.165 (1.24)	0.159 (1.19)	0.150 (1.12)	0.169 (1.27)	0.042 (0.61)	0.036 (0.52)	0.027 (0.38)	0.032 (0.44)
Inflation	0.008 (0.22)	0.009 (0.24)	0.009 (0.24)	0.010 (0.26)	0.064 (1.46)	0.064 (1.44)	0.064 (1.44)	0.064 (1.43)
Real GDP/capita	-0.000 (-0.29)	-0.000 (-0.25)	-0.000 (-0.25)	-0.000 (-0.30)	-0.000 (-1.18)	-0.000 (-1.13)	-0.000 (-1.14)	-0.000 (-1.19)
Concentration (HHI)	-0.032 (-1.46)	-0.032 (-1.47)	-0.031 (-1.42)	-0.032 (-1.44)	-0.016 (-1.38)	-0.017 (-1.41)	-0.016 (-1.35)	-0.015 (-1.27)
Total banking system assets (ln)	-0.023** (-2.33)	-0.022** (-2.32)	-0.023** (-2.36)	-0.023** (-2.33)	-0.015 (-1.64)	-0.014 (-1.62)	-0.015 (-1.65)	-0.015* (-1.67)
Regulatory quality index	0.009 (0.35)	0.004 (0.14)	0.004 (0.17)	0.009 (0.37)	0.002 (0.12)	-0.003 (-0.16)	-0.002 (-0.12)	-0.003 (-0.18)
Bank-based financial system	-0.061* (-1.96)	-0.114** (-2.60)	-0.135*** (-2.95)	-0.058*** (-2.74)	-0.065** (-2.38)	-0.060 (-1.48)	-0.077* (-1.86)	-0.023* (-1.95)
Financial development indicator	-0.021 (-0.75)	-0.022 (-0.78)	-0.012 (-0.41)	0.023 (1.31)	-0.024 (-1.04)	-0.025 (-1.07)	-0.016 (-0.70)	0.006 (0.40)
Loan impairment charges/Gross loans	0.136 (0.90)	0.139 (0.94)	0.137 (0.93)	0.130 (0.87)	0.470*** (2.67)	0.475*** (2.72)	0.473*** (2.71)	0.474*** (2.72)
Multiple interventions	-0.016 (-0.86)	-0.003 (-0.16)	0.000 (0.01)	-0.015 (-0.80)	0.016 (1.09)	0.026 (1.54)	0.029 (1.65)	0.025 (1.54)
Assisted mergers	0.002 (0.11)	0.003 (0.15)	0.004 (0.16)	-0.002 (-0.11)	-0.009 (-0.75)	-0.007 (-0.60)	-0.007 (-0.60)	-0.004 (-0.32)
Government consumption expenditure/GDP	-0.001 (-1.26)	-0.002 (-1.46)	-0.002 (-1.49)	-0.001 (-1.22)	0.002 (1.59)	0.002 (1.39)	0.002 (1.37)	0.002 (1.39)
Money market rate (ln)	0.001 (0.31)	0.000 (0.06)	0.000 (0.03)	0.001 (0.37)	0.004 (1.65)	0.003 (1.51)	0.003 (1.47)	0.003 (1.52)
Blanket guarantee	-0.026 (-1.09)				-0.013 (-0.52)			
Liquidity support		-0.033* (-1.97)				-0.027* (-1.82)		
Recapitalizations			-0.040** (-2.17)				-0.033** (-2.16)	
Nationalizations				-0.002 (-0.08)				-0.038** (-2.08)
Observations	1687	1687	1687	1687	1687	1687	1687	1687
R-squared	0.241	0.242	0.243	0.240	0.661	0.664	0.665	0.665
Number of interventions	11	34	32	26	11	34	32	26

Table 4
Robustness - Alternative explanations and falsification test

We confront alternative explanations. The first subpanel removes countries that experienced systemic crises to rule out the treatment effects are simply a response to systemic crises. The regressions are performed on treatment countries that experienced borderline crises. Since blanket guarantees do not occur in countries with borderline crises, we only consider the three remaining interventions. The second subpanel offers a test where we assign placebo interventions to countries that are likely to experience an increase in competition, reflected in a drop in an index that captures activity restrictions. The third subpanel accounts for the *too-big-to-fail* effect. We account for the *too-big-to-fail* effect by removing countries from the sample whose HHI lies above the 95th percentile of the distribution of the concentration variable. The final subpanel accounts for the *too-many-to-fail* effect. We do so by excluding countries whose total capital ratio is below the 5th percentile of the capital ratio. Control variables are explained in the notes to Table 3. We use the Lerner index in Panel A and the net interest margin in Panel B as dependent variable. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
Subpanel: Ruling out reactions to systemic crises								
Liquidity support	-0.043** (-2.25)				-0.040 (-1.30)			
Recapitalizations		-0.075*** (-4.33)				-0.053 (-1.41)		
Nationalizations			-0.010 (-0.26)					-0.095** (-2.05)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1296	1296	1296	1296	1296	1296	1296	1296
R-squared	0.256	0.258	0.254	0.254	0.679	0.680	0.682	0.682
Number of interventions	11	9	3	3	11	9	3	3
Subpanel: Falsification test (drop in activity restrictions index)								
Blanket guarantee (placebo, drop in activity restrictions)	-0.006 (-0.31)				-0.006 (-0.64)			
Liquidity support (placebo, drop in activity restrictions)		0.002 (0.12)				0.012 (1.34)		
Recapitalizations(placebo, drop in activity restrictions)			-0.001 (-0.08)				0.006 (0.79)	
Nationalizations (placebo, drop in activity restrictions)				-0.007 (-0.42)				-0.001 (-0.08)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	831	831	831	831	831	831	831	831
R-squared	0.288	0.288	0.288	0.288	0.645	0.646	0.645	0.645
Number of interventions	37	37	37	37	37	37	37	37
Subpanel: Accounting for the <i>too-big-to-fail</i> effect								
Blanket guarantee	-0.026 (-1.05)				-0.014 (-0.56)			
Liquidity support		-0.036** (-2.09)				-0.028* (-1.84)		
Recapitalizations			-0.041** (-2.24)				-0.034** (-2.20)	
Nationalizations				-0.003 (-0.16)				-0.039** (-2.12)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1610	1610	1610	1610	1610	1610	1610	1610
R-squared	0.234	0.236	0.237	0.233	0.656	0.658	0.659	0.660
Number of interventions	11	34	32	26	11	34	32	26
Subpanel: Accounting for the <i>too-many-to-fail</i> effect								
Blanket guarantee	-0.009 (-0.32)				-0.010 (-0.39)			
Liquidity support		-0.029* (-1.69)				-0.027* (-1.76)		
Recapitalizations			-0.035* (-1.87)				-0.034** (-2.13)	
Nationalizations				0.006 (0.30)				-0.039** (-2.05)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1610	1610	1610	1610	1610	1610	1610	1610
R-squared	0.248	0.250	0.250	0.248	0.672	0.674	0.675	0.676
Number of interventions	10	33	31	25	10	33	31	25

