The Real Effects of Financial Sector Interventions During Crises

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March 19, 2012

Abstract: We collect new data to assess the importance of supply-side credit market frictions by studying the impact of financial sector recapitalization on the growth of firms in a large cross-section of 50 countries during the recent crisis. We develop an identification strategy that uses the financial crisis as a shock to credit supply and exploits exogenous variation in the degree to which firms depend on external financing for investment needs, and focus on policy interventions aimed at alleviating the bank capital crunch. We find that the growth of firms dependent on external financing is disproportionately positively affected by bank recapitalization policies, and that this effect is quantitatively important and robust to controlling for other financial sector support policies. We also find that fiscal policy disproportionately boosted the growth of firms more dependent on external financing. These results provide new evidence of a quantitatively important role of credit market frictions in influencing real economic activity.

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1. Introduction

Three decades ago, skepticism in the economics profession about the relevance of financial factors for real economic activity prevailed. This view stemmed from the implications of Modigliani and Miller (1958) that, in frictionless markets, a firm's cost of capital is independent from its financial structure. Since then, most economists have accepted that the presence of information asymmetries and bankruptcy risk imply that financial factors matter for real economic decisions.

Most of the debate is now centered on the quantitative importance of these frictions and the channels through which they operate. The recent global financial crisis, and the global deleveraging process that ensued, offers perhaps the most convincing evidence to date of the economic relevance of financial frictions and their real effects.

This paper contributes to the literature on financial frictions and their macroeconomic importance. In particular, we focus on supply-side credit market frictions and look at the real effects of financial sector recapitalization policies implemented by various countries during the height of the crisis. In pursuing this analysis, we collect new and comprehensive cross-country data on resolution policies that capture the intensity of government policies, allowing us to quantify their economic importance, unlike previous studies that examined the effectiveness of resolution policies using a binary approach.

We develop a novel identification strategy that uses the global financial crisis as a shock to the supply of credit and exploits exogenous variation in the degree to which firms depend on external financing, appealing to a widely used measure of financial dependence developed by Rajan and Zingales (1998) [henceforth, RZ]. Identification is further achieved by focusing on recapitalization measures that targeted the financial sector directly and thus had a direct impact

on the supply of credit. We test whether the growth of firms in industries that are more financially dependent on external finance is boosted more by the distinct measures put in place. Because bank recapitalization has no direct impact on firms' value added, we argue that its effect on firms' value added takes place through the supply of credit. While identification using our approach is superior to that achieved in existing cross-country studies linking government policies to growth, one cannot draw inference about the aggregate effect of government policies on growth based on our empirical results.

The critic may think our identification strategy is problematic because government interventions are an endogenous response to real economic activity. However, our empirical strategy is valid as long as government policies are not correlated with financial dependence. While we agree that government policies may respond to credit demand shocks and pressure from non-financial firms to support lending activity, we think it is unlikely that government policy responds disproportionally to pressure from financially dependent firms as opposed to firms that are not financially dependent. To lend support to this claim and our empirical strategy we show that the intensity of government policies during the crisis is not correlated with the average financial dependence of firms in the country.

We address obvious simultaneity problems by controlling for other government interventions that potentially offered relief to banks, including guarantees, asset purchases, and liquidity support. These measures offered alternative ways to alleviate the effects of the capital crunch of banks. Similarly, we also control for monetary and fiscal policy actions, which helped both firms and banks by lowering their cost of funds and by stimulating domestic demand. Remaining simultaneity concerns are addressed through country and industry level fixed effects.

Our outcome variable of interest is real growth in value added, paralleling the work by RZ. While their work was conducted at the industry level, the unavailability of recent industry level data covering the global financial crisis period (the industry level data used in RZ is updated with a substantial lag) impedes us from proceeding in the same way, and we therefore opt for constructing comparable measures at the firm level. Using firm-level data has the added advantage that we can control for firm-specific factors.

We compare the growth in value added of firms over the year 2009 in response to crisis policies announced during the period September 2008 and March 2009, which is the period during which the crisis spread from the US to other countries and countries announced the most of their crisis response policies. This is also the period following the collapse of US investment bank Lehman Brothers in September 2008 and before the announcement of the bank stress test results in the US in May 2009, and during which bank credit tightened in a large number of countries (Aisen and Franken, 2010). Our sample consists of a large cross-section of firms from 50 countries in both advanced and emerging market economies.

We find that bank recapitalization has a significant and disproportionate effect on the growth of financially dependent firms, and that this result survives a large number of robustness checks. The estimation results suggest that a one standard deviation increase in the interaction between financial dependence and bank recapitalization would result in an increase in real growth in value added of 2.3 percentage points. The remaining financial sector intervention policies—guarantees, asset purchases, and liquidity support— are not individually significant, but all financial sector resolution policies are jointly significant.

We also find that fiscal policy was more effective than monetary policy in mitigating the effects of the crisis on financially dependent firms; nevertheless this result is subject to the

caveat that it is not straightforward in our analysis to identify the channel behind this outcome. Two factors may explain the lack of significance of monetary policy. First, monetary policy had already been eased substantially in the US by the time of the collapse of Lehman Brothers and therefore further easing was largely anticipated. Second, since our identification strategy focuses on the supply side of credit, the monetary transmission channel we would pick up is the lending channel. With banks being capital constrained, the lending channel may have been weakened substantially during the crisis. Our result on fiscal policy is consistent with findings in a recent paper by Aghion et al. (2009), who also find that countercyclical fiscal policy supports the growth of firms that are more financially dependent. However, unlike Aghion et al. (2009), our focus is on direct financial sector intervention policies, notably the impact of bank recapitalization.

Our paper offers new evidence on the relevance of financial frictions in the supply of credit. A number of studies show that financial conditions of banks matter for lending decisions. For example, Kashyap and Stein (2000) find that the impact of monetary policy shocks on lending is stronger for banks with less liquid balance sheets, while Bernanke and Lown (1991), Peek and Rosengren (1995), and Hancock and Wilcox (1994) each present evidence consistent with the hypothesis that bank lending is curtailed when bank capital is low or when the banking sector has suffered significant capital losses. These studies, however, are not conclusive regarding the real effects of changes in the supply of credit.

A related strand of the literature goes a step further and identifies real effects from exogenous changes in banks' financial conditions. Klein et al. (2002) and Peek and Rosengren (1997, 2000) exploit the losses faced by Japanese banks from the collapse of the Japanese stock market as an exogenous shock to the US and show it had real consequences by curtailing credit.

They estimate an important economic effect of this shock transmitted through lending by Japanese banks' subsidiaries in the US and Japanese foreign direct investments into the US. Ashcraft (2005) uses the closures of healthy subsidiaries of a failed banking holding company as an exogenous disruption in the supply of credit and finds important economic effects in the corresponding local county income. Peek et al. (2003) identify loan supply shocks using CAMEL ratings of US banks and find that bank health has economically significant effects on the US economy. Moreover, they also find that their loan supply measure is particularly important for understanding movements in inventories. In a cross-country setting, Kroszner et al. (2007) and Dell'Ariccia et al. (2008) examine the real effects of banking crises and find that economic sectors more dependent on external finance suffer more during a banking crisis.

Our paper also contributes to the literature on the mitigating real effects of bank financial sector support packages following a financial shock. Recent theoretical literature on government support of banks includes Philippon and Schnabl (2010) who characterize efficient bank recapitalizations when there is debt overhang in the financial sector, and Farhi and Tirole (2009) who examine government bailouts of banks in a setting in which private leverage choices exhibit strategic complementarities due to the monetary policy reaction. Empirical literature on the real effects of banking interventions is sparse and inconclusive. For example, Dell'Ariccia et al. (2008) find no statistically significant support for the hypothesis that standard government intervention policies such as blanket guarantees and bank recapitalizations were successful in mitigating the effects of the crisis. Similarly, Claessens et al. (2005) find that policies to support the banking system do not seem to reduce the output cost of banking crises. Detragiache and Ho (2009), on the other hand, find that policies that increased fiscal outlays were associated with lower real GDP growth during a crisis. Klingebiel et al. (2001) assess stock market responses to

bank restructuring policies and find that public interventions in banks are largely ineffective. None of these empirical studies controls for the intensity of government interventions, and most cover only a small sample of countries, which may explain the inconclusive findings. A recent paper by Giannetti and Simonov (2009) conducts a firm-level country case study to explore the real effects of bank bailouts during the Japanese crisis. They find that government recapitalizations increase returns for borrowers of recipient banks, which is consistent with our findings on the real effects of bank recapitalizations in a large cross-section of countries.

The paper is organized as follows. Section 2 summarizes the policy measures we examine in this paper. Section 3 elaborates on the methodology. Section 4 describes the dataset employed. Section 5 presents the empirical findings. Section 6 shows robustness exercises of the results, and Section 7 concludes.

2. Policy Intervention Measures

A negative bank capital shock causes a capital crunch, which in turn leads to a disruption in the supply of credit (Peek and Rosengren, 1995, and Valencia, 2008). Therefore, our focus is on policies that replenish bank capital. Policy options to alleviate the impact of a capital crunch on the supply of credit range from direct measures to recapitalize banks to macroeconomic stabilization policies (fiscal and monetary policy) that support the supply of credit indirectly through their effects on aggregate demand and asset prices.

In this section, we review the policies that were used in the context of the current crisis, building on the classification of crisis intervention policies proposed by Laeven and Valencia (2008). These policies are similar to those used in previous banking crises, as documented in Claessens et al. (2005) and Laeven and Valencia (2010). Laeven and Valencia (2008) also

mention other types of interventions, such as deposit freezes and bank holidays, which were not used in this crisis and are therefore not included in our analysis.

