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Bank Bailouts and Economic Growth: Evidence from Cross-Country, Cross-Industry Data

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Abstract

In this paper, we revisit the question of how bank bailouts affect economic growth. We adopt a broad concept of bailouts, which includes both capital injections and liquidity support to the banking system. We employ an identification strategy that controls for the various dimensions of bailout endogeneity and find that liquidity support has a significant positive real economic effect. The effect of recapitalizations per se is not statistically significant, but they reinforce the positive impact of liquidity interventions. Utilizing bank-level data, we provide evidence that this is the case because better-capitalized banks and banks in significantly recapitalized systems have a higher propensity to lend, thus raising aggregate-level real economic growth.

JEL Classification: E44, G01, G21

Keywords: Banking Crisis, Bailouts, Economic Growth

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1 Introduction

Given the important role of financial institutions for real economic growth (e.g., Rajan and Zingales, 1998; Levine, 1999; Levine, Loayza, and Beck, 2000; Chodorow-Reich, 2014; Cingano, Manaresi, and Sette, 2016; Bai, Carvalho, and Phillips, 2018), governments and central banks regularly spend substantial public resources to support banks whenever there is a severe risk of systemic distress. However, as an intervention in the capital allocation process, bailouts can also adversely affect economic growth by generating moral hazard and thus increasing the risk propensity of the banking system (e.g., Dam and Kötter, 2012). Hence, the expected net effect of bank bailouts is ambiguous.

The few existing empirical studies on the topic also produce inconclusive evidence. For example, Detragiache and Ho (2010) identify a negative relationship between bailouts and growth for a broad cross-country sample, while Giannetti and Simonov (2013) and Laeven and Valencia (2013b) demonstrate a positive impact of bailouts in different empirical settings. In this paper, motivated by the considerable policy relevance and the so-far inconclusive evidence, we revisit the question of how bank bailouts affect real economic dynamics. We perform a comprehensive empirical analysis that aims to overcome some of the shortcomings of the existing literature that will be reviewed in detail in the next section. In particular, we trace the real effects of different types of bailouts, e.g., fiscal vs. liquidity support and the interactions thereof for a sufficiently long period after the interventions. More specifically, we employ an international sample of 76 banking crises in 65 countries over the period 1970-2017.

We examine the effect of fiscal and monetary bailouts on industry-level value-added growth in each of the countries in our sample. The country-industry level data allow us to address the endogeneity of real economic growth with regard to the state of the financial industry by adopting the identification strategy proposed by Rajan and Zingales (1998), which relies on industry-level variation in external finance dependency and allows us to pin down the role of credit supply in the transmission of bailouts. Applying this form of identification to the nexus of banking crises and bailouts, we observe that industries with a higher reliance on external funding are stronger affected by bank bailouts than industries that rely less on external funding.

We also address the issue that the intensity of bailouts is endogenous with respect to the underlying banking system distress and, thus, related to the state of the real economy. For this purpose, we introduce instrumental variables for monetary and fiscal support to the banking sector. We instrument liquidity support by the de-jure degree of central bank independence, which is related to the importance of inflation control in the central bank's objectives (Garriga, 2016). Since liquidity support might generate some inflationary pressure, we presume that central banks with binding inflation objectives are less inclined to support the financial system in case of distress. To consider whether the inflation objective is binding, we combine the de-jure independence measure of Garriga (2016) with past inflation rates. The degree of fiscal support is instrumented by the share of military expenditures relative to GDP and

the rural population share. The intuition of these instruments is that they represent proxies for a more conservative orientation of the government, which in turn has been found to strongly correlate with the propensity of a government to support the financial system (Bove, Efthyvoulou, and Navas, 2017; Gropp, Guettler, and Saadi, 2019).

Our baseline results show that bank bailouts contribute to a real economic stabilization around banking crises. At a first glance, this positive (stabilizing) effect only exists for monetary support to the banking system, while we find no significant evidence that fiscal support has any lasting effects. However, when we focus on the interaction between monetary and fiscal support, we find that the positive effect of monetary support is mostly observed during crises where central bank liquidity is accompanied by a sufficient fiscal recapitalization of the banking system. To better explore the interactions between liquidity and fiscal support, particularly regarding the role of bank capitalization, we provide bank-level evidence that better-capitalized banks and banks in sufficiently recapitalized systems supply loans with higher ex-ante recognized risk. We assume that these loans, rather than evergreening loans for which risk is not transparently reflected in bank reports and low-risk loans to public institutions or firms with public support, are more likely to stimulate growth at the aggregate level. These findings align with the argument that institutions that remained poorly capitalized after the Japanese government, during the 1990s, intervened in the banking sector were more likely to lend to zombie firms (Giannetti and Simonov, 2013). Zooming in on the positive effect of monetary support, we find that it materializes already in the very short run, and is thus a proper choice for business cycle stabilization around financial system distress. Interestingly, the effect is quite long-lasting, as it can be detected on average until five to six years after the intervention. So, at least within this time horizon, any detrimental effects of bailouts are outweighed by the positive impact that support for financial institutions has on growth. We thus provide evidence that, generally, justifies the use of monetary support to neutralize the effect of banking system distress. However, our results also indicate that to limit the risk that bailouts increase moral hazard and lead to misallocation of credit towards less efficient firms, monetary support has to be complemented by recapitalizations of the banking system.

These results add to the existing literature in several dimensions. First, they complement the aforementioned body of empirical research that identifies the real effects of bank bailouts (Detragiache and Ho, 2010; Giannetti and Simonov, 2013; Laeven and Valencia, 2013b) by broadening the scope of the observations and strengthening the identification. Second, by exploring the impact of the interaction between monetary support and sufficient bank capital levels on the riskiness of bank loan portfolios, we contribute to the literature that studies how bank bailouts affect bank risk-taking (Flannery, 1998; Sironi, 2003; Gropp and Vesala, 2004; Dam and Kötter, 2012; Behn, Haselmann, and Wachtel, 2016). Finally, our results also speak to the extensive literature dealing with the question of how a bailout should be designed to mitigate the adverse effects of moral hazard (Aghion, Bolton, and Fries, 1999;

Diamond and Rajan, 2001; Farhi and Tirole, 2012; Philippon and Schnabl, 2013).

The rest of the paper is structured as follows. Section 2 summarizes the literature explaining the mechanisms through which bank bailouts can affect real economic activity and formulate the hypotheses. Section 3 describes our empirical strategy and the data involved in the analysis. Section 4 outlines the baseline results with regard to the effect of fiscal and monetary support, as well as their interaction, on industry growth. In Section 5, we provide several robustness checks. Section 6 identifies the transmission mechanisms. Section 7 differentiates between the short-run and long-run effects of bailouts, and Section 8 concludes the paper.

2 How Bailouts Affect Growth: A Summary of the Arguments and Empirical Hypotheses

The proposition that bank bailouts can affect real economic outcomes is rooted in the argument going back to at least Schumpeter that well-functioning financial systems are related to higher economic growth (Rajan and Zingales, 1998; Beck, Levine, and Loayza, 2000; Bekaert, Harvey, and Lundblad, 2005; Hsu, Tian, and Xu, 2014). The major theoretical motive behind this link is the role of well-functioning financial systems for the costs and the accessibility of external financing to firms. When defining well-functioning financial systems, some authors focus on the state of the financial system's development (e.g., Rajan and Zingales, 1998; Beck, Levine, and Loayza, 2000), while others concentrate on exploring how, even in well-developed financial systems, growth can be limited if banks reduce their lending due to leverage constraints, especially, when the banking sector has suffered significant capital losses (Bernanke, Lown, and Friedman, 1991; Peek and Rosengren, 1995; Hancock and Wilcox, 1994). Kroszner, Laeven, and Klingebiel (2007), Dell'Ariccia, Detragiache, and Rajan (2008) and Hardy and Sever (2021) extend this argument by focusing on periods when the depletion of bank capital is so severe and widespread that the whole banking system is in a crisis. They demonstrate that economic sectors and firms more dependent on external finance suffer more during such a banking crisis, which is consistent with the argument that the real effects of finance are contingent on the financial system's ability to provide credit.

Suppose economic growth is constrained by the distress of individual banks or the banking system as a whole. In that case, bank bailouts, as interventions intended to overcome this distress, can be expected to have a positive growth impact. As mentioned in the introduction, the empirical support for this hypothesis is, however, somewhat mixed. For example, Claessens, Klingebiel, and Laeven (2005) and Dell'Ariccia, Detragiache, and Rajan (2008) do not find a significant impact of standard government interventions, like blanket guarantees and bank recapitalizations, on the recovery of output following banking crises. Detragiache and Ho (2010) even find that the more fiscal resources are mobilized in

overcoming a banking crisis the slower the recovery of GDP. Laeven and Valencia (2013b) recognize that the above studies have at least two shortcomings: first, they do not account for the intensity of government interventions, and second, they abstract from the fact that the banking system's recovery is typically achieved not only by fiscal support recapitalizations, but also by providing sufficient liquidity support to banks in order to reduce the probability that liquidity shortages can generate liquidation pressures that raise bank insolvency risks. To overcome these shortcomings, the authors analyze how the economic recovery after the 2008 financial crisis was affected by the intensity of both fiscal and liquidity support to banks in a large sample of countries. They find that fiscal support positively impacts on the recovery, while the effect of liquidity support is statistically insignificant.