Table 5
Robustness – Subsamples and placebo treatments

We show robustness tests that exclude high-income economies, tests that exclude emerging markets, and tests that exclude countries that were subject to structural adjustment programs by the International Monetary Fund. The final subpanel uses placebo treatment tests. To generate placebo treatment effects, we pretend the interventions occurred two years prior to the intervention. An insignificant placebo effect suggests the significant effects presented in Table 3 are causally related to government interventions. Panel A reports results with the Lerner index, and Panel B uses the net interest margin as dependent variable. The control variables are explained in the notes to Table 3. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
Subpanel: High income countries excluded								
Blanket guarantee	-0.080** (-2.11)				-0.041 (-1.14)			
Liquidity support		-0.049 (-1.52)				-0.047** (-2.00)		
Recapitalizations			-0.061* (-1.91)				-0.048** (-2.42)	
Nationalizations				-0.027 (-0.68)				-0.071*** (-2.67)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1223	1223	1223	1223	1223	1223	1223	1223
R-squared	0.257	0.258	0.259	0.256	0.672	0.675	0.675	0.678
Number of interventions	7	21	20	17	7	21	20	17
Subpanel: Emerging markets excluded								
Blanket guarantee	-0.017 (-0.50)				-0.040*** (-2.98)			
Liquidity support		-0.043** (-2.13)				-0.032* (-1.86)		
Recapitalizations			-0.045** (-1.99)				-0.046** (-2.56)	
Nationalizations				-0.006 (-0.25)				-0.046** (-2.33)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1381	1381	1381	1381	1381	1381	1381	1381
R-squared	0.246	0.249	0.249	0.246	0.659	0.661	0.664	0.663
Number of interventions	6	24	22	17	6	24	22	17
Subpanel: IMF program countries excluded								
Blanket guarantee	-0.006 (-0.18)				-0.031*** (-3.26)			
Liquidity support		-0.032 (-1.59)				-0.006 (-0.68)		
Recapitalizations			-0.040* (-1.71)				-0.019 (-1.64)	
Nationalizations				0.008 (0.34)				-0.017* (-1.69)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1418	1418	1418	1418	1418	1418	1418	1418
R-squared	0.253	0.255	0.255	0.253	0.677	0.677	0.677	0.677
Number of interventions	5	16	17	12	5	16	17	12
Subpanel: Placebo regressions								
Blanket guarantee (placebo, two years forward)	-0.010 (-0.25)				0.001 (0.06)			
Liquidity support (placebo, two years forward)		-0.020 (-1.11)				-0.019 (-0.98)		
Recapitalizations (placebo, two years forward)			-0.011 (-0.53)				-0.026 (-1.37)	
Nationalizations (placebo, two years forward)				0.006 (0.25)				-0.024 (-1.14)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1644	1644	1644	1644	1644	1644	1644	1644
R-squared	0.249	0.249	0.249	0.249	0.673	0.674	0.675	0.674
Number of interventions	0	0	0	0	11	34	32	26

Table 6

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 and World Bank income category. The vector of control variables (not shown) is explained in the notes to Table 3. We present results for nearest neighbor matches with 1 and 2 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=1)</i>	-0.033**		-0.026***
	<i>z-statistic</i>	(-2.06)		(-8.84)
	<i>Control variables</i>	Yes		Yes
	<i>Matches (n=2)</i>	-0.031*		-0.027***
	<i>z-statistic</i>	(-1.78)		(-9.86)
	<i>Control variables</i>	Yes		Yes
Liquidity support	<i>Matches (n=1)</i>	-0.023**		-0.002
	<i>z-statistic</i>	(-2.44)		(-0.32)
	<i>Control variables</i>	Yes		Yes
	<i>Matches (n=2)</i>	-0.023*		-0.003
	<i>z-statistic</i>	(-1.93)		(-0.61)
	<i>Control variables</i>	Yes		Yes
Recapitalizations	<i>Matches (n=1)</i>	0.004		-0.018***
	<i>z-statistic</i>	(0.24)		(-7.42)
	<i>Control variables</i>	Yes		Yes
	<i>Matches (n=2)</i>	-0.004		-0.017***
	<i>z-statistic</i>	(-0.26)		(-6.98)
	<i>Control variables</i>	Yes		Yes
Nationalizations	<i>Matches (n=1)</i>	-0.001		-0.009***
	<i>z-statistic</i>	(-0.03)		(-4.23)
	<i>Control variables</i>	Yes		Yes
	<i>Matches (n=2)</i>	-0.008		-0.009***
	<i>z-statistic</i>	(-0.53)		(-3.70)
	<i>Control variables</i>	Yes		Yes
	<i>Observations</i>	1687		1687

Table 7

Instrumental variable regressions: Effects of government interventions on banking competition

We present two-stage least square regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on competition, measured by the Lerner index and by the net interest margin. Panel A presents the results from the second stage, and Panel B shows the first stage regressions. The first stage regressions rely on linear probability models. We use the same set of instruments for all four types of government interventions. The following set of instruments is used in the first stage regressions. First, we use variables that provide insights into the opacity of the banks' asset portfolio. To this end, we exploit the ratios of residential mortgage loans to net loans, other consumer and retail loans to net loans, corporate and commercial loans to net loans, and other loans to net loans. The securities holdings are captured by the ratio of AFS (available for sale) securities to total securities, and HTM (held to maturity) securities to total securities. Second, we use information about the electoral cycle and the political environment. The election year dummy takes on the value one if a parliamentary election takes place in the corresponding year, and we additionally use the time since last election (in years). Further, we use a dummy that takes on the value of one if the largest government party has a right-wing orientation. Third, we use an instrument that provides information about the institutional environment: an index that provides information about the prompt corrective power (ranging from 0 to 6) of the regulatory agency in charge of supervising banks. All our regressions include the set of control variables discussed in the notes to Table 3. For reasons of brevity, the control variables are not shown. We present a Hansen test for the exclusion restrictions to test the null that the instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. An F-Test for the joint significance of the excluded instruments is also reported, and we also show Kleibergen-Paap's F-Test for weak identification. The null hypothesis is that the instruments are weak. At the bottom of the table, we present the critical values of the Stock and Yogo (2005) F-Statistics for a size bias of 10% relative to OLS, R-square values if the instruments are excluded in the 1st stage, the increase in the 1st stage R-squared attributed to the instruments, and the percentage increase in the 1st stage R-squared. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, and income category dummies included. Standard errors clustered on the country level.

Panel A: Instrumental variable estimator 2nd stage

Dependent variable	<i>Lerner index</i>				<i>Net interest margin</i>			
Government interventions								
Blanket guarantee	0.000 (0.01)				-0.056 (-1.33)			
Liquidity support		-0.101* (-1.74)				-0.0634** (-2.26)		
Recapitalizations			-0.0992* (-1.66)				-0.0728** (-2.55)	
Nationalizations				0.00193 (0.03)				-0.0729* (-1.73)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	929	929	929	929	929	929	929	929
R-squared	0.065	0.041	0.047	0.065	0.282	0.227	0.244	0.247
Hansen J-Statistic	8.885	6.948	7.467	9.076	9.195	7.869	6.566	9.471
Hansen p-value	0.448	0.643	0.589	0.430	0.419	0.547	0.682	0.395

Panel B: Instrumental variable estimator 1st stage

Dependent variable	<i>Blanket guarantees</i>	<i>Liquidity support</i>	<i>Recapitalizations</i>	<i>Nationalizations</i>
Instruments				
Residential mortgage loans/Net loans	-0.013 (-1.41)	-0.037* (-1.87)	-0.019 (-1.05)	-0.020 (-1.20)
Other consumer and retail loans/Net loans	-0.001 (-0.11)	0.032 (0.92)	0.039 (1.03)	-0.019 (-1.61)
Corporate and commercial loans/Net loans	0.026 (1.37)	0.010 (0.45)	0.037** (2.00)	0.018 (0.66)
Other loans/Net loans	0.006 (1.53)	-0.022*** (-4.51)	-0.026*** (-5.90)	0.009 (1.35)
AFS securities/Total securities	-0.002*** (-3.25)	-0.001 (-1.20)	-0.002* (-1.93)	-0.002** (-2.31)
HTM securities/Total securities	0.039*** (4.67)	0.017** (2.00)	0.020** (2.25)	0.034*** (5.02)
Election year	-0.025* (-1.73)	-0.072*** (-3.95)	-0.070*** (-3.68)	-0.042** (-2.36)
Time since last election (years)	-0.008* (-1.74)	-0.042*** (-4.99)	-0.033*** (-4.40)	-0.022*** (-3.00)
Government party with right-wing orientation	-0.014 (-0.80)	-0.019 (-0.71)	-0.012 (-0.46)	-0.046* (-1.84)
Prompt corrective power	0.008* (1.93)	0.002 (0.29)	0.008 (1.17)	0.009 (1.36)
Control variables	Yes	Yes	Yes	Yes
Observations	929	929	929	929
R-squared	0.329	0.491	0.470	0.364
Number of interventions	6	22	20	15
First stage F-Test (instruments)	103.5	17.21	21.94	19.00
Kleibergen-Paap weak identification F-Statistic	103.6	17.23	21.96	19.02
Stock and Yogo (2005) maximal IV relative bias 10 %	11.49	11.49	11.49	11.49
R-squared excluding instruments	0.066	0.212	0.184	0.131
Partial R-squared due to inclusion of instruments	0.204	0.142	0.142	0.116
Percentage increase in R-squared relative to no IV	307%	67%	77%	88%