The most direct way to alleviate a capital crunch is through direct capital injections. Public sector recapitalizations, mostly in the form of common or preferred stock, took place in roughly half of the countries in our sample (Figure 1). Many countries pledged significant amounts, using on average roughly half of the initially committed resources. This is our key variable of interest.

However, there are alternative ways to alleviate the effects of a capital crunch. These other measures include asset purchases, guarantees, and liquidity support, and they are commonly used around the same time as bank recapitalization policies are announced.

Asset purchases are implemented by central banks or Treasury departments and can entail a broad range of asset classes, including performing assets such as long-term government bonds and mortgage-backed securities as well as non-performing and illiquid instruments. Our measure of asset purchases includes only those conducted by the Treasury. We exclude purchases of mortgage-backed securities and long-term government bonds by central banks because their effects are captured by our alternative measure of monetary policy, the change in the money base. It is worth highlighting, however, that until 2009, only five central banks in our sample conducted operations in this area: the US Federal Reserve, the Bank of England, the Bank of Japan, the Swiss National Bank, and the Reserve Bank of Australia. Asset purchases provide liquidity to banks and help sustain asset prices and thus avoid losses from fire sales. The use of asset purchases was significant in some countries in our sample (Figure 1). For example, they were substantial in Norway where the government announced that it would purchase assets from banks in the order of 13.8 percent of GDP.

Guarantees and liquidity support are more typically deployed at the initial stage (or containment phase) of a crisis, when it is difficult to assess whether the turmoil is due to liquidity or solvency problems (Calomiris et al., 2003). These policies can be seen as alternative ways to alleviate the effects of a capital crunch because they improve access to funding for banks in turbulent times.

Figure 1 shows the total amount of liquidity injected into the banking system by country over the period September 2008 to March 2009, measured as the change in central bank claims on financial institutions and normalized by GDP. This measure encompasses various types of liquidity injections from the traditional discount window to the broadening of collateral for accessing liquidity support and the creation of new facilities. For Ireland and Luxembourg these injections were large given the relative size of their banking systems.

Figure 1 also reports the size of guarantees. Guarantees cover mostly bank liabilities, but occasionally were used for non-banks—such as US money market funds—and bank assets. Guarantees on bank assets were used mainly in Europe and generally took the form of covering the losses on a portfolio of assets after a partial loss absorbed by the financial institution (Boudghene et al. 2010).

Guarantees on bank liabilities range from deposits to all liabilities, usually with the exception of subordinated debt. A number of countries (such as Korea, Malaysia, and Singapore) have implemented government guarantee programs to support credit to small and medium-sized firms. These programs are included in our asset guarantee measure, although they were relatively small in size. Furthermore, these schemes do not directly benefit the firms in our sample given that we focus on the growth of large and listed firms.

The financial sector policies we consider cover the main explicit actions taken by governments to support financial institutions during recent and past crises (Laeven and Valencia, 2008).[1] However, during the recent crisis policymakers also deployed significant support to the financial sector through monetary and fiscal stimuli, in contrast with previous crises that were concentrated in emerging markets and that had little room for expansionary monetary and fiscal policy (Laeven and Valencia, 2010). The last two charts in Figure 2 illustrate the responses in terms of discretionary fiscal policy and monetary policy used by policymakers in our sample of countries. We focus on discretionary fiscal policy to abstract from the impact of the depth of the recession.

The cross-sectional variation is significant, with fiscal impulses ranging from a 9 percent expansion in Nigeria to a 16 percent contraction in Latvia. These numbers include the cumulative fiscal impulses announced in late 2008 or early 2009 for the 2008 to 2010 period (see Section 4). Most countries relaxed monetary policy significantly, but some had to tighten it in response to currency pressures, as seen in Figure 2.

We focus our analysis on interventions between September 2008 and March 2009, which comprise the majority of all actions taken. While signs of distress at a number of financial firms were felt as early as the first half of 2007 (e.g. New Century and Bear Stearns) it was not until the collapse of Lehman Brothers in September 2008 that policy intervention escalated significantly in the US and elsewhere.[2]

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[1] Implicit support may also have an impact on firms' actions through the perception that banks will be bailed out. To the extent that governments signal the support they are willing to provide to the financial sector through explicit measures, our variables will also capture the role of implicit support in improving the supply of credit.

[2] See http://www.ny.frb.org/research/global_economy/policyresponses.html for a detailed timeline of events.

In reviewing all the measures that were put in place in response to the global turmoil, it is worth emphasizing the richness of the sample we analyze, which is a clear advantage over past studies assessing the impact of crisis resolution policies. We quantify not only the scope but also the intensity of the support provided to the financial system—as opposed to using the binary approach taken in earlier work (e.g., Claessens et al., 2005 and Dell'Ariccia et al., 2008) which only captures the range of interventions taken.

Our analysis includes both, countries that experienced severe shocks and those that did not. Specifically, our sample includes not only crisis countries but also countries that did not experience a banking crisis, as defined in Laeven and Valencia (2010). The latter include those countries in which financial systems were unaffected and those in which policies were implemented preemptively to avoid a financial crisis. Some of these countries implemented significant monetary or fiscal stimuli, while others did not change policies in a major way. Adding these non-crisis countries to our sample mitigates concerns that results are driven by a selection bias that arises when only analyzing countries that ended up experiencing a crisis.

3. Empirical Strategy

Our interest is in measuring the impact of financial sector intervention on growth. However, using standard cross-country regressions to analyze this question is subject to an obvious endogeneity problem, since policy responses are endogenous to the macroeconomic environment. We overcome this problem by appealing to the work by RZ. They use industry-level data on growth in a cross-section of countries to study whether real growth in value added of industries that are more dependent on external financing is relatively higher in countries that have more developed financial systems. Compared to standard cross-country regressions, their

approach is less subject to criticism regarding an omitted variable bias or model specification.

The reason is that by focusing on within-country differences among industries based on an

interaction between a country and an industry characteristic, their approach allows for the

correction of unobserved, time-invariant country and industry characteristics. Similarly, our

analysis focuses on the effects on value-added growth of interactions between an industry

characteristic (financial dependence) and country characteristics (government policies).

Following RZ, we capture any time-invariant country and industry characteristics using country

and industry fixed effects.[3]

We depart, however, from their original strategy in that we construct value-added growth

measures at the firm level instead of the industry level. The main reason for this departure is that

industry-level data on value added growth, including from the United Nations database on

Industrial Statistics which is the database used by RZ, is not yet available for a sufficiently large

number of countries, given the time lag with which such is collected. However, this departure

has the added advantage that it allows for the inclusion of firm controls and further strengthens

identification by mitigating concerns about reverse causality, since it is highly unlikely that

country level policy responses are driven in a systematic way by individual firm's value-added

growth prospects. However, our measure of financial dependence is constructed at the industry

level because it is computed using data on US firms and matched by industry to our sample of

non-US firms.

We estimate the following regression model:

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[3] We did conduct standard cross-sectional regression analysis on the overall effects of policy interventions on firm growth using regression specifications without interaction terms and country fixed effects. In these regressions, we do not find any evidence that country policies alleviate the growth of firms during the crisis period analyzed (results not reported but available upon request). However, these results are difficult to interpret given that they are not as cleanly identified as our approach relying on interaction effects (they do not include country fixed effects and may therefore suffer from omitted variables problems).

$$g_{i,k} = \alpha_j + \alpha_k + \beta_1 ED_j \cdot G_k + \beta_2 X_{i,k} + \varepsilon_{i,k} \qquad (1)$$

The dependent variable in equation (1), $g_{i,k}$, is annual growth rate in real value added (in percentages) of firm i in country k during the year 2009. Our primary variable of interest, $ED_j \cdot G_k$, is the interaction between industry j's dependence on external financing and a vector of country-level government interventions. In our baseline specification, G_k consists of the following three variables: fiscal policy in country k, monetary policy in country k, and bank recapitalization in country k, all measured over the period September 2008 and March 2009. In the case of bank recapitalization, it corresponds to committed amounts of public recapitalization funds. We control for fiscal and monetary policy in our baseline regression because many countries provided bank support in combination with these macroeconomic stabilization tools. $X_{i,k}$ is a vector of additional firm-level explanatory variables. Finally, α_j and α_k are industry and country fixed effects, and $\varepsilon_{i,k}$ is the error term.

We follow RZ and compute dependence on external finance as capital expenditures minus cash flow from operations divided by capital expenditures. Capital expenditures are the funds used for additions to property, plant, and equipment, including amounts arising from acquisitions. In our baseline specification, we use the external financial dependence of US firms over the 1980's as computed by RZ. As in their work, the use of an industry-level measure of external finance dependence (common to all countries) follows from the assumption that it is determined by technological characteristics of the industry that are correlated across countries. Under the assumption that capital markets in the US, especially for the listed firms we analyze, are relatively frictionless, this method allows us to identify an industry's intrinsic demand for external financing. In robustness tests, we compute this measure for the period 1980-2006,

because an industry's intrinsic demand for external finance may have changed over time due to changes in technology.

To enhance comparability of our results with those obtained in earlier work, including those obtained by RZ, we limit the sample to manufacturing firms only. Because our variables of interest vary at the country-industry level and our data set is at the firm level, we also adjust standard errors for clustering at the country-industry level.

Since we use US data to establish our benchmark of an industry's external financial dependence, one could argue that this variable is endogenous to the growth of US firms. Following RZ, we therefore drop US firms from all regressions, thereby addressing these endogeneity concerns. Importantly, our main results are not affected by the inclusion of US firms in the sample (not reported).