While the approach of Laeven and Valencia (2013b) overcomes many of the deficiencies of the earlier literature, a few remaining challenges motivate us to revisit the topic. To start with, although Laeven and Valencia (2013b) attempt to identify the effect of bailouts at the industry level using Rajan and Zingales' identification strategy, due to data availability in their analysis, they employ firm- rather than industry-level value-added data drawn from Compustat. However, the focus on a Compustat sample is likely to generate some biases since only large listed firms, which are less dependent on bank funding, are covered. Fortunately, a new 2015 edition of the industry-level value-added data in the INDSTAT2 ISIC Revision 3 database of the United Nations Industrial Development Organization (UNIDO) enables us to address the issue. So, the first hypothesis that we test is whether:

Hypothesis 1: Fiscal and liquidity support positively affect industry-level value-added when each of these support measures is taken in isolation and when the two are included in a joint estimation framework.

When testing this hypothesis, we explicitly address the challenge of the potential endogeneity of bailout intensity and achieve identification by re-estimating the model using suitable instruments for the two support forms.[1]

Next, we move to specifications that explore the interaction between fiscal and liquidity support and test whether a sufficient degree of recapitalization is needed for liquidity support to produce the desired positive effect. Even though Laeven and Valencia (2013b) recognize the potential role of liquidity support, they do not explicitly account for the potential interaction between fiscal and liquidity interventions. This is a relevant omission because fiscal support is crucial for timely and sufficient recapitalizations. These recapitalizations, in turn, might be a necessary condition for any positive effects of liquidity support to materialize. This argument is consistent with Giannetti and Simonov (2013), who, exploiting data from Japan, claim that only substantial recapitalizations of banks can generate positive growth impulses. Our next hypothesis, therefore, states that:

[1]Laeven and Valencia (2013b) ignore this endogeneity issue, which, although a bit less pronounced when the analysis is based on a firm-level dependent variable rather than on industry-level data, can still be a problem if there is a strong correlation between the value-added dynamics across firms.

Hypothesis 2: The intensity of fiscal support affects the growth impact of liquidity support. More specifically, a sufficient degree of recapitalization is needed for liquidity support to produce the desired positive effect.

A further gap in the existing literature on the link between bank bailouts and economic growth is that, even though the disruptions of bank lending are presumed to be the main channel behind the real effects of banking system distress, scant attention has been devoted to empirically exploring the impact of bailouts on bank lending. While some studies focus on specific bailout measures in single countries (e.g., Li, 2013; Duchin and Sosyura, 2014; Berger, Makaew, and Roman, 2019), there are, at least to the best of our knowledge, no studies looking at the impact of aggregate bailouts on bank-level outcomes in a broad cross-section of countries. To address this gap, we employ bank-level data and test whether:

Hypothesis 3: Bank-level lending behavior is affected by the different types of bailouts and their interaction.

We then fine-tune this hypothesis by controlling for the role of sufficient capitalization levels to boost lending. And last but not least, we address the argument that the moral hazard incentives generated by bailouts (Dam and Kötter, 2012) can shift up banks' risk-taking incentives. If banks undertake excess risks after bailouts, the long-term effects of the interventions might be adverse even though short-term dynamics are positively affected. We address this concern by testing whether:

Hypothesis 4: The impact of bailouts varies depending on the time horizon around the bailout included in the analysis.

To test this hypothesis, we re-estimate our models for time horizons from one to ten years. These tests also allow us to trace whether the potential positive impact of the interventions fades out over time.

3 Estimation Method, Data, and Identification

3.1 Empirical Methodology

Our baseline empirical model is derived as a test of the first hypothesis described in Section 2, that is whether fiscal and liquidity support positively affect industry-level value added. In econometric terms, we estimate the following regression equation:

$$\begin{aligned}\Delta\, ValueAdded_{i,c,t} = \alpha\; InitialShare_{i,c,t} + \lambda_{i,t} + \mu_{c,t} + \beta\; (Liquidity_{c,t} * FinanceDependency_i) \\ + \gamma\; (Fiscal_{c,t} * FinanceDependency_i) + \epsilon_{i,c,t}.\end{aligned} \tag{1}$$

We calculate the dependent variable ($\Delta\ ValueAdded$) as the difference between the average value-added growth rate of industry i in country c five years after a crisis and the average growth rate five years before year t. The five-year data averages, which allow us to smooth the effect of potential outliers, are standard in the finance-growth literature (e.g., Levine, Loayza, and Beck, 2000; Beck and Levine, 2004). Using those five-year averages, we do not focus on the immediate effect of the bailout on avoiding sharp recessions following financial system distress, but rather on how real economic growth develops in the medium-term following the distress period. The advantage of this approach is that it also allows us to account for the potential negative effects arising from bailouts that are unlikely to be observed in the short run, such as moral hazard, as well as the diversion of credit to less productive destinations.[2] The main regressors of interest are the interactions between an industry's dependence on external finance ($FinanceDependency$) and the degree of liquidity ($Liquidity$) or fiscal support ($Fiscal$) to the banking system. These interaction terms allow us to identify the effects of monetary and fiscal bailouts on the growth rates of industries with different external finance needs.

If bailouts are associated with positive effects on real economic growth, we should expect the interaction coefficients related to fiscal bailouts (γ) and monetary bailouts (β) to be positive. We further add the initial share of an industry's value-added in total country-level manufacturing value-added as a control ($InitialShare_{i,c,t}$). The data sources and exact variable definitions are provided in Section 3.3. λ and μ are global industry-period-specific and country-period-specific fixed effects that control for the heterogeneity across countries and industries.[3] $Liquidity$, $Fiscal$ and $FinanceDependency$ are subsumed in μ and λ and, therefore, do not enter the regression individually. $\epsilon_{i,c,t}$ is residual growth of industry i in country c for crisis t. Both bailout measures, the initial industry shares, as well as the dependent variable are winsorized at the 1% and 99% levels, similar to Prasad, Rajan, and Subramanian (2007), who use the Rajan-Zingales methodology to identify the impact of cross-border capital flows on economic growth. Finally, we employ heteroskedasticity-robust standard errors throughout the paper, consistent with Kroszner, Laeven, and Klingebiel (2007).

3.2 Instruments

As mentioned above, exploring the link between bank bailouts and economic growth faces two major identification challenges. The first relates to identifying the causal effect of the state of financial institutions on real economic outcomes. To this end, we adopt the approach of Rajan and Zingales (1998)

[2] In Section 7, we re-estimate the model for shorter and longer time horizons ranging between one and ten years.

[3] Several countries experienced only one banking crisis. We are thus not able to include country-industry fixed effects in our analysis, as they would force us to drop these countries and focus only on countries with multiple crises.

that explores the cross-industry variation in external finance dependence to identify the role of credit supply for growth. The advantage of using industry-level data across countries is that they allow us to identify the transmission mechanisms through which bailouts affect growth. Specifically, as bank bailouts are likely to affect the real economy mainly via increases in bank lending, we examine whether industries that are more dependent on bank credit (those with higher financial dependence) benefit more from bailouts than other industries. This empirical approach thus identifies the growth differential of industries dependent on external finance relative to those less dependent on it. Therefore, it minimizes the risk of reverse causality because the industry growth differential is unlikely to affect country-level bank bailouts.

The second identification challenge reflects the potential endogeneity of bank bailouts' intensity. Specifically, policy makers are more likely to intervene substantially in the banking sector when a banking crisis is more severe. To achieve identification, the degree of policy intervention, therefore, has to be isolated from the severity of the shock to the banking system, which in turn is likely to depend on the intensity of real economic distress. Our strategy to disentangle the scope of bailouts from the intensity of banking distress is based on an instrumental variable approach that extracts the exogenous components of both monetary and fiscal bailouts. More specifically, we estimate a 2SLS regression using Stata's ivreghdfe command with a first-stage that uses the interaction between specific, exogenous instruments at the country level, discussed in detail below, and industry-level external finance dependency as predictors for the interactions between monetary and fiscal support, respectively, and external finance dependence.

The degree of monetary support is instrumented by the importance of inflation control in the objectives of the central bank. This is measured by the de-jure degree of central bank independence, as proposed by Garriga (2016), combined with the history of inflation (in the regressions we use the average inflation for the three years preceding the crisis). We expect that more independent central banks employ less intense monetary bailout operations when the ex-ante inflation rate is higher. This logic follows from the consideration that a central bank has less room for maneuver to support the financial system if it is bound to an inflation target, especially when ex-ante inflation already brings inflation close to or above the target.