Table 8

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 of concentration, foreign bank ownership, 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 discussed in the notes to Table 3. Since our regressions include country-fixed effects, the initial condition of concentration (measured by an asset based HHI) 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, and World Bank income category. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, 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	-0.307*** (-6.22)	0.082 (1.66)	-0.016 (-0.81)	-0.050*** (-3.55)	0.060 (0.55)
Liquidity support × Column variable	-0.185** (-2.53)	0.132** (2.14)	-0.010 (-1.23)	-0.023 (-1.64)	0.046 (1.06)
Recapitalizations × Column variable	-0.250*** (-3.88)	0.135** (2.11)	-0.015* (-1.89)	-0.030** (-2.01)	0.059 (1.43)
Nationalizations × Column variable	-0.230** (-2.31)	0.148** (2.03)	-0.016* (-1.88)	-0.028* (-1.71)	0.075* (1.71)
Panel B: Net interest margin					
Blanket guarantee × Column variable	-0.063 (-0.76)	-0.003 (-0.07)	-0.016 (-1.05)	0.009 (0.63)	0.021 (0.52)
Liquidity support × Column variable	-0.045 (-0.73)	-0.035 (-0.73)	-0.009 (-0.96)	0.008 (1.50)	0.113*** (2.83)
Recapitalizations × Column variable	-0.061 (-0.96)	-0.023 (-0.49)	-0.009 (-1.08)	0.004 (0.66)	0.123*** (3.53)
Nationalizations × Column variable	-0.081 (-1.16)	-0.040 (-0.58)	-0.009 (-0.99)	0.005 (1.04)	0.111*** (2.70)

Table 9
Extensions: Government interventions, transparency, and bank charter values

The table presents 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 first subpanel tests for the effect of transparency in banking systems using a Transparency index. This 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 second subpanel tests the effect of charter values. We approximate bank charter values by the ratio of current deposits to total deposits and money market and short-term funding. The control variables are explained in the notes to Table 3. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Lerner index					Panel B: Net interest margin			
Subpanel: Transparency of banking systems								
Transparency index	-0.010 (-1.01)	-0.013 (-1.23)	-0.011 (-1.15)	-0.012 (-1.26)	-0.006 (-1.47)	-0.008* (-1.94)	-0.007* (-1.71)	-0.008* (-1.90)
Blanket guarantee	-0.217 (-0.98)				-0.133** (-2.50)			
Blanket guarantee × Transparency	0.045 (0.89)				0.026** (2.22)			
Liquidity support		-0.176** (-2.13)				-0.134** (-2.43)		
Liquidity support × Transparency		0.036** (2.07)				0.028*** (2.81)		
Recapitalizations			-0.223** (-2.19)				-0.113* (-1.82)	
Recapitalizations × Transparency			0.042* (1.79)				0.023* (1.80)	
Nationalizations				-0.188** (-2.07)				-0.152*** (-3.13)
Nationalizations × Transparency				0.044** (2.15)				0.030*** (3.43)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1142	1142	1142	1142	1142	1142	1142	1142
R-squared	0.319	0.320	0.322	0.321	0.723	0.725	0.724	0.725
Number of interventions	9	26	25	21	9	26	25	21
Subpanel: Bank charter values								
Charter value	0.003 (0.12)	0.008 (0.28)	0.006 (0.20)	0.004 (0.12)	0.034 (1.60)	0.027 (1.28)	0.030 (1.41)	0.030 (1.40)
Blanket guarantee	-0.001 (-0.02)				-0.030 (-1.32)			
Blanket guarantee × Charter value	-0.051 (-0.48)				-0.012 (-0.33)			
Liquidity support		-0.007 (-0.25)				-0.042** (-2.03)		
Liquidity support × Charter value		-0.067 (-1.05)				0.042 (1.27)		
Recapitalizations			-0.019 (-0.65)				-0.036** (-2.03)	
Recapitalizations × Charter value			-0.052 (-0.82)				0.011 (0.33)	
Nationalizations				0.018 (0.65)				-0.045** (-2.18)
Nationalizations × Charter value				-0.035 (-0.55)				0.018 (0.58)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1600	1600	1600	1600	1600	1600	1600	1600
R-squared	0.252	0.254	0.255	0.252	0.663	0.665	0.666	0.666
Number of interventions	10	32	30	24	10	32	30	24

Table 10

Difference-in-difference regressions: Government interventions and the presence of zombie banks

We present difference-in-difference regressions of the effect of blanket guarantees, liquidity support, significant recapitalizations, and nationalizations on the presence of zombie banks, measured by the number of zombie banks (relative to the number of banks in the banking system) in Panel A, by the loan market share of zombie banks in Panel B, and by the deposit market share of zombie banks in Panel C. We define zombie banks as banks with negative tangible capital ratios. Tangible capital equals common equity minus intangible assets. Intangible assets comprise good will, other intangibles, and deferred tax assets. We include the vector of control variables defined in the notes to Table 3. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, and income category dummies included. Standard errors are clustered on the country level. Panel D provides an overview about the number of government interventions per country and the corresponding number of zombie banks and these zombie banks' market share. In Panel E, we show the change in competition measures per quartile and the corresponding proportion of zombie banks, and the zombie banks' market shares in loan and deposit markets, respectively.

Panel A: Number of zombie banks/Total number of banks					Panel B: Loan market share of zombie banks				Panel C: Deposit market share of zombie banks						
Blanket guarantee	0.017 (0.80)				-0.007 (-0.25)				-0.006 (-0.20)						
Liquidity support	0.016* (1.76)				0.026 (1.37)				0.021 (1.30)						
Recapitalizations			0.016* (1.71)				0.025 (1.28)				0.020 (1.16)				
Nationalizations							0.012 (1.19)				0.011 (0.62)				
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Observations	1528	1528	1528	1528	1528	1528	1528	1528	1528	1528	1528	1528			
R-squared	0.228	0.230	0.230	0.228	0.245	0.247	0.247	0.245	0.248	0.250	0.250	0.248			
Number of interventions	9	30	28	23	9	30	28	23	9	30	28	23			
Panel D: Number of interventions	Number of zombie banks/Total number of banks				Loan market share of zombie banks				Deposit market share of zombie banks						
1	0.009				0.020				0.021						
2	0.042				0.089				0.067						
3	0.042				0.104				0.096						
4	0.090				0.164				0.166						
Panel E: Change in competition by quartile															
Breakdown by competition measure			Lerner index		Net interest margin		Lerner index			Net interest margin		Lerner index		Net interest margin	
Δ Lerner index	Δ Net interest margin		Number of zombie banks/Total number of banks		Loan market share of zombie banks				Deposit market share of zombie banks						
25 th	-0.133	-0.045	0.124		0.102		0.129		0.166		0.121		0.153		
50 th	-0.026	-0.002	0.078		0.081		0.164		0.087		0.155		0.083		
75 th	0.007	0.001	0.063		0.083		0.076		0.095		0.080		0.096		

Table 11

Welfare effects of government interventions into banking systems: Prices of banking products, 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 average deposit rates (Panel A), and on average loan rates (Panel B). Panel C measures the effect of interventions on domestic credit provided by the banking sector relative to GDP, and Panel D shows the effect on bank branch density per 100,000 of adults (logtransformed). In all regressions, we include the control variables (not shown) discussed in the notes to Table 3. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country, year, and income category dummies included. Standard errors are clustered on the country level.