In sum, our approach overcomes endogeneity concerns in three ways: first, external finance dependence is measured over a period prior to the crisis; second, external finance dependence is measured using data from US listed firms that face relatively frictionless capital markets and used to study the growth of non-US firms, and it is unlikely that US financial dependence responds to value-added growth elsewhere (moreover, we drop US firms from the sample); and third, we conduct our analysis at the firm level, with external finance dependence measured at the industry level.

Still, the critic may observe that endogeneity concerns remain because government interventions could be an endogenous response to a decline in real economic activity. However, our empirical strategy is valid as long as government policies are not correlated with a firm's dependence on external finance. While government policies may respond to pressure from non-financial firms to support lending activity, we consider it indeed unlikely that government policy

responds disproportionally to pressure from financially dependent firms. To lend support to this claim and our empirical strategy we will show in the next section of the paper that the intensity of government policies during the crisis is not correlated with the median level of financial dependence of firms in the country.

4. Data

Firm-level data comes from the Compustat North America (for US and Canadian firms) and Compustat Global (for firms outside the US) databases. As indicated in the previous section, external financial dependence is defined as the difference between capital expenditure and operating cash flow, computed over the 1980's or the 1980-2006 period, and expressed as a fraction of capital expenditure. Financial dependence is computed at the industry level using data on individual US firms. We follow the level of industry aggregation in RZ, which is based on the ISIC industry classification. Table 2 reports external dependence figures by ISIC industry. We obtain an industry-level measure by taking the median across firms within the industry.

We compute value added using Compustat data as the sum of earnings before taxes and depreciation (EBITDA) and labor expense. We limit the sample of firms to those whose fiscal year ends between October and December. We lose all firms from the Republic of Korea and Japan because of missing data on labor expense and because the fiscal year ends in March (including these firms does not alter our main findings). We also do not include firms from the US, which is the benchmark country for financial dependence. We compute real growth in value added by first converting value added into local currency and then by deflating it using the CPI inflation rate in the country where the firm is located. To remove potential outliers, we drop both

the top and bottom 1 percentile of the growth figures from the analysis. We also drop seven firms with missing data on total assets.

Other firm-level variables we use in our regressions include the log of initial real value added (initial value added); the log of total assets (size); firm leverage (leverage), defined as the ratio of total liabilities to total assets; asset tangibility (fixed assets), computed as the ratio of fixed assets to total assets; and Tobin's Q, computed as the ratio of the market value of equity plus the book value of debt divided by the book value of total assets. Each of these variables is computed as of end-2008.

An important caveat to the analysis is that the Compustat Global data set consists only of publicly-listed firms, which means that the sample of firms we analyze is likely biased towards larger firms. One implication of this bias is that we may be underestimating the overall effect of government policies in support of the financial sector if smaller, non-listed firms (that on average may be more financially dependent) would tend to benefit more from such government policies. Also, the financial crisis is likely to have led to the exit of weaker firms but this is a phenomenon that the Compustat Global data set is not well suited to examine given that there is likely to be less entry and exit among listed firms.

Unless indicated otherwise, all government policies are computed over the period September 2008 to March 2009 and normalized by the country's 2008 GDP. As a proxy for the change in the fiscal stance, we use the change in the structural balance, which we refer to as Announced fiscal impulse. Our two primary sources are the OECD (OECD, 2009) and the IMF's Fiscal Monitor. Both sources reflect the size of announced discretionary fiscal stimuli measured as their net effect on fiscal balances over the period 2008 to 2010 and exclude fiscal measures that had been announced before the crisis as well as fiscal outlays associated with financial

sector support packages announced during the crisis. Most cases were covered with these two sources, but in a handful of cases where this was not the case we used fiscal discretionary packages reported in IMF staff reports that were announced in response to the crisis, excluding financial sector support, to complete the data set.

As an alternative proxy for fiscal policy, we compute the fiscal impulse following Fedelino et al. (2009), and using data from the IMF's April 2010 World Economic Outlook (WEO). It corresponds to the sum of the variations in the cyclically adjusted primary balance (relative to potential GDP) over 2008 to 2010. Revenue elasticity is equal to one, while expenditure elasticity is taken from the OECD (Girouard and Andre, 2005), or set to zero when missing. This measure, however, is not purged from financial sector support packages and consists of actual rather than intended stimulus. We refer to this variable as Actual fiscal impulse.

The reason for focusing on the structural fiscal balance is because we want to capture discretionary policy, isolating the effects of the economic cycle. Furthermore, we focus on the period 2008 to 2010 because in most cases fiscal packages involved multi-year programs. Firms and the market should have reacted to the overall fiscal package and not only to the component to be implemented in 2009.

As a proxy for change in the monetary policy stance we use the change in nominal short-term interest rates over the period September 2008 to March 2009. As short-term interest rates we use money market rates whenever available and treasury bills otherwise, taken from the IMF's International Financial Statistics (IFS). As an alternative measure of monetary policy, we use the change in the money base over the same period, also using data from the IMF's IFS.

We collect new data on bank intervention policies for our sample of countries. For the crisis countries in our sample, we obtain information on bank intervention policies from Laeven and Valencia (2010). The data in that paper are hand-collected from IMF reports and official country reports, and quantitative information from IMF international financial statistics and IMF WEO. For countries not included in Laeven and Valencia (2010), we use the same approach and collect data from IMF staff reports and official country reports and official websites.

Finally, we construct new data on the size of guarantees not included in Laeven and Valencia (2010) relying on information contained in IMF staff reports and official announcements from country authorities. The final sample of countries we use in the regressions is chosen based on availability of firm-level data. It comprises 50 countries, of which 10 are considered to have experienced a systemic banking crisis, and 9 are borderline crises per Laeven and Valencia (2010)'s definition of a banking crisis (see Table 1).

We proxy for emergency liquidity support using the change in gross claims of the monetary authorities to financial institutions, normalized by 2008 nominal GDP. If the result is a negative number, we set this variable to zero. Gross claims on the financial system were taken from the IMF's IFS. Although these claims on the financial system may include central bank transactions other than emergency liquidity support, these other transactions are likely to be relatively small and are unlikely to behave in a systematic way that biases our results.

Turning to resolution measures, we record amounts used in bank recapitalization with public funds, in which we include direct capital injections in the form of preferred or common shares as well as subordinated debt. Asset purchases and swaps include the removal of impaired or illiquid assets from banks' balance sheets but include direct lending by the treasury. Direct lending by the treasury, however, took place in only a handful of cases. It is worth emphasizing

that our measure does not include purchases of mortgage-backed securities and long-term government bonds conducted by central banks. The impact of these excluded measures is captured by our alternative definition of monetary policy, the change in the monetary base. In collecting data for these measures we record committed amounts, announced between September 2008 and March 2009, and used amounts up to end-2009. Table 1 shows the values for the individual policy interventions at the country level.

While most crisis-affected countries resorted to accommodative fiscal and monetary policy to counter the negative impact of the crisis on growth, there was much dispersion. In the area of fiscal policy, countries like Iceland and Latvia tightened fiscal policy substantially under the auspice of an IMF program despite a dramatic fallout of the financial crisis on their economy. On the other hand, countries like Australia, Korea, and Morocco substantially loosened their fiscal policy stance, and also faced milder consequences from the financial shock, either because they were less exposed to the financial crisis shock emanating from the US or because their policies were more successful in containing the impact of this shock.

In terms of country level control variables, we consider public debt, trade openness, and financial development. Public debt data corresponds to the general government gross debt, dated as of end-2006, expressed in percent of GDP. For cases where general government debt was not available, we used central government gross debt. Debt figures were taken also from the IMF's WEO database. Other country-specific control variables include country openness, measured as the ratio of the sum of exports and imports to GDP, financial development, measured as the sum of outstanding credit to the private sector, and stock market capitalization, both expressed as percent of GDP. These variables are dated as of 2006 and are taken from the World Bank's World Development Indicators database.

Table 3 reports the summary statistics of the main regression variables. The average growth in real value added for firms over our sample period was -4 percent, though there was much dispersion with the firm at the 25th percentile growing at a rate of -25 percent and the firm at the 75th percentile growing at 16 percent.

While our empirical strategy address several important endogeneity and simultaneity concerns (see section 3), the critic may observe that endogeneity concerns remain because government interventions could be an endogenous response to a decline in real economic activity. Our empirical strategy is valid as long as government policies are not correlated with a firm's dependence on external finance. Table 4 reports the correlations between our main government intervention measures and the median level of financial dependence of firms in the country. We find that none of the government measures considered is significantly correlated with the financial dependence of firms in the country. In fact, the correlation of the country-median financial dependence with our measures of fiscal policy is negative (and insignificant) and the correlation with our measures of bank recapitalization is only 0.1 (and insignificant). The absence of a significant correlation between the intensity of government policies and the dependence on external finance of firms in the country suggests that policies are not endogenous to financial dependence in the country and thus lends additional support to our identification strategy.

5. Empirical Findings

Table 5 reports our baseline results obtained by including, first independently and then jointly, our main proxies for fiscal policy, monetary policy, and bank recapitalization. Because many countries that announced recapitalization packages also announced other support measures

such as guarantees and asset purchases, we add these extra variables one at a time in columns 5 and 6. Since the explanatory variables of interest vary only at the country-industry level and are being used to explain multiple observations at the firm level, we correct standard errors for clustering at the country-industry level. In unreported regressions, we also clustered standard errors at the country level, and the main results of the paper remain unaltered.