In addition, we instrument fiscal bailouts by the political and economic orientation of the government. Our point of departure is the presumption that conservative governments are, as shown by Dam and Kötter (2012), ex-ante more likely to perform bank bailouts due to their perception that bank bailouts will reduce the hardship of enterprises and the risk of an economic downturn. Since the declared orientations can be noisy (Ward, Ezrow, and Dorussen, 2011; Schumacher, 2015), we do not employ a de-facto measurement of political orientation, such as partisanship, but rather proxies for the observable one. To this end, we lean on Bove, Efthyvoulou, and Navas (2017) and Kuokštytė, Kuokštis, and Miklaševskaja (2021), who argue that military expenditures are greater in countries under a conservative

administration. To strengthen identification, we combine the share of military spending with the share of rural population as an additional instrument for fiscal support. The choice of the latter instrument is motivated by Knoke and Henry (1977), who show that a higher rural population share typically coincides with a higher conservative voting share.

3.3 Data

In this section, we present the sources and descriptive statistics of the industry- and country-level data. Those for the bank-level data are presented in Section 6.

A. Country-Level Data

We obtain banking crisis data from Laeven and Valencia (2013a), who classify a banking crisis based on specific criteria, such as the existence of deposit freezes or bank nationalizations. The dataset spans the period 1970–2011 for 147 crises in 116 different countries. If a country experiences two banking crises during the sample period, we split the interval in between in two halves and define the first half as the post-crisis episode to crisis 1 and the second half as the pre-crisis episode to crisis 2. For instance, Argentina had banking crises in 1980 and 1989. We thus define the years 1980-1984 as the post-crisis episode to the first crisis and 1985-1989 as the pre-crisis episode to the second crisis. However, if those crises occur within five years, we drop the second crisis from the sample entirely. In addition to identifying the crisis dates, Laeven and Valencia (2013a) also provide estimates for the size of bailouts, i.e., liquidity support by the central bank and fiscal recapitalizations by the government. Liquidity support is calculated as the share of central bank claims on deposit money banks plus liquidity support from the Treasury relative to the sum of total deposits and foreign liabilities. Fiscal bailouts are defined as gross fiscal costs necessary to restructure the financial sector relative to GDP. The most important component in this category are recapitalization costs, as argued by Laeven and Valencia (2013a). Since Laeven and Valencia's data are missing the value of fiscal bailouts for 24 of the crises in the sample, we also present specifications that do not include fiscal support but instead utilize all available monetary support observations.

We draw data about the instrumental variables for the bailouts from two sources. The measure of central bank independence stems from Garriga (2016) and covers 182 countries for the 1970–2012 period. The data on military expenditures, the rural population shares, and historical inflation is drawn from the World Bank's World Development Indicators.

Table 1 reports the summary statistics and the pairwise correlations of the variables measuring the liquidity and fiscal support, as our two main policy intervention proxies, and the corresponding instrumental variables. Table A1 in the Appendix provides detailed information on each of the crises observations by

country and year. The largest liquidity support was provided in Ecuador in 1982, amounting to 100% of GDP. The highest fiscal costs with a value of 56.8% of GDP were accrued in Indonesia in 1997. Surprisingly, liquidity support and fiscal costs exhibit only a weak cross-country correlation, suggesting that political decision-makers often choose between the two kinds of policy responses. This low correlation also strengthens our argument that the focus only on fiscal support may be misleading when identifying the relation between bank bailouts and economic growth.

Table 1: Descriptive Statistics and Correlations at the Country Level

Panel A: Descriptive Statistics

	Source	Obs.	Mean	25^{th}	50^{th}	75^{th}
Liquidity	Laeven and Valencia (2013a)	76	14.55	3.85	7.70	16.60
Fiscal	Laeven and Valencia (2013a)	61	12.67	3.10	6.30	16.40
Inflation	World Development Indicators	69	29.53	3.55	8.64	20.57
Military	World Development Indicators	72	2.56	1.25	1.82	2.36
Rural	World Development Indicators	76	38.38	22.08	34.06	52.28
Independence	Garriga (2016)	75	0.54	0.39	0.54	0.74

Panel B: Correlations

	Liquidity	Fiscal	Inflation	Military	Rural	Independence
Liquidity	1.00					
Fiscal	0.09	1.00				
Inflation	0.22	-0.12	1.00			
Military	0.09	0.22	0.12	1.00		
Rural	-0.02	0.11	-0.09	-0.20	1.00	
Independence	-0.01	-0.18	-0.11	-0.21	-0.20	1.00

This table reports descriptive statistics of the two bailout measures and their pairwise correlations with their instrumental variables. **Liquidity** and **Fiscal** are central bank liquidity support and fiscal support are taken from Laeven and Valencia (2013a). The degree of central bank independence **(Independence)** is taken from Garriga (2016). **Inflation** is the average ex-ante inflation rate calculated over a three-year window based on data from the World Development Indicators (World Bank). **Military** and **Rural** are military expenditures over GDP and the percentage of rural population, using the same database.

B. Country-Industry-Level Data

We draw data on value-added in USD from the 2015 version of the INDSTAT2 ISIC Revision 3 database of the United Nations Industrial Development Organization (UNIDO). It contains 22 manufacturing industries at the three-digit International Standard Industrial Classification (ISIC) level for several countries. After merging the industry-level data with the previously presented country-level covariates, we are left with a sample of 76 crises in 65 different countries and up to 1,307 country-industry observations.

Our measure of industry-level external finance dependence is from Rajan and Zingales (1998). We follow their approach and employ US industry-level external finance dependence as a benchmark mainly because US financial markets are relatively unaffected by financial frictions. Therefore, observed cross-industry differences in external finance dependency are likely to be driven by technological features of industries, rather than potentially endogenous financial system frictions. Note that this choice also potentially has certain problems. Specifically, the choice would be problematic if industry structures in other countries were significantly different from those in the United States. Note, however, that the main identifying assumption underlying our and Rajan and Zingales (1998)'s analysis is not that industries have the same level of external finance dependence in different countries. Instead, identification is rather based on the assumption that the partial correlation of external finance dependence across industries is the same in the US as in other countries. For instance, if the chemical industry exhibits a higher external finance dependency than the tobacco industry in the US, it is presumed also to exhibit a higher external finance dependence in Argentina. Rajan and Zingales (1998) corroborate the validity of this assumption by using data based on the 1970s and on Canadian industries. Similarly, our results are materially unchanged when using a US external finance proxy calculated for the 1990s and 2000s, strengthening the argument that cross-industry differences in external finance dependency are stable over time (and likely across countries).

Table 2: Descriptive Statistics at the Industry Level

	ISIC	FinanceDependency
Food	15	0.14
Tobacco	16	-0.45
Textiles	17	0.40
Apparel	18	0.03
Leather	19	-0.14
Lumber	20	0.28
Paper	21	0.18
Printing	22	0.20
Petroleum	23	0.33
Chemicals	24	0.21
Rubber and Plastics	25	0.23
Stone	26	0.06
Primary Metals	27	0.09
Fabricated Metals	28	0.24
Machinery	29	0.45
Computing Machinery	30	1.06
Electrical Equipment	31	0.77
Communication Equipment	32	0.77
Instruments	33	0.96
Automobiles	34	0.39
Other Transportation Equipment	35	0.31
Furniture	36	0.47
Mean		0.32
Standard Deviation		0.34
Median		0.28
75^{th} percentile		0.45
25^{th} percentile		0.14

This table reports descriptive statistics of our industry benchmark, the external finance dependence **(FinanceDependency)** of 22 different industries. The data come from Rajan and Zingales (1998).

4 Empirical Results

4.1 Ordinary Least Squares (OLS) Results

In this section, we present the results by estimating model (1) via a standard OLS technique, ignoring the potential endogeneity of bailouts with respect to the intensity of distress. Our main identification technique here is the Rajan and Zingales' (1998) approach that allows us to identify supply-side effects of financial system distress on industry-level value-added dynamics. The estimated coefficient presented in column (1) of Table 3 indicates that liquidity support for banks leads to significantly higher value-added growth of industries relatively dependent on external finance, with a corresponding interaction that is statistically significant at the 10% level. In economic terms, the value-added growth differential between an industry at the 75th percentile of external finance dependence and an industry at the 25th percentile is 0.78% higher in a country with a monetary bailout intensity at the 75th percentile than in a country at the 25th percentile of the distribution. The magnitude is economically significant given a mean growth rate of -0.69% in our sample on average in the five post-crisis years relative to the five pre-crisis years. In contrast, as can be seen from column (2), fiscal support is not significantly associated with increased growth of external finance-dependent industries, as can be gauged from the low t-statistics of 0.17. In column (3), we include both interactions simultaneously. Still, the effects of monetary bank bailouts dominate those of fiscal ones, although the statistical significance lies slightly below the 10% level. It also becomes apparent that, in all specifications, the coefficient on the initial level of value added is negative and statistically significant at the 1% level. This negative coefficient is in line with the literature on growth convergence (e.g., Baumol, 1986) and indicates that industries with high value added tend to grow slower.