Panel A: Deposit rates					Panel B: Loan rates			
Blanket guarantee	-0.088 (-1.65)				-0.051 (-1.47)			
Liquidity support		-0.048** (-2.31)				-0.049** (-2.11)		
Recapitalizations			-0.041* (-1.78)				-0.048** (-2.00)	
Nationalizations				-0.057** (-2.29)				-0.066** (-2.45)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1687	1687	1687	1687	1687	1687	1687	1687
R-squared	0.916	0.916	0.916	0.916	0.916	0.917	0.917	0.917
Number of interventions	11	34	32	26	11	34	32	26
Panel C: Domestic credit provided by banking sector (% of GDP)					Panel D: Bank Branches/Population (ln)			
Blanket guarantee	0.098 (0.90)				-0.239*** (-4.70)			
Liquidity support		0.133*** (2.67)				-0.182*** (-3.40)		
Recapitalizations			0.079* (1.68)				-0.208*** (-3.38)	
Nationalizations				0.118** (2.07)				-0.232*** (-3.89)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1687	1687	1687	1687	598	598	598	598
R-squared	0.944	0.946	0.945	0.945	0.983	0.983	0.983	0.983
Number of interventions	11	34	32	26	3	19	16	12

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. 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.

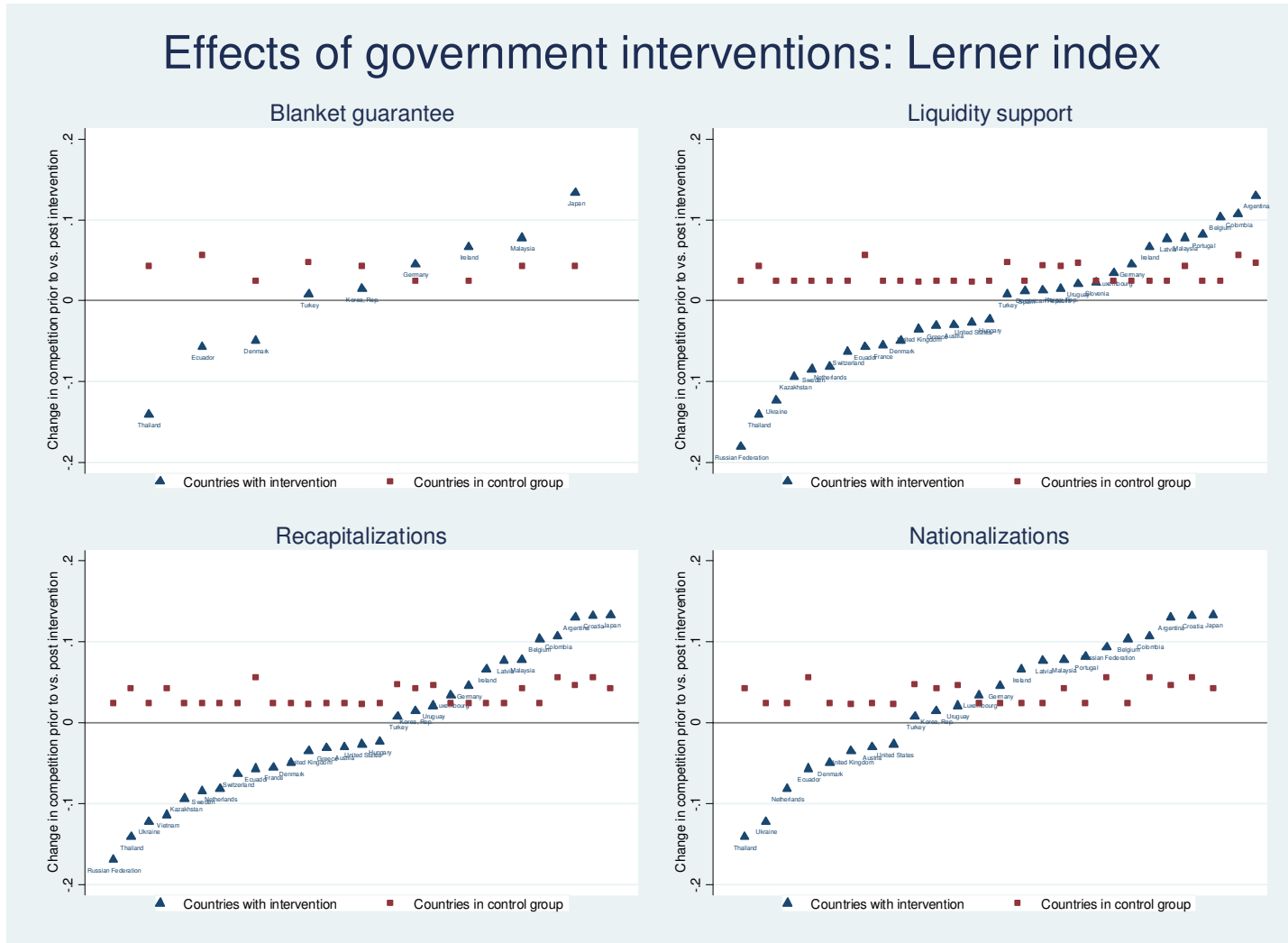


Figure 2

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.