The first result to highlight is that our results reject the hypothesis of a frictionless supply of credit. Recapitalizing banks has a positive and statistical significant effect on the value added growth of firms in industries that are more dependent on external finance. Because our external-finance dependence measure is constructed in a way that is not affected by the position of the country in the economic cycle, the firm's financial structure is not the driver of the results, neither are country or industry specific shocks, given that we include industry and country dummies to control for them. Therefore, our results are evidence of the real effects of a disruption in the supply of credit, which is alleviated by bank recapitalization. This is consistent with earlier work by Klein et al. (2002) and Peek and Rosengren (1997, 2000) who provide evidence of the real effects of negative shocks to bank capital. An interesting aspect of our results is that among financial sector interventions only bank recapitalization turns out to be significant, while guarantees and asset purchases do not. However, all bank intervention variables taken together enter jointly significant, albeit at the 10 percent level. These results confirm our prior, that, of all bank intervention policies considered, bank recapitalization is most directly targeted to alleviate solvency problems at banks, and therefore has a quantitatively important effect on the supply of bank credit.

A second result to highlight is that the coefficient estimate for the interaction between external financial dependence and fiscal policy is positive and statistically significant at the 1

percent level. Discretionary fiscal policy tends to give a greater boost to the growth of firms in industries that are more dependent on external finance. One explanation for the significance of fiscal policy comes from its impact on expected losses for banks. By improving firm profitability, fiscal policy reduces expected losses at banks, who in turn may be more encouraged to lend. To the extent that financially dependent firms benefit the most from such an increase in the supply of credit, their growth will benefit disproportionately as well.

Our result on fiscal policy is consistent with Aghion et al. (2009) who analyze the effect of countercyclical fiscal policy on growth and also find that it supports the growth of firms that are more financially dependent.[4] They rationalize this result with a model in which fiscal policy increases the relative profitability of long- versus short-term investments because with higher expected profits, the illiquidity risk attached to long-term projects goes down. Our explanation is consistent with the implications of their model.

However, our fiscal policy result is not purged from demand effects. If firms' financial conditions are correlated with external finance dependence at the industry level, the observed effect of fiscal policy could also be driven by credit demand. Since our focus is on financial intervention policies, we do not attempt to disentangle demand and supply effects of fiscal policy. Importantly, however, our main result on the supply-side effect of bank recapitalization is not affected by the inclusion of fiscal policy as an alternative channel affecting the growth of financially dependent firms.

A third result to highlight is the insignificance of our monetary policy variable. It is not found to have a differential effect on the returns of financially dependent firms. In principle,

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[4] Their work is conducted at the industry level, as in RZ, but does not extend to the recent global financial crisis episode, nor does it consider the role of bank intervention policies, as we do.

proponents of the bank lending channel of monetary transmission, as first proposed by Bernanke

and Blinder (1988) and further developed by Kashyap et al. (1993, 1994), would expect to see a

differential, positive effect of interest rate reductions on the lending to and growth of financially

dependent firms, for which financial conditions matter the most. At the same time, the increased

accessibility of banks to non-deposit sources of funds are seen under this view as mitigating the

importance of the bank lending channel (Romer and Romer, 1990). The increasing importance of

wholesale funding markets for banks in many of the countries in our sample could thus partly

explain this result. Moreover, the transmission channel of monetary policy may be less powerful

at time of crises, when banks are capital constrained (Van den Heuvel, 2009). Finally, by the

third quarter in 2008, monetary policy in the US had been relaxed significantly. Specifically, a

series of interest rate reductions had brought the target Federal Funds rate down from 4.25

percent in early January 2008 to 1.5 percent in early October 2008. Therefore, further relaxation

in the US and elsewhere may have been largely anticipated and already reflected in firms' stock

prices.

Finally, we find that the growth in value added over the sample period was higher for

larger firms, as measured by total assets, possibly because larger firms were more diversified or

enjoyed relatively larger internal capital markets, and were therefore shielded to a greater extent

from the fallout of the crisis.

The effect of bank recapitalization is economically significant. The estimation results in

Column 4 of Table 5 suggest that a one standard deviation increase in the interaction between

financial dependence and bank recapitalization would result in an increase in real growth in

value added of 2.3 percentage points. Alternatively, the estimation results suggest that a firm

from an industry at the 75th percentile of financial dependence would have a real growth in value

added that is 1.1 percentage points higher than a firm from an industry that is at the 25th

percentile of financial dependence if it were located in a country that is at the 75th percentile

compared to a country at the 25th percentile of bank recapitalizations. Both differentials in real

growth rates are substantial compared to the average growth rate in value added of -4.0 percent.

The effect of fiscal policy is also economically significant. The estimates in Column 4 of

Table 5 suggest that a one standard deviation increase in the interaction between financial

dependence and fiscal expenditure would result in an increase in real growth in value added of

2.5 percentage points. Alternatively, the estimates suggest that a firm in an industry at the 75th

percentile of financial dependence would have a real growth in value added that is 1.4 percentage

points higher than a firm in an industry that is at the 25th percentile of financial dependence if it

were located in a country that is at the 75th percentile compared to a country at the 25th percentile

of fiscal expenditures. Again, both differentials in real growth rates are substantial compared to

the average growth rate in value added of -4.0 percent.

Interestingly, the effect of bank recapitalization is, on average, of similar magnitude as

the impact of fiscal policy: both variables enter with a similar coefficient of about 1.3 (which is

directly comparable because both measures are expressed in terms of GDP), indicating that a 1

percentage point of GDP increase in either fiscal stimulus or bank recapitalizations would

enhance the growth of financially dependent firms by 1.3 percentage points. This of course is not

the total impact of each corresponding measure since we are only assessing their short-run effect.

The total impact, including long-term, will likely differ because of indirect effects, such as

improved financial stability. Nevertheless, this equivalence in the magnitude of effects of

financial sector and fiscal policies suggests that—at least during periods of financial distress—

policymakers can exploit this short run equivalence in mitigating the real effects of financial

added that is 1.1 percentage points higher than a firm from an industry that is at the 25th

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The total impact, including long-term, will likely differ because of indirect effects, such as

improved financial stability. Nevertheless, this equivalence in the magnitude of effects of

financial sector and fiscal policies suggests that—at least during periods of financial distress—

policymakers can exploit this short run equivalence in mitigating the real effects of financial

turmoil by using the alternative that turns out easier to implement, given the institutional

constraints faced by each country.

Importantly, this result is not driven by collinearity between fiscal policy and bank

recapitalization: there is a low and negative correlation of -0.14 between our main fiscal policy

variable (announced fiscal impulse) and our main bank recapitalization variable

(recapitalization).

Because firms in our dataset are unequally distributed across both countries and

industries—for example, UK firms and firms in the food processing industry dominate the

sample—one obvious concern is that the results are being driven by the unbalanced nature of the

data set. To alleviate such concerns, we re-run our baseline regressions using weighted least

squares, with observations weighted by the inverse of the number of firm observations in each

country-industry pair. In unreported weighted least squares regressions, we find that our main

results are qualitatively unaltered compared to our baseline regressions.

6. Robustness Tests and Extensions

We now consider several robustness checks and extensions of our main analysis.

6.1 Additional Firm Controls

Our main objective is to test the economic and statistical importance of credit frictions on

the supply side. For this, we need to be sure that the results are not driven by the financial

condition of firms. Therefore, we include an additional regressor which is firm leverage

(leverage), computed as the ratio of firm liabilities to total assets. Results could also be driven by

firms' ability to pledge fixed assets as collateral for bank loans. We therefore also control for the

ratio of fixed assets to total assets (fixed assets), which proxies for the tangibility of firm assets

and is increasing in the value of collateral. The results are presented in Column 1 of Table 6. We find that the growth of firms is negatively affected by high leverage, although the result is not statistically significant. In addition, we find that firm growth is negatively and significantly affected by high tangibility. Importantly, our main findings on fiscal policy and bank recapitalizations are unaltered when controlling for these additional firm characteristics.

The results obtained thus far could also be driven by a change in growth opportunities rather than dependence on external finance. We therefore perform a regression that includes interactions between the government intervention policies and a firm's Tobin's Q, a proxy of a firm's growth opportunities, as well as the level of Tobin's Q. We do not construct an industry level measure of a firm's growth opportunities using US data because growth opportunities vary substantially across countries and within industries depending on firm specific circumstances, so the US is not a useful benchmark. We compute Tobin's Q at year-end 2006 as the ratio of market value of equity plus book value of liabilities to the book value of total assets using Compustat data on the book value of assets and liabilities of firms and Datastream and CRSP data on the market value of equity of firms.

The interaction terms with Tobin's Q as proxy for growth opportunities do not enter significantly, nor does the level of Tobin's Q, and their inclusion does not alter our findings on the relevance of fiscal policy and bank recapitalization measures (not reported). Importantly, the correlation between financial dependence and the measure of Tobin's Q is low at 0.18, indicating that the financing channel, as captured by our measure of financial dependence, is distinct from the growth opportunities channel, as captured by Tobin's Q.

6.2 Alternative Definitions of Intervention Variables

In column 2 of Table 6, we use actual fiscal impulse, our estimate of the fiscal impulse. Unlike our main announced fiscal impulse variable, this alternative measure of fiscal policy does not exclude fiscal outlays associated with bank intervention policies, because it is estimated from outcomes, instead of intentions, as our baseline fiscal variable. Still, we continue to find that bank recapitalization enters significantly after controlling for fiscal policy using the actual fiscal impulse variable. We also try an alternative way to control for monetary policy, to account for quantitative measures other than policy rate shifts. In Column 3, we use the expansion of the monetary base, normalized by GDP. We still find a statistically insignificant effect for monetary policy in affecting the growth of firms.