Table 3: Fiscal and liquidity support and industry-level value-added: OLS Results

	(1) Value Added	(2) Value Added	(3) Value Added
FinanceDependency × Liquidity	0.195*		0.199
	(1.88)		(1.44)
FinanceDependency × Fiscal		0.0264	-0.0310
		(0.17)	(-0.21)
InitialShare	-1.123***	-0.926***	-0.936***
	(-5.63)	(-4.20)	(-4.23)
Country-Year FE	yes	yes	yes
Industry-Year FE	yes	yes	yes
Observations	1331	1060	1032
Adjusted R^2	0.314	0.301	0.296

This table contains the OLS results. We regress industry-country-level value-added growth **(Value Added)**, calculated as the average of the five years after a banking crisis and the five years before it, on monetary **(Liquidity)** and fiscal **(Fiscal)** bank bailouts interacted with external finance dependence **(FinanceDependency)**. All regressions include industry-year and country-year fixed effects (coefficients not reported) and the initial share of industry value-added relative to total manufacturing value-added as additional regressors. The t-statistics are based on heteroskedasticity-robust standard errors and are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

4.2 Instrumental Variable Results

In this sub-section, we account for the fact that bank bailouts can be endogenous because they are likely to be positively related to the severity of distress in the financial system, which itself might depend on real economic outcomes. To overcome this endogeneity problem, we instrument the interactions between the potentially endogenous bailout measures and industry-level finance dependency by the interactions between the exogenous instruments, discussed in detail in subsection 3.3, and external finance dependency. We report the attendant results in Table 5. Focusing on liquidity support, column (1) gauges that monetary bank bailouts still raise the value-added growth of external finance-dependent industries disproportionately more. In terms of economic significance, the value-added growth differential between an industry at the 75th percentile of external finance dependence and an industry at the 25th percentile is 1.89% higher in a country with a monetary bailout intensity at the 75th percentile than in a country at the 25th percentile of the distribution. This estimated growth differential is more than twice as large as the corresponding OLS estimate. In column (2), we focus on fiscal bank bailouts and we find that the attendant coefficient estimate is again not statistically significant. Both results are similar once we include both fiscal and monetary bailouts simultaneously in one estimation (column (3)). Due to the result that fiscal bailouts only have an insignificant effect on value-added growth differentials across industries, we focus on liquidity support in the remaining instrumental variable specifications of this paper.

To motivate the statistical validity of the instruments employed above, we briefly discuss here several dimensions of their properties. We start with the instruments' strength by presenting in Table 4 the first-stage results. All coefficient estimates are consistent with our theoretical priors. That is, both military expenditures and the rural population share (each interacted with external finance dependence) have a positive impact on fiscal bank bailouts (interacted with external finance dependence). Further, central banks with binding inflation objectives are less inclined to support the financial system in case of distress.

We present the first-stage F-statistics and tests of overidentification restrictions in each of the tables that contain the second-stage estimates. Generally, throughout the paper, the first-stage F-statistics are almost always larger than the rule of thumb value of 10. The tests of overidentification restrictions confirm the validity of the instrumental variables in all specifications. Finally, we are confident that the exclusion restrictions hold and our instrument variable estimation are well-defined since the degree of central bank independence and the government's political orientation are exogenous with regard to real economic growth and the severity of the banking crisis.

Table 4: First Stage Statistics

	(1) FinanceDependency × Liquidity	(2) FinanceDependency × Fiscal
FinanceDependency × Inflation	1.024***	
	(6.36)	
FinanceDependency × Independence	13.23***	
	(3.21)	
FinanceDependency × Inflation × Independence	-1.744***	
	(-5.56)	
FinanceDependency × Military		1.010***
		(6.69)
FinanceDependency × Rural		0.191***
		(3.72)
InitialShare	0.0190	-0.00716
	(0.38)	(-0.17)
Country-Year FE	yes	
Industry-Year FE	yes	
Observations	1160	1012
Adjusted R^2	0.747	0.774

In this table, we present our first-stage estimates, regressing monetary **(Liquidity)** bank bailouts on de-jure the interaction of central bank independence **(Independence)** and the ex-ante three-year inflation average **(Inflation)**, and fiscal bailouts **(Fiscal)** on military expenditures over GDP **(Military)** and the percentage of rural population **(Rural)**. The t-statistics based on heteroskedasticity-robust standard errors are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

Table 5: Fiscal and liquidity support and industry-level value-added: IV Results

				Low Fiscal	High Fiscal
	(1)	(2)	(3)	(4)	(5)
	Value Added	Value Added	Value Added	Value Added	Value Added
FinanceDependency × Liquidity	0.472***		0.374***	0.0123	0.370***
	(2.77)		(2.97)	(0.03)	(2.83)
FinanceDependency × Fiscal		-0.802	-0.432		
		(-1.57)	(-0.99)		
InitialShare	-1.101***	-0.992***	-0.937***	-0.601	-0.930***
	(-5.12)	(-4.46)	(-4.07)	(-1.19)	(-3.54)
Country-Year FE	yes	yes	yes	yes	yes
Industry-Year FE	yes	yes	yes	yes	yes
Observations	1160	1012	904	174	697
Adjusted R^2	0.356	0.262	0.300	0.376	0.254
F(first-stage)	20.39	25.80	12.67	59.38	133.0
p(overidentification)	0.241	0.253	0.995	0.324	0.400

This table contains the IV results, regressing industry-country-level value-added growth **(Value Added)**, calculated as the average of the five years after a banking crisis and the five years before it, on the interaction between monetary **(Liquidity)** and fiscal **(Fiscal)** bank bailouts and industry-level external finance dependence **(FinanceDependency)**. All regressions include industry-year and country-year fixed effects (coefficients not reported) and the initial share of industry value-added relative to total manufacturing value-added as additional regressors. Monetary bailouts are instrumented by de-jure central bank independence, the ex-ante three-year inflation average and their interaction. Fiscal bailouts are instrumented by military expenditures over GDP and the rural population share. In column (4), we restrict the sample to those observations that have fiscal costs below a threshold of 3% of GDP. In column (5), we restrict the sample to those observations that have fiscal costs larger than 3% of GDP. The t-statistics are based on heteroskedasticity-robust standard errors and are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

4.3 The Interaction of Liquidity Support and Capital Injections

The results of the previous sub-section suggest that capital injections enacted during a banking crisis do not raise industry-level value-added growth. However, we have so far studied the "stand-alone" effect of capital injections ignoring the potential interactions between liquidity and fiscal support. As explained in Section 2, one potential argument favoring recapitalizations, put forward in the extant literature, is that they are necessary for liquidity injections to positively affect the real economy. For instance, Giannetti and Simonov (2013) show that recapitalizations induce banks to supply more loans to creditworthy firms. In contrast, if the recapitalization is insufficient and banks that receive liquidity support remain poorly capitalized, they are more likely to engage in zombie lending. Consistent with Diamond and Rajan (2001), this line of arguments indicates that insufficient recapitalizations can lead to evergreening in bank lending.[4]

This section explores this interaction between recapitalization and monetary support by testing our second hypothesis. More specifically, we examine whether only liquidity support accompanied by substantial recapitalizations leads to growth rate differentials between external finance-dependent and less dependent industries. To this end, we split our sample into crises where governments provide a capital injection higher than 3% of GDP, and those where fiscal support accounts for less than 3% of GDP. When choosing the threshold of 3% of GDP, which corresponds to the 25th percentile of fiscal bailouts in our sample, we lean on Laeven and Valencia (2013a), who define significant policy interventions in the banking system as such beyond the 3% mark. We then regress industry growth on the interaction between country-level liquidity support and industry-level external finance dependence for each sub-sample.[5] As can be seen from columns (4)-(5) of Table 5, the interaction between central bank liquidity support and industry-level external finance dependence is only positive and statistically significant when governments provide capital injections exceeding 3% of GDP. In contrast, when recapitalization volumes are small, liquidity support has no positive effect on industry growth. In unreported specifications, we also split the sample along the median of the distribution of capital injections (slightly more than 6% of GDP). In this case, the *Liquidity* interaction is also statistically significant in the sub-sample of low recapitalizations. We, therefore, conclude that only very low levels of capital injections are insufficient when it comes to unfolding the positive growth effects of liquidity support.

Overall, we demonstrate that the effectiveness of central bank liquidity injections depends on recapitalizations of the banking system. In other words, they are a necessary condition to establish the effectiveness of liquidity injections in terms of increasing the value-added growth rates of external finance-dependent

[4]See also Peek and Rosengren (2005), Niinimaki (2007), Caballero, Hoshi, and Kashyap (2008), Watanabe (2010) and Acharya et al. (2019).

[5]In unreported regressions, we also include a triple interaction between liquidity support, fiscal recapitalizations and external finance dependency. In this regression, however, the instruments do not meet the relevance condition, i.e., the first-stage F-statistic is clearly below 10, presumably because the instrument set becomes very large and does not properly predict some of the endogenous regressors.

industries disproportionately more than those of less dependent ones.

5 Additional Evidence and Sensitivity Analysis

In this section, we present the results of a battery of robustness checks. Specifically, we gauge the robustness of our results to dropping some industries, countries and time periods from the sample. We further employ other variants of the regressors, introduce additional country variables and interact those with external finance dependency, control for interactions with industry characteristics, and harmonize the sample across specifications. We report here the estimates with regard to the robustness of the results corresponding to column (2) of the baseline instrumental variable model (Table 5). In unreported tests, we achieve very similar results by estimating the robustness of the specification corresponding to column (3) of Table 5.