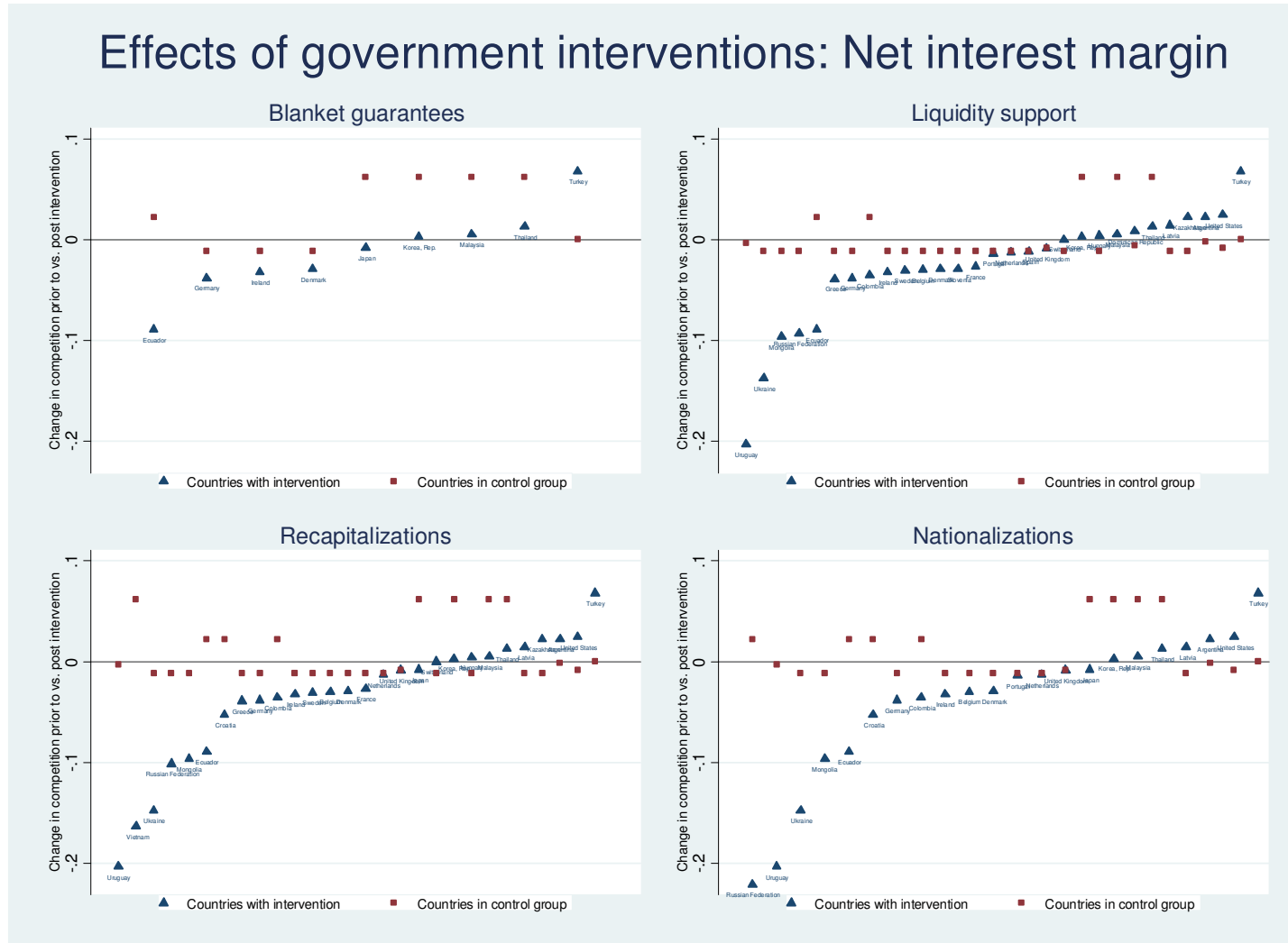


Figure 3

Parallel trends: Behavior of competition measures (Lerner index and net interest margins) prior to government interventions

Figure 3 illustrates the behavior of annual changes of Lerner indices and net interest margins in the three years prior to the government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations). 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.

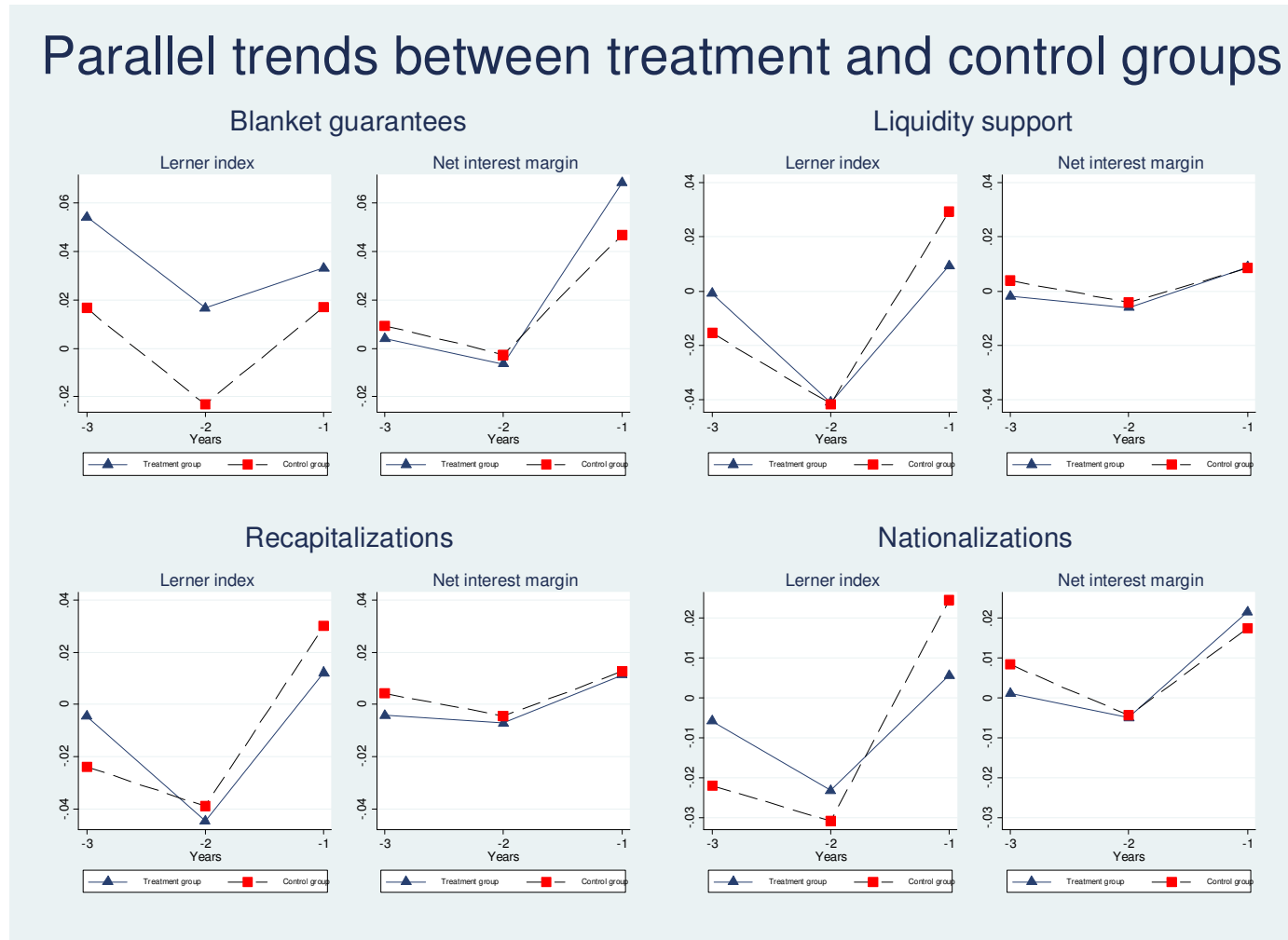


Figure 4

Long-run effect of government interventions on competition

Figure 4 illustrates the evolution of Lerner indices and net interest margins following government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations) over the following five years in the treatment countries. The dark bar shows competition in the year the government intervention was announced, and the light bars illustrate the evolution in the five subsequent years. For counties that experience interventions after 2005, we only observe the mean values of the competition measures in the remaining years of the sample period.