In column 4, we include variables that denote the actual amounts used for bank recapitalization and asset purchases rather than the committed amounts using in our baseline regressions. The difference between announced and actual amounts can be substantial, particularly for recapitalizations and asset purchases. The results, however, do not depend on using announced or actual amounts. We continue to find that bank recapitalization has a statistically significant differential effect on value-added growth of financially dependent firms when using actual amounts. Notably, the economic effect is somewhat larger than when using the announced bank recapitalization packages.

In column 5, we consider the impact of emergency liquidity support to banks. Given the role of central banks as lenders of last resort, liquidity support is generally the most common policy response to contain a banking crisis, acting as the first line of defense. In the particular crisis episode we analyze here, a number of existing liquidity facilities had already expanded in scope and several new liquidity facilities had been introduced before September 2008, the start

of the period over which we measure policy interventions. For instance, by this time the US

Federal Reserve had already established the Term Auction Facility (TAF), had made emergency

liquidity available not only to banks but also broker-dealers, and had established US dollar swap

lines with other central banks.

We do not find that liquidity support disproportionately affected the growth of financially

dependent firms during the financial crisis. When banks face solvency problems and not just

liquidity problems, as was likely the case for many banks during the recent crisis, bank capital

and lending capacity is not restored through liquidity injections, which would explain the

insignificance of the liquidity support variable.

6.3 Other Country Characteristics

Another potential alternative explanation of our results could simply be that countries

with more developed financial systems are more capable of recapitalizing banks and are in a

better position to conduct countercyclical fiscal policy. Alternatively, deeper financial systems

could offer alternative sources of financing at times of financial crisis. If financial development

affects growth in such ways, then we would have an omitted variable problem. We test this

alternative explanation by including in our regression the interaction between financial

dependence and financial development. Following RZ, we measure financial development as the

sum of private credit and stock market capitalization to GDP in 2006, prior to the ongoing

financial crisis that started in 2007 in the US.

We find that financial development has an independent growth enhancing effect for

financially dependent firms, although this effect is entirely driven by capital market development

(as measured by stock market capitalization to GDP), and not banking sector development (as

measured by private credit to GDP), as indicated in Columns 1 and 2 of Table 7.[5] This suggests

that capital markets can be a "spare wheel" at times of banking crises by offering an alternative

source of finance to traditional bank credit. These results are also consistent with Kroszner et al.

(2007) who find that the growth of financially dependent firms is hurt disproportionately in

deeper banking systems when these systems are in crisis.

Thus far, we have not considered the potential role of financial and trade integration. Yet,

the crisis hit a number of economies that were well integrated in global markets, and thus policy

responses in part reflect actions taken to mitigate the effects from financial integration. Since

financially integrated economies have better access to external financing, they have the capacity

to finance larger bank bailout packages, thus our bank intervention variables could simply

capture the degree of financial integration. Similarly, the financial shock was followed by a

collapse in trade, hitting more open economies more adversely. Not controlling for trade

openness could therefore raise concerns about an omitted variables problem. We address these

concerns by including the interaction between trade openness (as measured by the ratio of trade

to GDP) and financial dependence. Column 3 in Table 7 shows the results. We lose three

observations due to missing data on trade for Jamaica. Allowing for this alternative channel does

not alter our main findings on the relevance of fiscal policy and bank recapitalization.

Next, we test if the size of government and fiscal space empower governments to conduct

countercyclical fiscal policy or to recapitalize banks, while it also may affect growth. It is not

clear what an ideal, simple measure of fiscal space is, therefore we use total public debt, as of

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[5] Indeed, when including interactions of external financial dependence with private credit to GDP and stock market capitalization to GDP simultaneously into the regression, we find that the effect of financial development stems entirely from stock market capitalization (not reported).

2006 and expressed as percentage points of GDP, as an alternative variable. Column 4 in Table 7 shows the results. Again, our main findings remain unaltered.

To further control for industry-specific demand shocks, we include each country's growth rate of aggregate real GDP over the year 2009 interacted with a full set of industry dummies. The results are presented in column 5 of Table 7. Our main results are qualitatively unaltered although the significance of the bank recapitalization effect drops somewhat, lending additional support to the relevance of credit-supply factors.

6.4 Additional Industry Characteristics

Table 8 presents results using alternative measures of industry financial dependence and additional industry-level controls. In Column 1, we use financial dependence computed over the period 1980-2006 using Compustat data for US firms and obtain qualitatively similar results. This is not surprising given the high correlation between financial dependence over the period 1980-1989 and the period 1980-2006 of 0.75 (see Table 3). The results are also robust to using the RZ industry-specific measure of dependence on equity financing, defined as the ratio of the amount of net equity issues to capital expenditures and computed for US firms over either the period 1980-1989 or the period 1980-2006, as alternative measure of financial dependence (not reported).

Thus far, we have focused on the importance of government interventions for the performance of firms that depend on outside finance for the capital expenditure needs; in other words, for their long-term financing needs. However, firms also have short-term financing needs for shorter term investment projects or simply working capital purposes, including inventory investment and accounts payables and receivables management. The global financial crisis also curtailed the availability of short-term credit for these purposes. We therefore separately

investigate whether government interventions, and in particular banking sector interventions, alleviated the financing constraints of firms in need of working capital financing by including interaction terms between intervention policies and a measure of an industry's natural dependence on working capital financing.

To measure an industry's intrinsic need for working capital financing, we follow Raddatz (2006). Specifically, liquidity needs (working capital I) is defined as the industry median ratio of inventories to sales during the pre-crisis period 2000 to 2006, and a broader measure of working capital needs (working capital II) is computed as the industry median ratio of inventories to sales plus ratio of receivables to sales minus accounts payables to cost of goods sold during the pre-crisis period 2000 to 2006. The results are presented in Columns 2 and 3 of Table 8.

Interestingly, we find that bank recapitalization measures also disproportionately enhance the growth of firms that are dependent on working capital financing. However, fiscal policy does not appear to disproportionately benefit these firms, contrary to firms that are dependent on outside financing for capital expenditure purposes. We argued before that fiscal policy can influence the financing of capital expenditures because it affects firms' profitability. However, it may be that fiscal policy disproportionally boosts profitability of long-term projects relative to short-term ones, and long-term projects are more directly linked with capital expenditure financing than working capital financing.

In sum, we find that the real growth rate in value added of financially dependent firms is disproportionately positively affected by fiscal stimulus and bank recapitalization measures. Fiscal policy, by giving a boost to domestic demand, improves the growth prospects of firms, and firms that are financially dependent benefit relatively the most from such a boost because they are hurt the most from a disruption in the supply of credit. Bank recapitalizations, by

mitigating the negative credit supply shock, similarly benefit financially dependent firms that face financial constraints the most.

7. Conclusions

This paper contributes to the literature on financial frictions with new evidence on the real effects of disruption in the supply of credit, using new data on policy intervention measures that were deployed in a sample of 50 countries during 2008 and 2009 in response to the global financial crisis. We address potential endogeneity concerns by exploiting the cross-sectional variation of firm-level data, using a widely used measure of external finance dependence developed by RZ.

We find statistically significant, economically important, and robust results that bank recapitalization policies boosted the value added growth of firms that are more financially dependent, consistent with the importance of supply-side financial frictions in influencing real economic activity. We also find that discretionary fiscal policy supported the growth of financially dependent firms, just as bank recapitalization did. These results are not driven by correlation between fiscal and bank recapitalization policies. Importantly, our results are likely to be underestimated because we focus on large and listed firms that have better non-bank financing alternatives than smaller and bank-dependent firms.

Monetary policy and other bank intervention measures turn out insignificant once we control for the effects of fiscal policy and bank recapitalization. Our conjecture is that these other actions were less effective in supporting the growth of financially dependent firms because they were much less targeted to alleviate solvency problems at banks, which may have been the largest concern at the time.

Overall, our results provide new insights in the relative effectiveness of government interventions in managing financial crises, and new evidence on the importance of credit market frictions in explaining differences in economic growth.

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Table 1. Government interventions during the global financial crisis

Systemic banking crises and borderline cases are taken from Laeven and Valencia (2010), where a crisis is defined as a situation with significant signs of financial distress in the banking system and significant policy intervention measures. Recapitalization packages include bank capital injections by the public sector. Guarantees of assets corresponds to announced coverage of bank assets, existing or new. Guarantees of bank creditors measures coverage of deposits and/or other liabilities, existing or new. Asset purchases reflect acquisition of assets either by a special entity or the central bank, from banking institutions, excluding long-term government bonds, but including loans from the Treasury to banks. All the above intervention measures are expressed in percent of 2008 GDP and include packages announced during the period September 2008 to March 2009, and used amounts up to end-2009. Liquidity support is measured by the change in gross claims of the monetary authorities to financial institutions, expressed in percent of GDP. Monetary policy is proxied by the change in nominal short-term interest rates. Change in monetary base is the change in the money base (or reserve money) in percent of GDP. Liquidity support and monetary policy indicators are measured over the period September 2008 to March 2009. Public debt data corresponds to the general government gross debt, dated as of end-2006, expressed in percent of GDP. Fiscal policy reflects the size of announced discretionary fiscal stimulus packages, measured as the net effect on fiscal balances over the period 2008-10, expressed as percent of GDP, and excludes fiscal measures that had been announced before the crisis as well as fiscal outlays associated with financial sector support packages announced during the crisis. Fiscal impulse corresponds to the sum of the variations in cyclically-adjusted primary balances (relative to potential GDP) over 2008-2010.