We start by recognizing that our results might differ depending on the state of economic development. For example, the real effects of bank bailouts might vary across different samples of countries because of the potentially different role that financial institutions play in developed relative to less developed economies. As the set of countries classified as developed economies varies widely across different classifications, we employ an income-based classification, where we focus on a poor vs rich countries' split. We define countries with per capita GDP (in 2010 USD) in the lowest two thirds of the in-sample distribution as poor, and all others as rich. The results, shown in column (1) and (2) of Table 6, illustrate that poorer countries drive our baseline results. In contrast, in rich economies, the effect of liquidity support is slightly negative, but not statistically different from zero, which is evidence that liquidity support is a more effective tool to countervail the adverse real economic effects of a financial crisis in low-income countries. In unreported tests, we further trace the difference between rich and poor countries and find (i) that rich countries have on average a larger financial system, as measured by credit over GDP, and (ii) that the growth differentials following liquidity support are again positive (yet estimated imprecisely) for rich economies with smaller (below median) financial systems. These findings are consistent with the so-called "Too Much Finance" literature of Arcand, Berkes, and Panizza (2015) in the sense that they suggest that the effect of liquidity support is exhausted in samples with large financial systems.

In a subsequent set of robustness tests, we drop observations during the global financial crisis of 2007-08 in order to ensure that our baseline results are not only driven by this particular episode, which accounts for about 20% of all observations in our sample. As can be seen from column (3), this concern is unwarranted. Monetary bailouts are still linked to higher value added growth of external finance-dependent industries. In column (4), we restrict the sample to crises before 1990 in order to show that our results are not only

driven by liquidity support provided during episodes of low monetary policy rates.[6] Again, our main results are unaffected. Finally, we drop some industries from the sample to gauge that our results are not driven by industries which are outliers in terms of external finance needs. In column (5), we drop ISIC codes 30-33, which are related to the new economy and have the highest external finance needs, and in column (6), we drop the tobacco industry (ISIC code 16)—the industry with the lowest external finance dependency in our sample. The attendant results show that the interaction between liquidity support and industry-level external finance dependence is positive in both cases, but statistically insignificant if we drop the tobacco industry.

Next, we address the potential concern that our results might be biased if the external finance dependence of industries has substantially changed over the last decades. So far, we employ throughout the paper the original industry-level external finance benchmark from Rajan and Zingales (1998), calculated over the period 1980-1989. To address this concern, we employ recent advances of the empirical literature to fine-tune the external finance dependencies according to the specific period we consider. Specifically, we use the original Rajan-Zingales benchmark only for observations prior to 1990. For observations during 1990-1999, we use the benchmark of Arcand, Berkes, and Panizza (2015), calculated for the 1990s. Finally, for all observations in the 2000s, we use the benchmark of Eppinger and Neugebauer (2017), which is based on exactly this period. The correlation between the 1980s measure and the 1990s measure is equal to 90%, and the one between the 1990s measure and the 2000s measure is equal to 78%. Because of these pronounced correlation coefficients, we do not expect the following results to be different from our baseline estimates. Column (1) of Table 7 contains the attendant results. Indeed, the interaction between bank bailouts and the time-varying industry-level external finance dependence is still positive and statistically significant at the 5% level.

In our sample, industries with higher external finance dependence are also more intensive in human capital and less intensive in physical capital, indicated by a pairwise correlation coefficient of 60% and -23%, respectively, among these variables. As the next step, we test whether the effect of bank bailouts on external finance-dependent industries is biased by this correlation between *FinanceDependency* and the additional industry characteristics. To this end, we add the interactions between bailouts and industry-level human and physical capital intensity to our baseline regression—benchmarks employed in Ciccone and Papaioannou (2009) and Erman and Kaat (2019), among others. The results of column (2) show that the correlation between *FinanceDependency* and the additional industry-level characteristics does not distort our baseline estimates. The effect of the interaction between bailouts and external finance dependence changes little in size and statistical significance relative to the estimates presented in Table 5. Further, none of the additional interaction terms is statistically significant at conventional significance levels. Thus, especially the degree of external finance dependency determines industries' sensitivity to

[6]For instance, while the annual effective federal funds rate was chiefly above 5% before 1990, it was close to or even below this level post-1990 in most years.

monetary bank bailouts.

Next, we explore whether our results are robust to controlling for the interaction of industry-level external financing needs with other country-level variables that are, potentially, correlated with bailouts and likely to affect industry growth. This exercise is important in order to rule out the possibility that our baseline results are biased by the correlation between bailouts and the respective macroeconomic covariate. Specifically, we augment our baseline model with the corresponding interactions of per capita GDP (in logs), the size of the financial sector relative to GDP and the share of trade relative to GDP as a measure of external openness. In all of the regressions of columns (3)-(5), the main interaction between external finance dependence and bailouts remains positive and statistically significant, suggesting that the correlation does not bias the previous results. In contrast, none of the additional interaction terms is statistically significant.

We continue replacing liquidity support by the residual of a Taylor rule-like regression of liquidity support (i.e., central bank claims vis-a-vis the banking sector scaled by deposits and foreign liabilities) on GDP growth and inflation.[7] The data stem from the International Financial Statistics and cover the 1965-2018 period.[8] This exercise is important to circumvent any criticism that our baseline results only measure the bank lending channel of monetary policy, which has already been established in the literature. As can be seen from column (6), the residuals of the auxiliary regression are still significantly related to higher growth of external finance-dependent industries. This result indicates that the previously documented effect of liquidity support is not simply reflecting well-established facts about the real effects of monetary policy. Instead, our results show that the increase in central bank liquidity injections that exceeds the one predicted by the classical Taylor rule helps stabilize real economic outcomes around a banking crisis.

In a final set of robustness checks, whose results are reported in Table 8, we harmonize the sample across the different specifications of columns (1)-(3) in Table 5 in order to show that the differences between fiscal and liquidity support are not driven by the different number of observations and the slightly different coverage of the corresponding samples, which is driven by the fact that not all countries report data on both fiscal and liquidity support. Again, this concern is unwarranted. The coefficients are similar to our baseline estimates in terms of size and statistical significance.

[7] We define the residuals as the peak value during the respective banking crisis.

[8] Note that not all countries are covered by the International Financial Statistics throughout the whole episode.

Table 6: Robustness (1)

	Low GDP	High GDP	No GFC	$year < 1990$	No Computer Industry	No Tobacco Industry
	(1)	(2)	(3)	(4)	(5)	(6)
	Value Added	Value Added	Value Added	Value Added	Value Added	Value Added
FinanceDependency × Liquidity	0.391**	-0.160	0.440**	0.454***	0.650***	0.274
	(2.09)	(-0.44)	(2.50)	(2.65)	(2.88)	(1.24)
InitialShare	-1.458***	-0.364	-1.334***	-1.500***	-1.064***	-1.069***
	(-5.88)	(-1.15)	(-6.35)	(-3.51)	(-4.61)	(-4.90)
Country-Year FE	yes	yes	yes	yes	yes	yes
Industry-Year FE	yes	yes	yes	yes	yes	yes
Observations	489	555	761	284	1012	1115
Adjusted R^2	0.275	0.407	0.344	0.339	0.413	0.378
F(first-stage)	15.47	39.69	21.88	78.59	19.27	19.01
p(overidentification)	0.187	0.342	0.182	0.382	0.274	0.564

In this table, we perform several robustness checks. Specifically, we regress industry-country-level value-added growth **(Value Added)**, calculated as the average of the five years after a banking crisis and the five years before it, on the interaction between monetary **(Liquidity)** bank bailouts and industry-level external finance dependence **(FinanceDependency)**. In columns (1) and (2), we restrict to the sample to counties with above and below median values of GDP, respectively. In column (3), we exclude observations that refer to the 2007-09 global financial crisis. In column (4), we reduce the sample to crises that happened before the year 1999, while in columns (4) and (5) we drop observations that belong to the computer and tobacco industry, respectively. All regressions include industry-year and country-year fixed effects (coefficients not reported) and the initial share of industry value-added relative to total manufacturing value-added as additional regressors. Monetary bailouts are instrumented by de-jure central bank independence, the ex-ante three-year inflation average and their interaction. Fiscal bailouts are instrumented by military expenditures over GDP and the rural population share. The t-statistics are based on heteroskedasticity-robust standard errors and are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

Table 7: Robustness (2)

	(1) Value Added	(2) Value Added	(3) Value Added	(4) Value Added	(5) Value Added	(6) Value Added
FinanceDependency × Liquidity		0.617***	0.384**	0.497**	0.515***	
		(2.64)	(2.23)	(2.48)	(2.78)	
FinanceDependency2 × Liquidity	0.565**					
	(2.53)					
HumanCapital × Liquidity		-0.704				
		(-1.40)				
PhisicalCapital × Liquidity		0.0488				
		(0.79)				
FinanceDependency × Trade				-0.00298		
				(-0.06)		
FinanceDependency × Finance					0.0384	
					(0.82)	
FinanceDependency × GDP			2.595			
			(1.08)			
FinanceDependency × LiquidityResidual						0.273**
						(2.46)
InitialShare	-1.103***	-1.109***	-1.143***	-1.095***	-1.109***	-1.190***
	(-5.07)	(-5.16)	(-5.13)	(-4.96)	(-5.02)	(-4.67)
Country-Year FE	yes	yes	yes	yes	yes	yes
Industry-Year FE	yes	yes	yes	yes	yes	yes
Observations	1160	1141	1109	1126	1126	830
Adjusted R^2	0.259	0.363	0.337	0.326	0.326	0.325
F(first-stage)	7.689	11.99	15.61	14.00	14.96	516.9
p(overidentification)	0.317	0.243	0.334	0.250	0.197	0.261