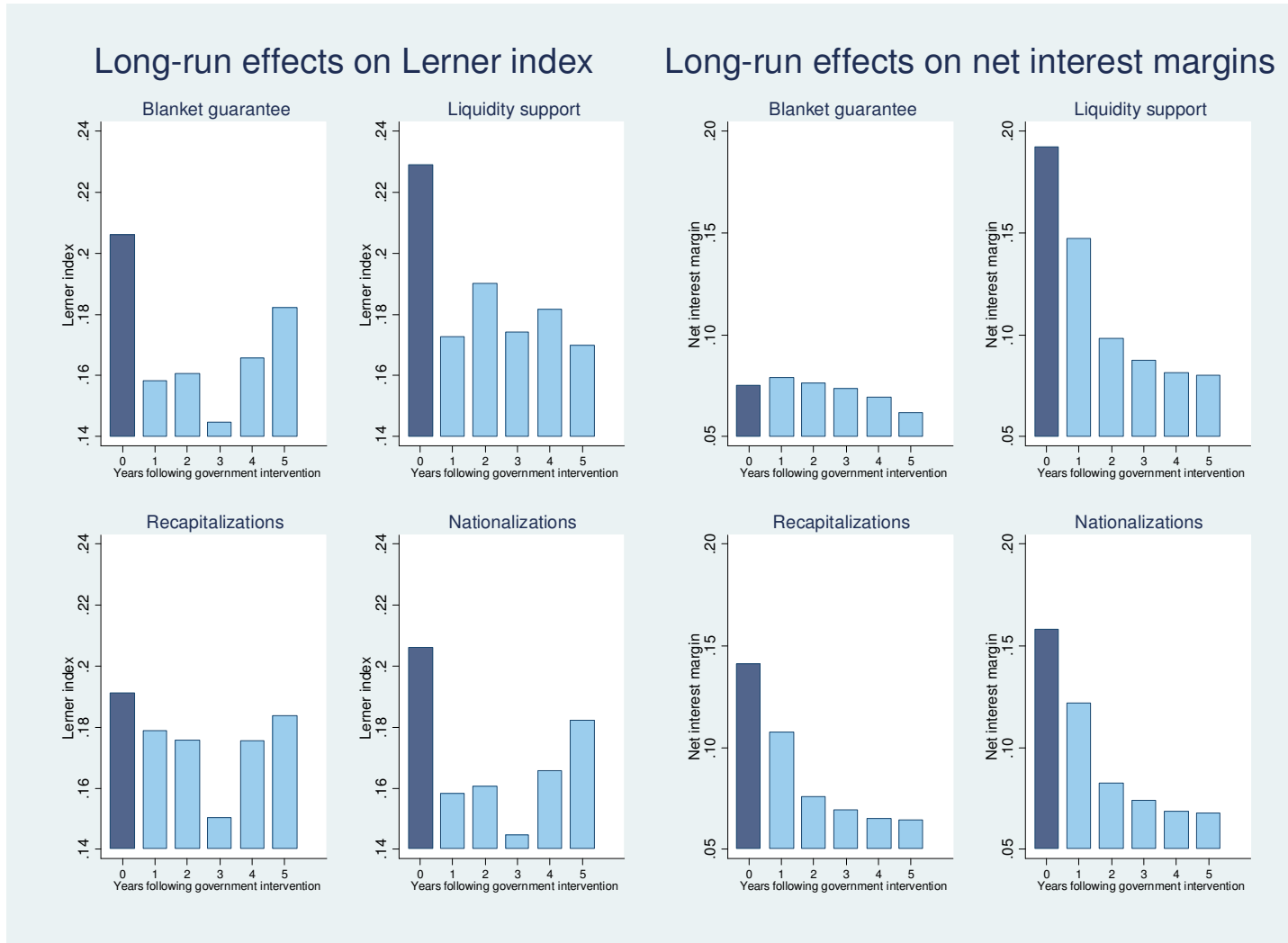
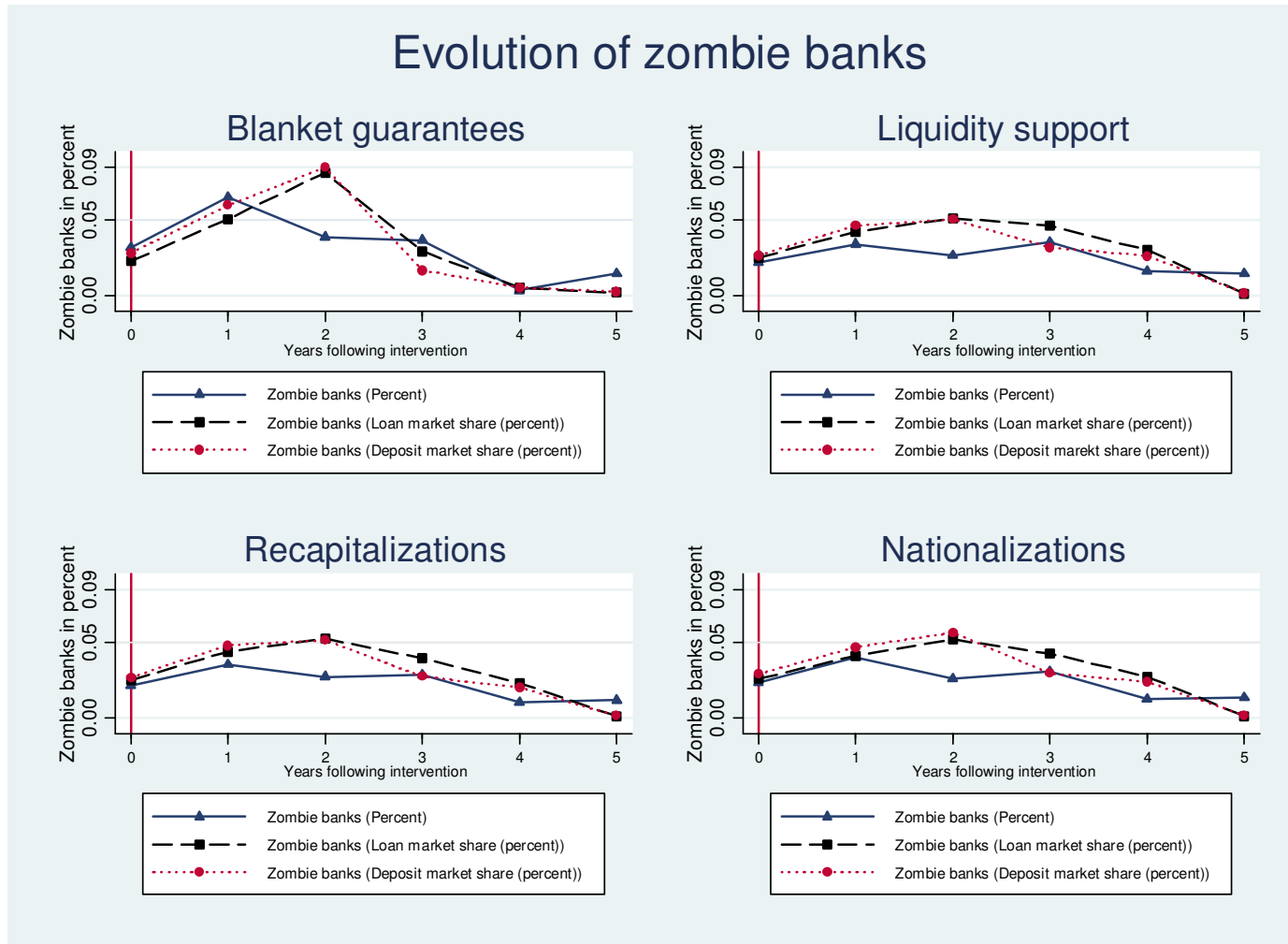


Figure 5
Evolution of zombie banks

Figure 5 illustrates the evolution of zombie banks in countries that announced blanket guarantees, liquidity support, recapitalizations, and nationalizations. We present the information for the 5 years following the announcement year. Each panel demonstrates the evolution of the average percentage of zombie banks relative to the total number of banks (depicted by a triangle). We also present the market shares in terms of loans (depicted by a square), and in terms of deposits (depicted by a circle) held by zombie banks. Zombie banks are defined as banks with negative tangible capital ratios. Tangible capital equals common equity minus intangible assets. Intangible assets comprise good will, other intangibles, and deferred tax assets.