Country	Banking Crises — Systemic	Banking Crises — Borderline	Recapitalizations — Pledged amount (percent of GDP)	Recapitalizations — Used amount (percent of GDP)	Guarantees — Asset guarantees (percent of GDP)	Guarantees — Bank creditor's guarantees (percent of GDP)	Asset Purchases and Lending by Treasury — Pledged amount (percent of GDP)	Asset Purchases and Lending by Treasury — Used amount (percent of GDP)	Liquidity — Liquidity support (percent of GDP)	Monetary policy (percent, 08/08-03/09)	Change in monetary base (percent of GDP)	Public debt (percent of 2006 GDP)	Fiscal policy (percent of GDP)	Fiscal impulse (percent of GDP)
Argentina			0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.2	0.6	76.5	1.5	2.8
Australia			0.0	0.0	0.0	97.0	0.0	0.0	1.4	3.6	-0.2	10.1	4.6	5.2
Austria	*		5.2	2.1	0.6	25.7	2.0	2.0	8.9	2.4	1.5	62.3	1.1	2.1
Belgium	*		5.0	5.0	7.7	26.2	8.2	8.2	23.9	2.4	1.5	87.7	1.6	2.7
Brazil			0.0	0.0	0.0	0.5	0.8	0.0	0.5	1.7	-2.2	66.7	0.6	-0.4
Canada			0.0	0.0	0.0	0.0	9.1	4.4	2.3	2.2	0.1	68.0	4.1	4.6
Chile			0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	-0.4	5.3	5.0	9.6
China			0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	2.3	16.5	4.4	3.5
Colombia			0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.4	0.6	35.8	1.0	1.3
Croatia			0.0	0.0	0.0	0.0	0.0	0.0	1.6	-9.4	-1.7	35.9	0.1	-4.8
Czech Republic			0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.5	1.0	29.5	3.0	1.3
Denmark	*		5.8	2.8	0.0	237.5	0.3	0.3	10.9	1.9	0.2	30.6	2.5	5.2
Finland			2.2	0.0	0.0	28.4	0.0	0.0	1.4	2.4	1.5	39.2	3.1	4.9
France		*	1.3	1.0	0.3	16.9	0.0	0.0	6.2	2.4	1.5	63.6	0.6	3.2
Germany	*		3.4	1.2	6.1	17.2	0.2	0.2	8.4	2.4	1.5	65.9	3.0	3.7
Greece		*	2.1	1.7	0.0	6.2	1.9	1.9	15.4	2.4	1.5	95.9	0.1	1.5
Hong Kong			0.0	0.0	0.0	295.2	0.0	0.0	0.0	2.1	13.3	1.7	-0.2	8.3
Hungary		*	1.1	0.1	0.0	48.8	2.6	2.6	1.2	2.0	-0.1	65.7	-4.4	-5.6
Iceland	*		24.0	13.0	0.0	108.4	0.0	0.0	24.7	-0.4	-2.3	30.1	-9.4	5.6
India			0.0	0.0	0.0	0.0	0.0	0.0	0.2	6.7	0.6	82.2	0.5	4.4
Indonesia			0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	-2.0	39.0	1.9	0.9
Ireland	*		7.6	7.6	0.0	200.0	0.0	0.0	42.2	2.4	1.5	24.8	-4.4	5.8
Israel			1.7	0.0	0.4	0.0	0.0	0.0	0.0	3.2	5.8	84.4	0.3	3.7
Italy			1.3	0.3	0.0	0.0	0.0	0.0	2.7	2.4	1.5	106.5	0.0	1.8
Jamaica			0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.9	2.5	90.3	0.6	0.6
Japan			2.5	0.1	0.0	7.2	4.1	0.1	2.0	0.4	0.0	191.3	2.0	4.2
Kenya			0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.1	0.1	50.6	2.1	2.1
Korea			1.2	0.4	1.8	11.6	3.9	0.4	2.2	0.1	1.3	30.1	4.9	2.8
Latvia	*		2.5	2.5	0.0	3.5	2.5	2.5	3.9	2.4	-5.0	9.9	-16.3	-16.3
Lithuania			0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	-1.1	18.0	-6.4	-6.4

Country	Banking Crises		Recapitalizations		Guarantees		Asset Purchases and Lending by Treasury		Liquidity	Monetary and fiscal indicators				
	Systemic	Borderline	Pledged amount (percent of GDP)	Used amount (percent of GDP)	Asset guarantees (percent of GDP)	Bank creditor's guarantees (percent of GDP)	Pledged amount (percent of GDP)	Used amount (percent of GDP)	Liquidity support (percent of GDP)	Monetary policy (percent, 08/08-03/09)	Change in monetary base (percent of GDP)	Public debt (percent of 2006 GDP)	Fiscal policy (percent of GDP)	Fiscal impulse (percent of GDP)
Luxembourg	*		7.7	7.7	0.0	12.0	0.0	0.0	57.5	2.4	1.5	6.6	3.6	4.4
Malaysia			1.5	0.0	3.6	112.0	0.0	0.0	0.0	1.0	-2.6	40.9	3.0	1.8
Mexico			0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.5	0.6	38.3	1.3	0.2
Morocco			0.0	0.0	0.0	0.0	0.0	0.0	1.5	-0.1	-1.4	58.1	6.4	6.4
Netherlands	*		6.5	6.5	10.8	34.8	6.1	6.1	9.3	2.4	1.5	47.4	1.5	4.0
New Zealand			0.0	0.0	0.0	93.0	0.0	0.0	3.9	4.1	0.5	22.4	4.3	5.1
Nigeria			0.0	0.0	0.0	0.0	0.0	0.0	3.5	6.3	0.6	11.8	9.0	9.0
Norway			2.0	0.2	0.0	0.0	13.8	4.8	1.7	0.9	0.0	68.3	0.8	4.8
Pakistan			0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.4	2.2	56.4	-1.1	-1.7
Peru			0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.4	0.8	33.2	2.5	6.9
Philippines			0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.2	55.4	2.3	1.5
Poland			0.0	0.0	0.0	3.3	0.0	0.0	1.4	2.1	2.9	47.8	1.0	4.1
Portugal		*	2.5	0.0	0.0	12.6	0.0	0.0	2.8	2.4	1.5	64.7	0.8	4.0
Russia		*	7.1	1.9	0.0	0.0	0.4	0.4	9.8	-5.7	0.0	9.1	1.7	7.2
Singapore			0.0	0.0	2.2	118.0	0.0	0.0	0.7	0.8	0.7	94.0	5.6	13.5
Slovenia		*	0.0	0.0	3.2	83.8	2.8	2.8	3.1	2.4	1.5	26.7	2.1	1.9
South Africa			0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.1	0.1	33.0	2.9	6.2
Spain		*	0.0	0.0	0.0	19.1	4.6	1.8	4.7	2.4	1.5	39.5	3.5	8.3
Sri Lanka			0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.5	-0.3	88.7	-1.6	-1.6
Sweden		*	1.6	0.2	0.0	46.8	0.0	0.0	14.8	3.5	1.3	45.9	2.8	3.7
Switzerland		*	1.1	1.1	0.0	1.1	7.9	7.9	10.8	1.7	4.6	47.2	0.5	2.4
Taiwan			0.0	0.0	0.0	208.6	0.0	0.0	1.7	2.4	0.1	35.2	0.9	0.9
Thailand			0.0	0.0	0.0	94.0	0.0	0.0	0.0	1.8	0.8	25.1	2.4	1.6
Turkey			0.0	0.0	0.0	0.0	0.0	0.0	1.3	4.1	1.3	46.1	0.0	0.5
UK	*		8.2	5.0	14.5	40.0	0.0	0.0	7.9	4.7	0.9	43.2	1.4	5.2
US	*		5.1	3.1	0.0	10.4	2.3	1.6	3.5	1.8	4.4	60.9	5.6	7.2

Table 2. External financial dependence across industries in the US, 1980-89 and 1980-06

This table denotes external financial dependence across industries in the US (by ISIC industry code) over the period 1980-89 (financial dependence) and over the period 1980-06 (financial dependence 8006)

ISIC code	Industrial sector	Financial dependence	Financial dependence 8006
314	Tobacco	-0.45	-1.76
361	Pottery	-0.15	-0.52
323	Leather	-0.14	-0.98
3211	Spinning	-0.09	0.08
324	Footwear	-0.08	-0.56
372	Nonferrous metal	0.01	0.32
322	Apparel	0.03	0.05
353	Petroleum refineries	0.04	0.03
369	Nonmetal products	0.06	0.09
313	Beverages	0.08	0.06
371	Iron and steel	0.09	0.24
311	Food products	0.14	0.14
3411	Pulp, paper	0.15	0.10
3513	Synthetic resins	0.16	0.10
341	Paper and products	0.18	0.13
342	Printing and publishing	0.20	0.06
352	Other chemicals	0.22	-0.07
355	Rubber products	0.23	0.37
332	Furniture	0.24	-0.07
381	Metal products	0.24	0.19
3511	Basic excluding fertilizers	0.25	0.06
331	Wood products	0.28	0.14
384	Transportation equipment	0.31	0.13
354	Petroleum and coal products	0.33	0.27
3843	Motor vehicle	0.39	0.38
321	Textile	0.40	0.17
382	Machinery	0.45	0.50
3841	Ship	0.46	0.30
390	Other industries	0.47	0.52
362	Glass	0.53	0.24
383	Electric machinery	0.77	0.39
385	Professional goods	0.96	0.85
3832	Radio	1.04	0.93
3825	Office and computing	1.06	0.66
356	Plastic products	1.14	0.24
3522	Drugs	1.49	0.78

Table 3. Summary statistics

This table presents summary statistics of the main regression variables used in the paper.