In this table, we perform several robustness checks. Specifically, we regress industry-country-level value-added growth **(Value Added)**, calculated as the average of the five years after a banking crisis and the five years before it, on the interaction between monetary **(Liquidity)** bank bailouts and industry-level external finance dependence **(FinanceDependency)**. In column (1), we employ a time-varying measure of external finance dependence **(FinanceDependency2)**. Column (2) adds the interactions between bailouts and industry-level human **(HumanCapital)** and physical **(PhysicalCapital)** capital intensity to our baseline regression. In columns (3)-(5), we control for the interaction of industry-level external financing needs with other country-level variables, i.e., per capita GDP, the size of the financial sector relative to GDP **(Finance)**, and the share of trade relative to GDP **(Trade)**. Column (6) replaces *Liquidity* with the residual of a Taylor rule-like regression of Liquidity **(LiquidityResidual)** on GDP growth and inflation. All regressions include industry-year and country-year fixed effects (coefficients not reported) and the initial share of industry value-added relative to total manufacturing value-added as additional regressors. Monetary bailouts are instrumented by de-jure central bank independence, the ex-ante three-year inflation average and their interaction. Fiscal bailouts are instrumented by military expenditures over GDP and the rural population share. The t-statistics are based on heteroskedasticity-robust standard errors and are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

Table 8: Robustness (3)

	(1) Value Added	(2) Value Added	(3) Value Added
FinanceDependency × Liquidity	0.388***		0.374***
	(3.15)		(2.97)
FinanceDependency × Fiscal		-0.691	-0.432
		(-1.40)	(-0.99)
InitialShare	-0.927***	-0.905***	-0.937***
	(-3.97)	(-3.96)	(-4.07)
Country-Year FE	yes	yes	yes
Industry-Year FE	yes	yes	yes
Observations	904	904	904
Adjusted R^2	0.307	0.280	0.300
F(first-stage)	56.77	25.57	12.67
p(overidentification)	0.950	0.385	0.995

In this table, we perform several robustness checks. Specifically, we regress industry-country-level value-added growth **(Value Added)**, calculated as the average of the five years after a banking crisis and the five years before it, on the interaction between monetary **(Liquidity)** bank bailouts and industry-level external finance dependence **(FinanceDependency)**. All regressions are based on a harmonized sample with the same number of observations. Monetary bailouts are instrumented by de-jure central bank independence, the ex-ante three-year inflation average, and their interaction. Fiscal bailouts are instrumented by military expenditures over GDP and the rural population share. The t-statistics are based on heteroskedasticity-robust standard errors and are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

6 Bank Capital, Recapitalizations, and Lending

In this section, we explore the channels behind the documented impact of bailout interventions on industry-level growth. In particular, we employ bank-level data to examine the dynamics of bank lending behavior around bailouts as a mechanism transmitting the impact of fiscal and monetary bailouts to aggregate economic outcomes. As formulated in our third hypothesis, we conjecture that liquidity support allows the expansion of growth-inducing credit at the bank level, but mostly when banks have the capital capacity to proceed with this expansion without breaching capital regulations.

To trace this argument empirically, we employ bank-level data from Bureau van Dijk's Bankscope database at annual frequency, covering bank balance sheet data for the period 1995-2017. We restrict the analysis to commercial, savings, and cooperative banks, thus excluding, for instance, central banks and governmental institutions. Further, we only include unconsolidated balance sheet data (consolidation codes U1 and U2 in Bankscope) in order to ensure that our results are not affected by consolidation with bank subsidiaries from abroad, which are not subject to the corresponding banking crisis and bailouts. Also, for banks located in countries where the fiscal year ends in the first half of the following calendar year, we attribute the report to the previous year.

Using these bank-level data, we estimate a regression of the following form:

$$\Delta\, Y_{b,c,t} = \alpha_t + \omega\; X_{b,c,t} + \beta\; Liquidity_{c,t} + \gamma\; Fiscal_{c,t} + \epsilon_{b,c,t}. \tag{2}$$

Y contains the bank-level logarithm of the volume of loans (in USD) and the share of loan loss provisions over net interest income, where the latter should, in principle, measure banks' adjustments in their reserves to take into account expected future losses on their credit portfolio (see Ahmed, Takeda, and Thomas (1999) and the literature cited therein).[9] The dependent variable is then calculated as the difference in the average of the respective variable in the five years after a banking crisis relative to the five pre-crisis years. As with the industry-level analysis, the intuition behind taking the difference of the mid-term averages around the bailout event is to abstract from short-term cyclical fluctuations and focus on the time horizon used in the industry-level analysis. While the change in loan volumes as a dependent variable illuminates the credit dynamics around a banking crisis contingent on the intensity of the bailouts, the change in loan loss provisions provides us with insights about the types of loans that banks provide. Generally, higher loan loss provisions suggest a higher risk of the loan. Still, they also reflect a more transparent accounting policy with regard to the riskiness of the loans, which is likely to be related to the ability of banks to provide growth-inducing credit to innovative projects, rather than evergreening pre-crisis loans. As before, the main regressors are monetary and fiscal bailouts. We also

[9] Bankscope does not provide bank data prior to 1995.

add GDP per capita, real GDP growth, and the inflation rate as additional macro controls, as well as the capital-to-asset ratio, total assets, and returns on assets as additional bank covariates. Finally, we saturate the regressions with year fixed effects to control for time-specific global factors affecting banks. We cannot include bank fixed effects as most countries had only one banking crisis, so we only have one observation for each bank in most circumstances.

Table 9: Descriptive Statistics and Correlations at the Bank Level

Panel A: Descriptive Statistics

	Obs.	Mean	25^{th}	50^{th}	75^{th}
Loans	3470	0.31	0.08	0.23	0.46
LLP	3334	-2.46	-16.95	-5.99	5.52
Profitability	3470	0.34	0.11	0.24	0.62
Capital	3470	10.17	5.18	7.04	11.17
Size	3470	10588.59	178.14	533.71	1836.98

Panel B: Correlations

	Loans	LLP	Profitability	Capital	Size
Loans	1.00				
LLP	0.01	1.00			
Profitability	0.07	0.02	1.00		
Capital	0.08	0.02	0.39	1.00	
Size	-0.04	0.03	-0.01	-0.07	1.00

This table reports descriptive statistics of the bank-level variables. **LOANS** and **LLP** are the changes in the logarithm of total loans and loan loss provision in the five post-crisis years relative to the five pre-crisis years. **PROFITABILITY** is the return on assets, **CAPITAL** is the capital-to-asset ratio and **SIZE** is measured by total assets in the year of the crisis.

As can be seen from Table 9, which presents the summary statistics for the variables employed in the bank-level analysis, our bank-level data set contains up to 3470 bank-crisis observations. The dependent variables have average values of 0.31% and -2.46%, respectively, showing that, around a banking crisis, credit growth is quite low and loan loss provisions decrease. Regarding the bank-level covariates, Table 9 shows that the median bank in our sample has a capital-to-asset ratio of 7.0%, a return on assets of 0.2%, and total assets of 534 million USD.

The estimation approach in this section differs somehow from the one we use at the aggregate level. To start with, for obvious reasons, we cannot employ the Rajan and Zingales (1998) identification approach. Also, the reverse causality concern described at the aggregate level does not exist in the bank-level analysis where bank-level loan dynamics are unlikely to affect the aggregate severity of a banking crisis and thus the intensity of the bailout. We, therefore, estimate the model using standard OLS.

Identification can still be challenged by unobservable features (e.g., those related to an adverse state

of the banking system or the real economy), which affect both lending dynamics and the intensity of the bailouts. To address these concerns, in unreported tests, we have replicated model (2) using the same instruments as in the aggregate specifications. At the bank level, however, these do not pass the test of overidentification restrictions. To overcome this issue, we have used an instrumental variable scheme that is not subject to overidentification since it has used only one instrument per variable (the central bank independence measure for liquidity support and military expenditures for fiscal support). This identification scheme has generated similar results to the OLS specification presented here, which is consistent with our presumption that the endogeneity concerns are less pronounced at the bank level. Table 10 contains the attendant OLS results and shows that central bank liquidity injections are associated with an increase in bank-level credit growth. This result implies that monetary bank bailouts reduce the credit constraints of the real economy and, consequently, are likely to increase the value-added growth of industries most dependent on external finance. In contrast, fiscal bailouts are associated with a decrease in credit volumes, as can be seen from the t-statistic of -3.19 in column (1). This negative coefficient can provide one explanation of why fiscal bailouts do not raise the value-added growth rates of external finance-dependent industries, as seen in subsection 4.1 and subsection 4.2. Column (2) further shows that both bailout measures are associated with a significant increase in banks' loan loss provisions, suggesting that both bailout measures induce banks to shift credit supply towards loans with higher recognized risk. These results are also robust to dropping the largest 5% of banks from the sample, which have a high probability of being multinational and thus are likely to have access to funds in other countries which are not subject to a financial crisis and bailout measures. The results, which are not reported here but are available upon request, are unaffected.