Appendix I: Crises and government interventions

The table provides an overview about countries with banking crises, based on the classification in Laeven and Valencia (2008, 2010, 2012) 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	21	0	0	0	0
2009	21	0	0	0	0
2008	20	3	18	15	9
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

Panel C: Frequency of interventions		Number of government interventions			
	Government interventions per country	1	2	3	4
% of countries with multiple interventions		13.51	24.95	31.89	29.64

Appendix II: Bank level evidence for the effect of recapitalizations and nationalizations

We report panel data models for the effect of recapitalizations and nationalizations on Lerner indices and net interest margins on the bank level using data for 1996-2010 using manually collected information on recapitalizations and nationalizations. The information on recapitalizations and nationalizations only covers the recent crisis from 2007 onwards. Banks that receive capital injections or are nationalized are matched with observationally similar banks from the same country, the same year, and from the same bank type (commercial, savings, or cooperative bank). Additionally, we impose the criterion that the banks from the control group are similar in terms of size based on being in the same size quartile of the distribution of total assets to compare banks that are similar in terms of scope and scale of business activities. If multiple banks serve as a match for a treatment bank, we restrict the number of matches to a maximum of 5 banks in the control group. Our control variables are identical to the control variables used in the regressions on the aggregate (i.e., country) level, except for the dummy for bank-based financial systems and the Financial development indicator which are both dropped due to collinearity. We use GDP growth, inflation, real GDP per capita, an asset-based Herfindahl-Hirschman index, the size of the banking system in terms of total assets (ln), a regulatory quality index, a dummy that takes on the value of one if a country used multiple forms of bailouts (blanket guarantees, liquidity support, recapitalizations, or nationalizations), a dummy variable that takes on the value of one if the country uses assisted mergers to rescue distressed banks, government consumption expenditure in % of GDP, and the money market rate (ln) as a proxy for monetary policy conditions as control variables. On the bank level, we use loan impairment charges/gross loans, and total assets (ln) as further control variables. We also include bank and year fixed effects. Standard errors are clustered at the bank level. Since different countries revert to different types of bailouts, we use for recapitalizations and nationalizations two different samples. We present the countries that are included in the two different samples at the bottom of the table. *** p<0.01, ** p<0.05, * p<0.1

	Lerner index		Net interest margin	
GDP growth	0.053 (0.11)	0.194 (0.70)	2.849*** (5.14)	-0.023 (-0.49)
Inflation	-2.355* (-1.93)	0.074 (0.55)	-0.308 (-0.34)	0.043 (1.40)
Real GDP/capita	0.000* (1.80)	0.000** (2.42)	-0.000 (-0.92)	0.000 (0.11)
Concentration (HHI)	-0.618 (-1.50)	0.046 (1.49)	-0.008 (-0.16)	-0.005 (-0.97)
Total banking system assets (ln)	0.137** (2.27)	-0.016 (-1.19)	0.514*** (7.90)	-0.001 (-0.23)
Regulatory quality index	0.032 (0.26)	0.146* (1.67)	0.149 (1.49)	-0.009 (-1.17)
Multiple interventions	0.018 (1.21)	0.007 (0.19)	0.010 (0.80)	-0.001 (-1.31)
Assisted mergers	0.037* (1.74)	-0.020 (-0.75)	-0.000 (-0.01)	-0.001 (-0.45)
Government Consumption expenditure (% GDP)	-1.047 (-0.71)	-0.251 (-1.55)	-1.865* (-1.76)	0.098 (0.69)
Money market rate (ln)	-0.042** (-2.41)	-0.041 (-1.54)	0.104*** (5.13)	0.003 (0.93)
Loan impairment charges/Gross loans	-0.020 (-1.61)	0.001*** (4.72)	0.024** (2.34)	0.000*** (7.05)
Total assets (ln)	0.154*** (6.71)	0.023 (1.25)	0.037* (1.93)	-0.003 (-0.88)
Recapitalization	-0.035** (-2.00)		-0.052** (-2.03)	
Nationalization		-0.084* (-1.86)		0.002 (0.30)
Bank fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	7023	890	7023	890
R-squared	0.158	0.172	0.050	0.102
Number of interventions	589	26	589	26
Countries included	Austria, Belgium, Germany, France, Greece, Ireland, Luxembourg, Netherlands, United Kingdom, United States	Austria, Belgium, Denmark, Germany, Iceland, Ireland, Kazakhstan, Latvia, Luxembourg, Mongolia, Netherlands, Portugal, Ukraine, United Kingdom	Austria, Belgium, Germany, France, Greece, Ireland, Luxembourg, Netherlands, United Kingdom, United States	Austria, Belgium, Denmark, Germany, Iceland, Ireland, Kazakhstan, Latvia, Luxembourg, Mongolia, Netherlands, Portugal, Ukraine, United Kingdom

Appendix III: Lerner index

The Lerner index is a widely used measure of competition in banking (e.g., Koetter et al. (2012)).

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 124 countries are used to compute the index.