Variable	Definition	Obs	Mean	Std. Dev.	Min	p25	p75	Max
Firm-level variables								
Growth	Growth in real value added	2902	-4.02	34.98	-99.99	-24.92	15.61	98.73
Initial value added	Initial real value added	2902	3.57	2.65	-9.53	2.42	5.02	10.97
Size	Total assets	2902	5.01	2.63	-9.13	3.90	6.45	12.62
Leverage	Ratio of total liabilities to total assets	2902	0.49	0.25	0.02	0.32	0.62	4.28
Fixed assets	Ratio of fixed assets to total assets	2902	0.31	0.19	0.00	0.15	0.44	0.99
Industry-country level variables								
Financial dependence * A. fiscal impulse		771	0.50	1.83	-24.31	0.02	0.77	9.55
Financial dependence * Monetary policy		771	0.74	1.36	-14.02	0.15	0.99	10.05
Financial dependence * Guarantees		771	17.35	44.00	-52.15	0.00	15.42	440.29
Financial dependence * Recapitalization		771	0.67	1.75	-3.70	0.00	0.58	23.06
Financial dependence * Asset purchases		771	0.54	1.85	-0.67	0.00	0.06	20.58
Financial dependence * Liquidity support		771	1.88	4.64	-6.66	0.02	1.72	62.90
Financial dependence * Total capitalization		754	81.28	115.31	-149.74	14.07	103.44	910.94
Financial dependence * Trade		768	41.46	71.64	-95.30	6.88	49.40	681.10
Financial dependence * Public debt		771	17.81	24.30	-40.04	3.04	22.14	158.85
Industry-level variables								
Financial dependence	External finance dependence (1980-1989)	36	0.32	0.41	-0.45	0.07	0.45	1.49
Financial dependence 8006	External finance dependence (1980-2006)	36	0.13	0.49	-1.76	0.06	0.35	0.93
Country-level variables								
Announced fiscal impulse	Discretionary fiscal policy, announced (percent of GDP)	50	1.02	3.90	-16.30	0.25	3.00	9.00
Actual fiscal impulse	Fiscal impulse (percent of potential GDP, 2008-2010)	50	2.80	4.51	-16.30	1.50	5.20	13.50
Monetary policy	Change in short term rates, percent	50	1.70	2.55	-9.40	1.11	2.42	6.74
Monetary base	Change in money base, percent of GDP	50	0.89	2.50	-4.99	0.03	1.50	13.28
Guarantees	Guarantees of bank liabilities (percent of GDP)	50	36.63	64.58	0.00	0.00	46.80	295.20
Asset guarantees	Guarantees of bank assets (percent of GDP)	50	0.99	2.87	0.00	0.00	0.00	14.50
Recapitalization	Bank recapitalization, announced (percent of GDP)	50	2.03	4.00	0.00	0.00	2.20	24.00
Recapitalization used	Bank recapitalization, used (percent of GDP)	50	1.20	2.62	0.00	0.00	1.10	13.00
Asset purchases	Asset purchases, announced (percent of GDP)	50	1.26	2.90	0.00	0.00	0.40	13.80
Asset purchases used	Asset purchases, used (percent of GDP)	50	0.92	2.02	0.00	0.00	0.30	8.20
Liquidity support	Liquidity support (percent of GDP)	50	5.97	10.82	0.00	0.29	7.87	57.54
Total capitalization	Private credit plus stock market cap (percent of GDP)	50	191.02	128.96	35.53	88.17	260.41	610.75
Market capitalization	Stock market capitalization (percent of GDP)	50	98.59	83.39	13.57	41.45	120.51	471.35
Trade	Sum of exports and imports (percent of GDP)	49	104.22	83.99	25.83	57.45	111.23	456.65
Public debt	Public Sector debt as of 2006 (percent of GDP)	50	48.02	26.54	1.67	29.53	65.92	106.50

Table 4. Correlations between financial dependence and policy intervention measures

This table reports country-level correlations between the median of financial dependence of firms in the country and country-level policy measures, with the *p*-value of statistical significance reported between brackets. For each firm, financial dependence is computed using US data for the period 1980-89. Fiscal policy is the change in the fiscal structural balance as announced for the period 2008-2010 normalized by GDP in 2008. Fiscal impulse corresponds to the sum of the variations in cyclically-adjusted primary balances (relative to potential GDP) over 2008-2010. Monetary policy is the absolute decrease in nominal interest rates between Sep 2008 and Mar 2009. Change in monetary base is the change in the money base (or reserve money) in percent of GDP. Recapitalization is announced amounts of bank recapitalizations as a percent of GDP. Recapitalization used is used amounts of bank recapitalizations as a percent of GDP. Guarantees is guarantees on bank assets plus guarantees on bank liabilities as a percent of GDP. Asset purchases is announced amounts of asset purchases as a percent of GDP. Asset purchases used is used amounts of asset purchases as a percent of GDP.

Policy intervention measure	Correlation with the median financial dependence of firms in the country
Announced fiscal impulse	-0.144
	(0.320)
Actual fiscal impulse	-0.054
	(0.712)
Monetary policy	0.076
	(0.600)
Change in monetary base	0.228
	(0.111)
Guarantees	0.175
	(0.225)
Recapitalization	0.023
	(0.877)
Recapitalization used	-0.026
	(0.859)
Asset purchases	0.190
	(0.186)
Asset purchases used	0.196
	(0.172)

Table 5. Government interventions, financial dependence, and real growth in value added

Dependent variable is the firm's real growth in value added during 2009 (in percentages). Size is the natural logarithm of the firm's total assets in 2008 expressed in millions of US dollars. Financial dependence is external financial dependence during 1980's. Announced fiscal policy is the change in the fiscal structural balance as announced for the period 2008-2010 normalized by GDP in 2008. Monetary policy is the absolute decrease in nominal interest rates between Sep 2008 and Mar 2009. Recapitalization is announced bank recapitalizations as a percent of GDP. Guarantees is guarantees on bank assets plus guarantees on bank liabilities as a percent of GDP. Asset purchases is asset purchases announced as a percent of GDP. All regressions include country and industry fixed effects (not included). Standard errors are corrected for clustering at the country-industry level. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Size	1.308***	1.316***	1.338***	1.334***	1.332***	1.330***
	(0.320)	(0.320)	(0.321)	(0.321)	(0.322)	(0.322)
Financial dependence × Announced fiscal impulse	1.094**			1.281**	1.292**	1.358***
	(0.511)			(0.513)	(0.518)	(0.523)
Financial dependence × Monetary policy		0.113		-0.0731	-0.0516	0.0675
		(1.093)		(0.978)	(0.983)	(1.015)
Financial dependence × Recapitalization			1.170**	1.335**	1.348**	1.289**
			(0.544)	(0.558)	(0.562)	(0.555)
Financial dependence × Guarantees					0.00537	0.00841
					(0.0148)	(0.0155)
Financial dependence × Asset purchases						0.513
						(0.562)
Observations	2,902	2,902	2,902	2,902	2,902	2,902
R-squared	0.139	0.138	0.139	0.140	0.140	0.140

Table 6. Alternative specifications

Dependent variable is the firm's real growth in value added during 2009 (in percentages). Size is the natural logarithm of the firm's total assets in 2008 expressed in millions of US dollars. Leverage is the debt to asset ratio of the firm. Fixed assets is the ratio of fixed assets to total assets of the firm. Initial value added is the natural logarithm of the firm's real value added in 2008 expressed in millions of US dollars. Financial dependence is external financial dependence during 1980's. Announced fiscal policy is the change in the fiscal structural balance as announced for the period 2008-2010 normalized by GDP in 2008. Monetary policy is the absolute decrease in nominal interest rates between Sep 2008 and Mar 2009. Recapitalization is announced bank recapitalizations as a percent of GDP. Asset purchases is announced asset purchases as a percent of GDP. Actual fiscal impulse is the fiscal impulse over 2008-2010 as a percent of potential GDP. Change in monetary base is the change in money base or reserve money between Sep 2008 and Mar 2009, as percent of 2008 GDP. Recapitalization used is bank recapitalizations used as a percent of GDP. Guarantees is guarantees on bank assets plus guarantees on bank liabilities as a percent of GDP. Asset purchases used is asset purchases used as a percent of GDP. Liquidity support is the change in central bank claims against financial institutions during Sep 2008 and Mar 2009 scaled by 2008 GDP. Regression in Column (1) includes firm leverage and fixed assets as additional firm-level control variables. All regressions include country and industry fixed effects (not included). Standard errors are corrected for clustering at the country-industry level. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Size	1.343***		1.340***	1.332***	1.332***	1.323***
	(0.323)		(0.321)	(0.322)	(0.322)	(0.323)
Leverage	-2.550					
	(2.912)					
Fixed assets	-9.355**					
	(4.748)					
Initial value added		0.442				
		(0.324)				
Financial dependence × Announced fiscal impulse	1.354**	1.374***		1.462***	1.458***	1.324**
	(0.528)	(0.531)		(0.514)	(0.537)	(0.524)
Financial dependence × Monetary policy	-0.0296	0.00482	-0.257		-0.0790	0.0893
	(1.006)	(1.074)	(0.949)		(1.074)	(1.021)
Financial dependence × Recapitalization	1.278**	1.228**	1.177**	1.379**		1.670**
	(0.555)	(0.577)	(0.548)	(0.560)		(0.683)
Financial dependence × Guarantees	0.0107	0.00957	-0.0207	-0.00107	0.00655	0.00744
	(0.0157)	(0.0157)	(0.0174)	(0.0228)	(0.0155)	(0.0156)
Financial dependence × Asset purchases	0.518	0.525	0.319	0.447		0.682
	(0.561)	(0.576)	(0.559)	(0.554)		(0.580)
Financial dependence × Actual fiscal impulse			1.264**			
			(0.497)			
Financial dependence × Change in monetary base				0.298		
				(0.482)		
Financial dependence × Recapitalization used					1.977**	
					(0.816)	
Financial dependence × Asset purchases used					0.419	
					(0.734)	
Financial dependence × Liquidity support						-0.294
						(0.233)
Observations	2,902	2,902	2,902	2,902	2,902	2,902
R-squared	0.142	0.134	0.141	0.141	0.141	0.141