Following the approach of subsection 4.3, we next inspect the interaction between liquidity support and recapitalizations. To this end, we split the sample again into two sub-samples—one with a capital injection relative to GDP below, and one above, the threshold of 3%, which is the threshold used by Laeven and Valencia (2013a) to define whether a fiscal policy intervention in the banking system is significant or not. For each sub-sample, we then regress credit growth and loan loss provisions on the intensity of central banks' liquidity injections. As is apparent from columns (3) and (5), liquidity support always positively impacts banks' credit volumes. Yet, columns (4) and (6) indicate that central bank support raises banks' loan loss provisions only when the government injects capital into the banking system. We interpret this result as bank-level evidence that recapitalized banks are more likely to provide loans with higher loan loss provisions. This is not surprising since banks need sufficient capitalization levels in order to back these loans with the required regulatory capital. Also, economic growth is likely to be generated by loans with reasonable risk levels that are transparently reflected in bank balance sheets, rather than by loans with very low perceived risk (e.g., mortgages or loans to public institutions). Loans with risks that are not transparently reflected in the balance sheet (e.g., evergreening loans) are also unlikely to

generate economic growth, so our result here is consistent with the corresponding aggregate result reported in subsection 4.3. In contrast, central bank liquidity support in the absence of capital injections only leads to higher credit volumes, with no effect on loan loss provisions. This result is in line with Giannetti and Simonov (2013), in the sense that it suggests that loans are rolled over to less productive (zombie) firms, so that firm insolvency rates stay constant and banks do not need to raise their reserves for loan losses. It could also suggest that banks, due to the lack of recapitalizations, can only afford loans with lower risk weights, which absorb less capital capacity. Taken together, these bank-level results thus point to a potential mechanism for the positive interaction between capital injections and central bank liquidity support in terms of raising industry-level value-added growth.

To further explore this conjecture, we also provide an additional set of tests where we split the bank sample according to ex-ante bank-level capitalization levels. We distinguish between low- and well-capitalized banks. The first group includes banks with capital levels below the median in the corresponding country-year pair and the second group includes all banks with above-median capital levels. The results reported in Table 11 are consistent with those using a split along the intensity of country-level fiscal recapitalization measures. They suggest again that well-capitalized banks extend lending characterized by higher perceived risk, as reflected in LLPs. This additional exercise further highlights that liquidity support helps restore bank lending, but a positive growth effect is likely to be achieved when banks are sufficiently capitalized.

Table 10: Bailouts and Bank Lending: Main Results

	(1) Loans	(2) LLP	(3) Low Fiscal Loans	(4) Low Fiscal LLP	(5) High Fiscal Loans	(6) High Fiscal LLP
Liquidity	0.0210***	1.002**	0.0343***	0.520	0.00587*	1.949***
	(8.03)	(2.45)	(9.44)	(0.99)	(1.82)	(3.81)
Fiscal	-0.0107***	2.827**				
	(-3.19)	(2.15)				
Year FE	yes	yes	yes	yes	yes	yes
Bank Controls	yes	yes	yes	yes	yes	yes
Macro Controls	yes	yes	yes	yes	yes	yes
Observations	3470	3343	2734	2672	736	671
Adjusted R^2	0.110	0.100	0.155	0.105	0.058	0.066

In this table, we regress bank-level credit growth (**Loans**) and the change in the share of loan loss provisions over net interest income (**LLP**), calculated as the average of the five years after a banking crisis and the five years before it, on fiscal bailouts (**Fiscal**) and monetary bailouts **(Liquidity**). We also add year fixed effects to all regressions, as well as several bank (returns on assets, total assets, capital-to-asset ratio) and macroeconomic controls (GDP growth, GDP per capita, inflation), measured in the year of the crisis. In columns (3)-(4), we restrict the sample to those observations that have fiscal costs below 3% of GDP. In columns (5)-(6), we restrict the sample to those observations that have fiscal costs larger than 3% of GDP. The t-statistics based on heteroskedasticity-robust standard errors are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

Table 11: Bailouts and Bank Lending: The Role of Capitalization

	Low Capital	Low Capital	High Capital	High Capital
	(1)	(2)	(3)	(4)
	Loans	LLP	Loans	LLP
Liquidity	0.0225***	0.173	0.0212***	0.815***
	(6.25)	(0.22)	(4.92)	(2.74)
Fiscal	-0.0124**	4.697**	-0.0104**	1.984***
	(-2.35)	(2.37)	(-2.13)	(4.27)
Year FE	yes	yes	yes	yes
Bank Controls	yes	yes	yes	yes
Macro Controls	yes	yes	yes	yes
Observations	1769	1706	1699	1636
Adjusted R^2	0.148	0.182	0.079	0.082

In this table, we regress bank-level credit growth (**Loans**) and the change in the share of loan loss provisions over net interest income (**LLP**), calculated as the average of the five years after a banking crisis and the five years before it, on fiscal bailouts (**Fiscal**) and monetary bailouts **(Liquidity**). We also add year fixed effects to all regressions, as well as several bank (returns on assets, total assets, capital-to-asset ratio) and macroeconomic controls (GDP growth, GDP per capita, inflation), measured in the year of the crisis. In columns (1)-(2), we restrict the sample to poorly capitalized banks in the lowest 50% of the annual, country-specific bank capital-to-asset distribution. In columns (3)-(4), we restrict the sample to well-capitalized banks in the top 50% of the same distribution. The t-statistics based on heteroskedasticity-robust standard errors are reported in parentheses below the coefficients. * p<0.10, ** p<0.05, *** p<0.01.

7 Is the Effect of Bailouts Short- or Long-Term?

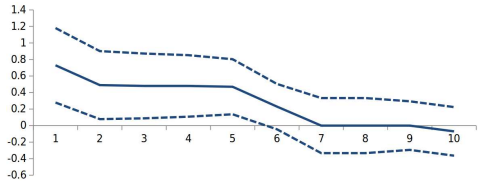
In this section, we examine whether the effects of bank bailouts vary across different time horizons. Identifying the time-varying implications of bank bailouts is essential for policy makers, as it provides information on how quickly and for how long bailouts affect the real economy. As mentioned in Section 2, this exercise also shows whether some potential adverse effects driven by the materialization of moral hazard concerns overturn the short-run positive growth impulses of liquidity support in the longer term. To this end, we test Hypothesis 4 by replicating the industry-level analysis of Table 5, columns (1), (2), (4) and (5), by calculating the dependent variable, industry-level value-added growth, over a one-year to ten-year horizon. For instance, for the ten-year horizon, we subtract the average growth in value added in the ten years before the financial crisis from the average growth in value added in the ten years after the crisis. For ease of presentation, the attendant results are presented in Figure 1, rather than in a table.

The northwest panel shows the coefficient estimate on the interaction between country-level monetary bailouts and industry-level external finance dependence, and its 95% confidence interval, for the respective time horizon; the northeast panel shows the same estimates for the interaction between fiscal support and external finance dependence. It becomes obvious that monetary bank bailouts affect industry growth primarily, but not only, in the short run. Only after six years, the effect of central bank bailouts becomes statistically insignificant. Specifically, whereas the interaction coefficient is equal to 0.73 in the first year after the financial crisis, it drops to 0.47 in the fifth year (our benchmark case) and to almost 0 in the seventh year. The corresponding estimates for fiscal bailouts are insignificant throughout.

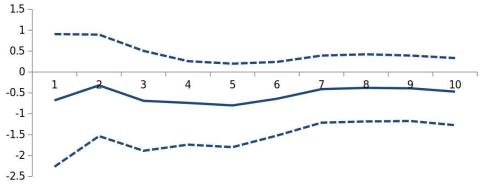
For consistency with subsection 4.3, we also provide results contingent on the intensity of fiscal support. While the southwest panel shows the estimates for the interaction between monetary bailouts and external finance dependency when fiscal support is smaller than 3% of GDP, the southeast panel shows the same estimates when monetary bailouts are complemented by significant recapitalization of the banking sector of at least 3%. As in subsection 4.3, the impact of monetary bailouts is only positive and statistically significant, at least during the first six years after a banking crisis, when they are combined with fiscal ones.

Overall, the evidence presented in this section involves two important implications for policy makers. First, central bank liquidity support during a financial crisis is an effective and prompt tool to boost the real economy. Second, the positive impact of bailouts persists for several years and is not only restricted to the years immediately after the crisis.