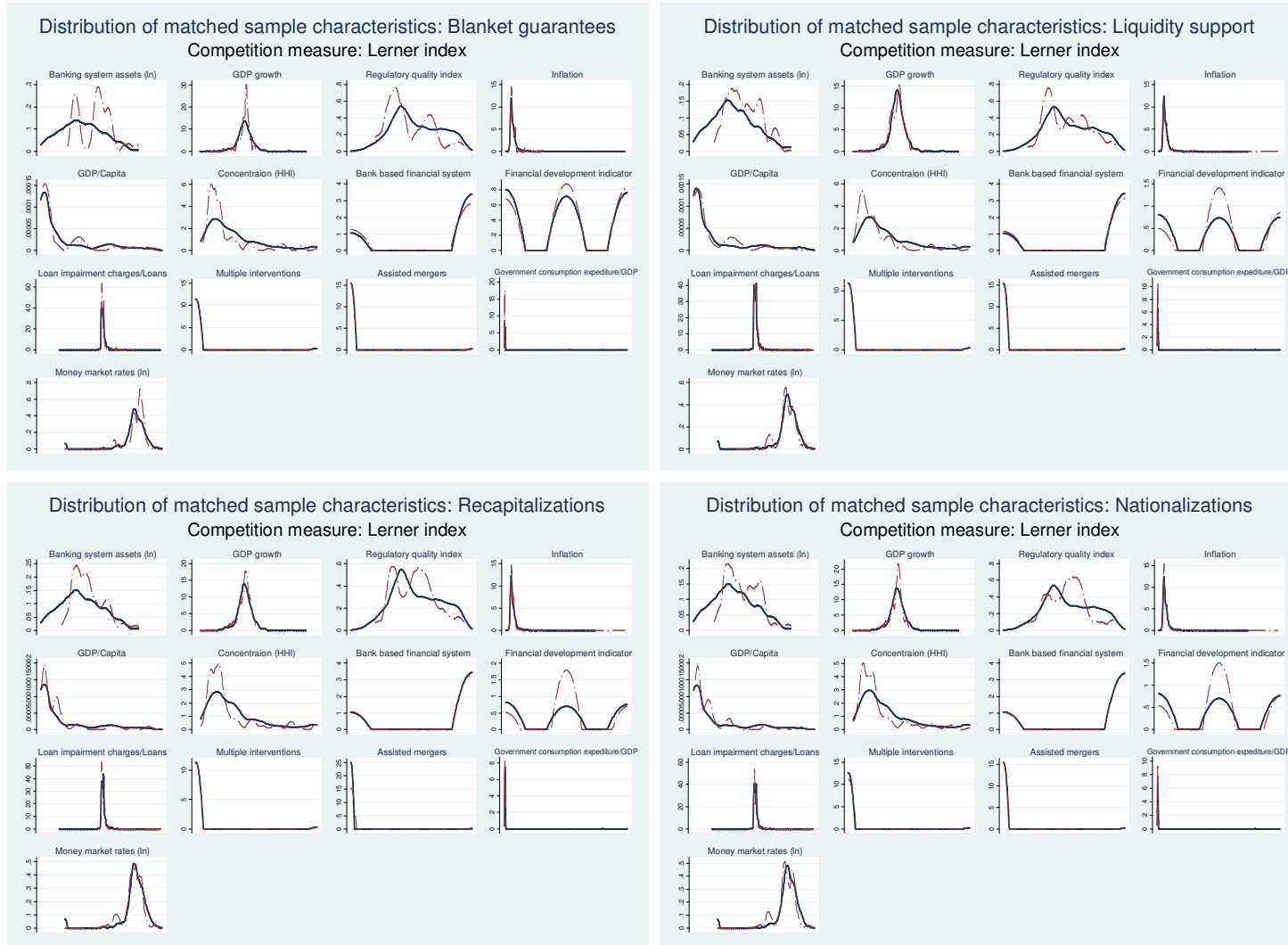
Summary statistics

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

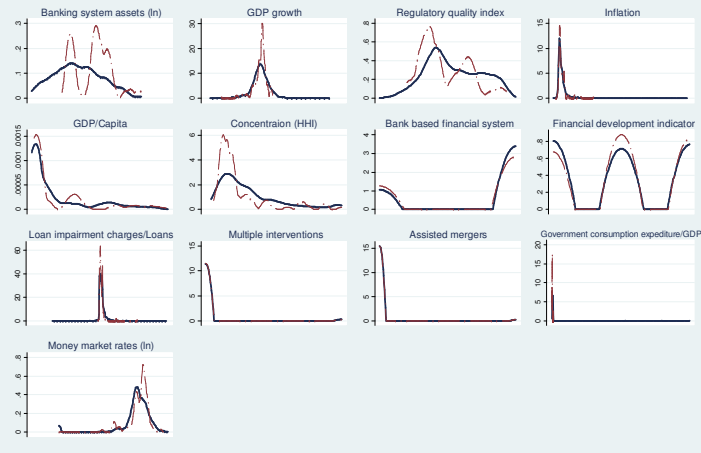
Appendix IV: Distribution of competition measures and control variables

We plot the distribution of the control variables banking system size (ln), GDP growth, regulatory quality index, inflation, GDP/capita, concentration, bank-based financial system, financial development indicator, loan impairment charges, multiple interventions, assisted mergers, government consumption/GDP and money market rates (ln) for the treatment and control groups for the matched samples for the government interventions blanket guarantees, liquidity support, recapitalizations, and nationalizations. 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.



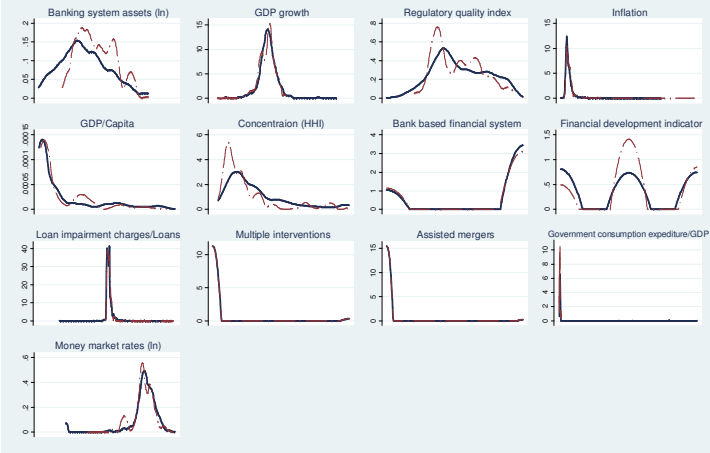
Distribution of matched sample characteristics: Blanket guarantees

Competition measure: Net interest margin



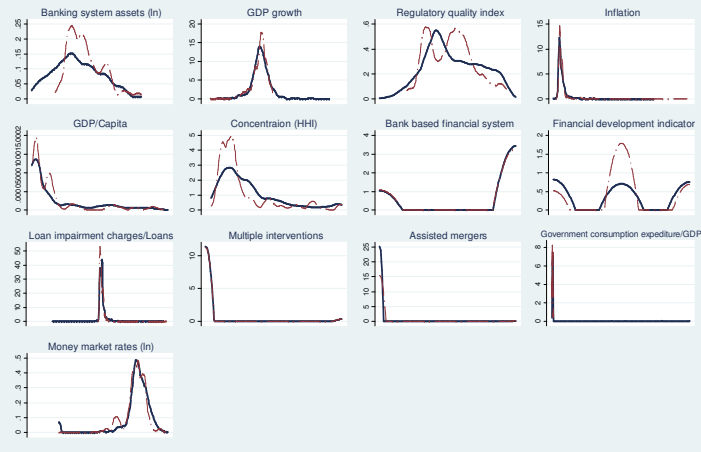
Distribution of matched sample characteristics: Liquidity support

Competition measure: Net interest margin



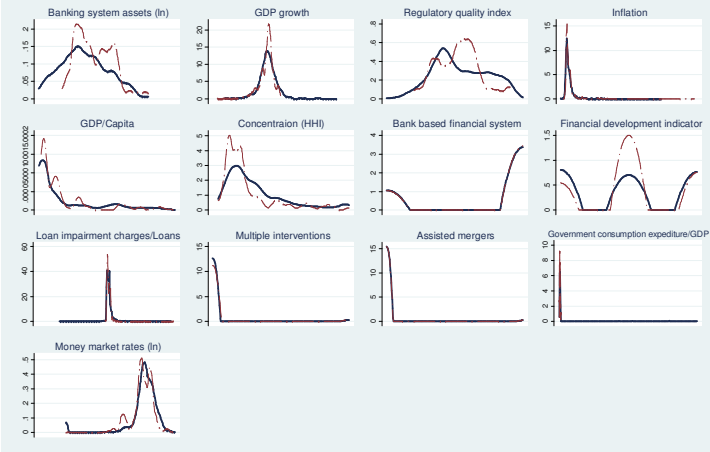
Distribution of matched sample characteristics: Recapitalizations

Competition measure: Net interest margin



Distribution of matched sample characteristics: Nationalizations

Competition measure: Net interest margin



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 domestic credit provided by the banking sector relative to GDP to address alternative explanations. The vector of control variables (not shown) is discussed in the notes to Table 3. 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. 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, and income category dummies included. Standard errors are clustered on the country level.

Dependent variable	<i>Domestic credit to private sector (% of GDP)</i>			
Panel A: Countries with liberalized capital accounts (Chinn-Ito index) removed				
Blanket guarantee	0.229 (1.19)			
Liquidity support		0.263*** (3.43)		
Recapitalizations			0.151* (1.96)	
Nationalizations				0.240** (2.39)
Control variables	Yes	Yes	Yes	Yes
Observations	1383	1383	1383	1383
R-squared	0.938	0.941	0.939	0.940
Number of interventions	3	18	15	10
Panel B: IMF program countries removed				
Blanket guarantee	0.090 (0.40)			
Liquidity support		0.262*** (3.15)		
Recapitalizations			0.146* (1.88)	
Nationalizations				0.213** (2.13)
Control variables	Yes	Yes	Yes	Yes
Observations	1418	1418	1418	1418
R-squared	0.954	0.957	0.955	0.955
Number of interventions	5	16	17	12
Panel C: Countries that had increase in government-owned banks after nationalizations and recapitalizations removed				
Blanket guarantee	0.023 (0.24)			
Liquidity support		0.130** (2.00)		
Recapitalizations			0.055 (0.94)	
Nationalizations				0.092 (1.29)
Control variables	Yes	Yes	Yes	Yes
Observations	1556	1556	1556	1556
R-squared	0.944	0.945	0.944	0.944
Number of interventions	10	23	23	19
Panel D: Countries with currency crises removed				
Blanket guarantee	11.741 (0.54)			
Liquidity support		23.461*** (3.40)		
Recapitalizations			12.318* (1.93)	
Nationalizations				17.427** (2.07)
Control variables	Yes	Yes	Yes	Yes
Observations	1497	1497	1497	1497
R-squared	0.942	0.946	0.943	0.944
Number of interventions	5	20	21	14