Table 7. Other country characteristics

Dependent variable is the firm's real growth in value added during 2009 (in percentages). Size is the natural logarithm of the firm's total assets in 2008 expressed in millions of US dollars. Financial dependence is external financial dependence during 1980's. Announced fiscal policy is the change in the fiscal structural balance as announced for the period 2008-2010 normalized by GDP in 2008. Monetary policy is the absolute decrease in nominal interest rates between Sep 2008 and Mar 2009. Recapitalization is bank recapitalizations announced as a percent of GDP. Guarantees is guarantees on bank assets plus guarantees on bank liabilities as a percent of GDP. Asset purchases is asset purchases announced as a percent of GDP. Total capitalization is total financial sector capitalization computed as the sum of private credit to GDP and stock market capitalization to GDP in 2006. Market capitalization is stock market capitalization to GDP in 2006. Public debt is government debt to GDP in 2006. Regression 5 includes interactions between the country's growth in real GDP during the year 2009 and a full set of industry dummies. All regressions include country and industry fixed effects (not included). Standard errors are corrected for clustering at the country-industry level. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

| VARIABLES	(1) Financial development	(2) Market capitalization	(3) Trade	(4) Public debt	(5) Growth times industry effects
Size	1.340***	1.332***	1.323***	1.330***	1.267***
	(0.323)	(0.323)	(0.322)	(0.322)	(0.324)
Financial dependence × Announced fiscal impulse	1.301**	1.405***	1.278***	1.366***	1.833***
	(0.526)	(0.530)	(0.478)	(0.517)	(0.631)
Financial dependence × Monetary policy	-0.189	-0.0950	0.235	0.0764	0.570
	(1.014)	(0.984)	(1.077)	(1.013)	(1.030)
Financial dependence × Recapitalization	1.196**	1.487**	1.393**	1.289**	1.248*
	(0.565)	(0.585)	(0.574)	(0.554)	(0.665)
Financial dependence × Guarantees	-0.0330	-0.0315	-0.00782	0.00743	0.00774
	(0.0256)	(0.0251)	(0.0271)	(0.0201)	(0.0150)
Financial dependence × Asset purchases	0.112	0.195	0.448	0.517	0.537
	(0.607)	(0.585)	(0.562)	(0.563)	(0.557)
Financial dependence × Total capitalization	0.0295**				
	(0.0149)				
Financial dependence × Market capitalization		0.0350*			
		(0.0179)			
Financial dependence × Trade			0.0143		
			(0.0223)		
Financial dependence × Public debt				-0.00592	
				(0.0700)	
Observations	2,902	2,902	2,899	2,902	2,902
R-squared	0.141	0.141	0.140	0.140	0.156

Table 8. Other industry characteristics

Dependent variable is the firm's real growth in value added during 2009 (in percentages). Size is the natural logarithm of the firm's total assets in 2008 expressed in millions of US dollars. Financial dependence 8006 is external financial dependence during 1980-2006. Liquidity needs is computed as median ratio of inventories to sales during 2000-06. Working capital needs is computed using cash conversion cycle method as ratio of inventories to sales plus ratio of receivables to sales minus accounts payables to cost of goods sold, during 2000-06. The industry characteristics included in the regression variables are indicated below each column number. Announced fiscal impulse is the change in the fiscal structural balance as announced for the period 2008-2010 normalized by GDP in 2008. Monetary policy is the absolute decrease in nominal interest rates between Sep 2008 and Mar 2009. Recapitalization is announced bank recapitalizations as a percent of GDP. Guarantees is guarantees on bank assets plus guarantees on bank liabilities as a percent of GDP. Asset purchases is announced asset purchases as a percent of GDP. All regressions include country and industry fixed effects (not included). Standard errors are corrected for clustering at the country-industry level. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

VARIABLES	(1) "Industry characteristic"= Financial dependence 8006	(2) "Industry characteristic"= Liquidity needs (working capital I)	(3) "Industry Characteristic"= Working capital needs (working capital II)
Size	1.342***	1.312***	1.319***
	(0.323)	(0.320)	(0.321)
"Industry Characteristic" × Announced fiscal impulse	1.824**	-11.46	0.0990
	(0.892)	(7.493)	(4.502)
"Industry Characteristic" × Monetary policy	0.251	8.053	6.342
	(1.584)	(10.47)	(6.026)
"Industry Characteristic" × Recapitalization	1.668**	13.00**	7.535**
	(0.830)	(6.410)	(3.146)
"Industry Characteristic" × Guarantees	0.00748	0.305*	0.115
	(0.0232)	(0.173)	(0.110)
"Industry Characteristic" × Asset purchases	0.708	-6.005	0.495
	(0.786)	(6.941)	(3.421)
Observations	2,902	2,902	2,902
R-squared	0.140	0.141	0.140

Notes: Countries with amounts close to or equal to zero are excluded from the figures.
Source: WEO, Official Websites, IMF IFS, and authors' calculations.

Figure 2. Monetary and Fiscal Policies
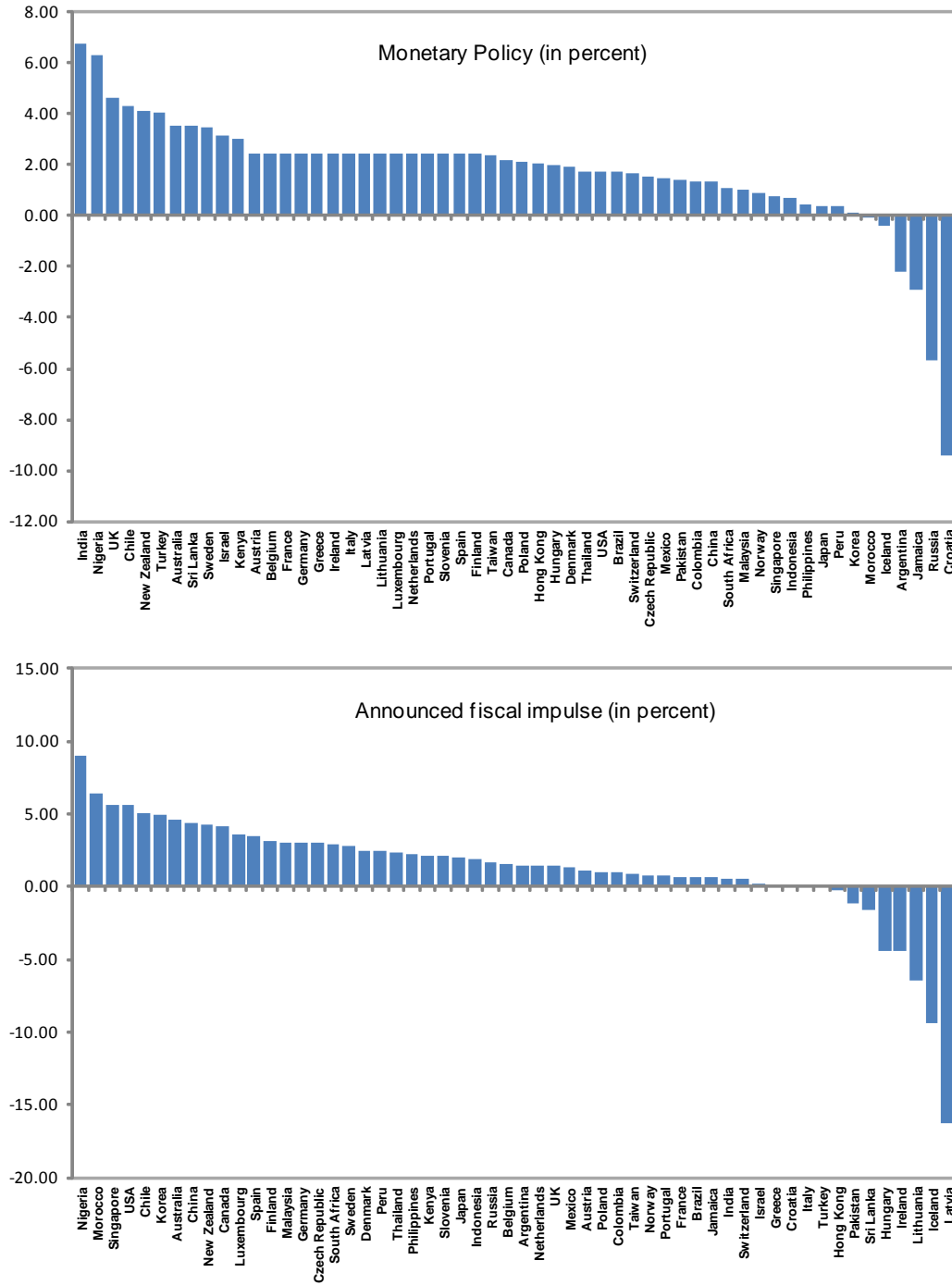
Notes: Monetary policy is the change in nominal short-term interest rates over the period September 2008 to March 2009. Announced fiscal impulse is the change in the fiscal structural balance as announced for the period 2008-2010 normalized by GDP in 2008, excluding fiscal measures that had been announced before the crisis as well as fiscal outlays associated with financial sector support packages announced during the crisis.
Source: OECD, WEO, Official Websites, IMF IFS, and authors' calculations.