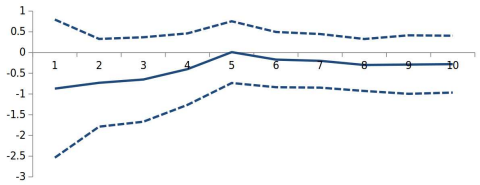
Figure 1: Short-Term vs Long-Term effect of Liquidity Support



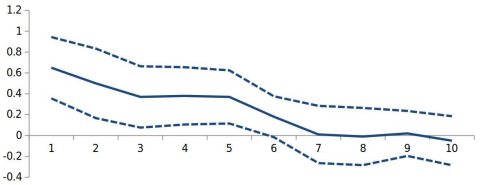
Full sample, effect of monetary bailouts



Full sample, effect of fiscal bailouts



Fiscal<3%, effect of monetary bailouts



Fiscal≥3%, effect of monetary bailouts

This chart depicts the coefficient estimates and 95% confidence intervals for the interaction between country-level monetary bank bailouts or fiscal bank bailouts, respectively, and industry-level external finance dependence, resulting from a regression of industry-country-level value-added growth **(Value Added)**, calculated as the average of the x years after a banking crisis and the x years before it (where x is between 1 and 10), on the interaction between monetary **(Liquidity)** and fiscal **(Fiscal)** bank bailouts and industry-level external finance dependence **(FinanceDependency)**. All regressions include industry-year and country-year fixed effects and the initial share of industry value-added relative to total manufacturing value-added as additional regressors. Monetary bailouts are instrumented by de-jure central bank independence, the ex-ante three-year inflation average, and their interaction. Fiscal bailouts are instrumented by military expenditures over GDP and the rural population share. The southwest panel restricts the sample to crises with a fiscal bailout smaller than 3% and the southeast panel to crises with a fiscal bailout larger than 3%.

8 Conclusion

In this paper, we provide new evidence on the real economic effects of bank bailouts. We adopt a broader view of bailout interventions by analyzing fiscal support measures (recapitalizations by the government) and liquidity interventions provided by central banks. We achieve identification by addressing both the issue of reverse causality and the endogeneity of the bailout measures with respect to the severity of banking system distress. Specifically, we use industry-country level data and the Rajan and Zingales (1998) identification approach, based on differences in industry-level reliance on external finance, to rule out reverse causality. We further use instrumental variables in order to identify the exogenous component of the intensity of bank bailouts with respect to the severity of a banking crisis.

Our results indicate that liquidity support raises the value-added growth rates of external finance dependent industries significantly more than those of less dependent ones. While the corresponding effect of fiscal support per se is not statistically significant, we find that the positive effect of central bank liquidity support is driven by crises where fiscal recapitalizations of the banking system accompany central bank liquidity. Employing bank-level data, we provide evidence that this is the case because better-capitalized banks and banks in systems with a significant bank recapitalization are more likely to supply loans with recognized credit risk. We presume that these are the loans that are associated with positive growth at the aggregate level. We further show that the effect of liquidity support is quite long-lasting. Even though its magnitude deteriorates over time, it is still positive and statistically significant five to six years after the intervention.

In sum, our results indicate that bank bailouts can play a positive role in smoothing real economic outcomes around times of banking system distress, but the design of the bailouts is essential. Specifically, the most effective way to countervail the macroeconomic consequences of banking crises is a combination of central bank liquidity support and government recapitalizations of the banking sector.

9 Appendix

Table A1: Crisis observations (country and year), covariates and instruments

Country	Year	Liquidity	Fiscal	Inflation	Military	Rural	Independence
Argentina	1989	100	6	188.1	1.9	13.4	.4
Argentina	1995	63	2		1.5	11.8	.8
Austria	2008	7.7	4.9	2	.9	34.2	.8
Bangladesh	1987	2.8			1.2	81.6	.4
Belgium	2008	14.1	6	2.1	1.2	2.5	.8
Bolivia	1994	12.9	6	14	2.3	41.2	.4
Brazil	1994	17.6	13.2		2	23.1	.2
Bulgaria	1996	9.9	14	77	2.1	32	.5
Cameroon	1995	6.2		10.6	1.3	57.4	.6
Central African Republic	1976	10.5				67.4	.6
Chile	1976	23.6		410.8	5.8	21	.5
Chile	1981	52.7	42.9		6.6	18.2	.5
China	1998	7.2	18	9.3	1.7	66.1	.6
Colombia	1982	7.7	5	26.2	1.7	36.5	.2
Colombia	1998	4.3	6.3	20.1	3.4	28.5	.7
Costa Rica	1987	6.1		12.9		52.7	.5
Costa Rica	1994	6.3		20.1	0	46.3	.5
Cote d'Ivoire	1988	22.5	25	6.2	1.2	61.4	.8
Croatia	1998	3.1	6.9	4.2	5.6	44.7	.4
Czechia	1996	4.2	6.8		1.7	25.5	.7
Denmark	2008	11.4	3.1	1.8	1.4	13.5	.5
Ecuador	1982	100		13.2	1.1	51.2	
Ecuador	1998	22.5	21.7	26	2	40.7	.8
Egypt, Arab Rep.	1980	22.7		11.2	5.8	56.1	.4
Finland	1991	5.5	12.8	5.9	1.7	20.2	.3
France	2008	7.4	1	1.6	2.3	22.1	.8
Germany	2008	3.6	1.8	1.8	1.3	26.1	.8
Ghana	1982	.2	6	73.7	.5	68.4	.3
Greece	2008	42.3	27.3	3.2	3	24.4	.8
Hungary	1991	4.6	10	20.6	2.1	34.3	.7
Hungary	2008	1.3	2.7	5.1	1.2	32.1	.8
Iceland	2008	16.8	44.2	5.2		6.6	.7
Indonesia	1997	17.2	56.8	8.6	1.5	61.6	.3
Ireland	2008	16.3	40.7	3.8	.6	38.7	.8
Israel	1977	16.5	30	36.8	23.1	12.5	.4
Italy	2008	5.7	.3	2	1.7	31.9	.8
Jamaica	1996	.3	43.9	25.7	.6	49.1	.4
Japan	1997	1.6	14	.2	.9	21.7	.5
Jordan	1989	16.1	10	2.1	9.1	27.9	.5
Kenya	1992	24.3		17.2	1.9	82.7	.4
Kuwait	1982	2.9		7.1	6	3.6	.4
Latvia	1995	5.5	3	129.3	.8	31.3	.6
Latvia	2008	3.4	5.6	7.8	1.6	32.2	.8
Luxembourg	2008	4.1	7.7	2.5	.4	12.2	.8
Malaysia	1997	8.8	16.4	3.6	2.1	41.8	.4
Mexico	1994	15.8	19.3	16	.5	27	.7
Mongolia	2008	9.4	4.2	9	1.2	34.4	.6
Morocco	1980	8.6		10.2	5.1	58.8	.1
Nepal	1988	3.8			1.1	91.8	.2
Netherlands	2008	3.7	12.7	1.5	1.3	14.6	.8
Norway	1991	4.2	2.7	5.1	2.7	27.7	.2
Panama	1988	3.2	12.9	.7	1.7	46.8	.3
Peru	1983	9.7		66.3	5.3	34	.4
Philippines	1983	1.5	3	13.8	2.4	59.2	.5
Philippines	1997	.7	13.2	8.2	1.9	51.8	.7
Poland	1992	8.7	3.5	292.2	2	38.6	.6
Portugal	2008	16.7	0	2.6	1.8	40.6	.8
Republic of Korea	1997	11.9	31.2	5.2	2.7	21.1	.4
Russian Federation	1998	21.1	.1	86.7	2.9	26.6	.5
Russian Federation	2008	23.9	2.3	10.5	3.4	26.4	.6
Senegal	1988	6.6	17	5	2.1	61.4	.8
Slovak Republic	1998	4.8		7.3	1.7	43.6	.6
Slovenia	2008	9.6	3.6	2.9	1.5	49.8	.8
Spain	1977	3.5	5.6	16.8	2.1	29.1	.1
Spain	2008	6.4	3.8	3.2	1.4	22	.8
Sri Lanka	1989	2	5	9.9	1.8	81.4	.6
Sweden	1991	.2	3.6	7.6	2.3	16.8	.3
Sweden	2008	13	.7	1.3	1.2	15.3	.3
Switzerland	2008	3	1.1	1	.7	26.4	.7
Tanzania	1987	97.6	10	34		82.3	.4
Thailand	1997	4.4	43.8	5.6	2.2	69.4	.1
Tunisia	1991	15.1	3	7.2	2	41.2	.4
Turkey	1982	29.3	2.5	68.5	4.3	53	.6
Uganda	1994	3.9		27.2	2.3	88.4	.5
Uruguay	1981	18.5	31.2	58.3	6.4	14.2	.1
Venezuela (Bolivarian Republic of)	1994	1.6	15	34.6	1.6	14.1	.6

In this table, we present all combinations of country and crisis that are in our final dataset, i.e. crisis observations that also have industry related data. Column(1) contains the Worldbank country name. **Liquidity** (column (2)) and **Fiscal** (Column (3)) are central bank liquidity support and fiscal support are taken from Laeven and Valencia (2013a). **Inflation** (column (4)) is the average ex-ante inflation rate calculated over a three-year window based on data from the World Development Indicators (World Bank). **Military** (column (5)) and **Rural** (column (6)) are military expenditures over GDP and the percentage of rural population, using the same database. The degree of central bank independence **(Independence)** (column (7)) is taken from Garriga (2016). Column (8) refers to the crisis year.

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