How does financial market structure affect the impact of a banking crisis?

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HIGHLIGHTS

- The 2007 financial crisis hit industries more dependent on external finance harder.
- The negative impact was larger in countries with a more leveraged financial sector.
- The depth of financial markets did not affect the impact of the financial crisis.

ARTICLE INFO

ABSTRACT

We find a more negative impact of a financial crisis on growth of industrial sectors in developed countries that are more dependent on external finance, also when controlling for omitted variables by including country–time, industry–time and country–industry fixed effects. This differential effect is stronger in countries with a more leveraged financial sector, while it is unaffected by the depth of financial markets.

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1. Introduction

Banking crises are followed by long and deep recessions. One explanation is that banks reduce lending in response to shocks to their equity capital, which increases firms' costs of external financing and thus reduces firms' growth. A shock to the banking sector therefore hits firms harder the more they rely on external finance (Rajan and Zingales, 1998). In addition, we expect the structure of the financial sector to matter. A shock should hit more leveraged banks harder, because their equity capital is depleted faster, while large stock markets may cushion the shock, because they provide an alternative source of funding.

To investigate these hypotheses, we study how the vulnerability of industrial sectors is influenced by these sectors' dependence on external finance and how the effect changes with the importance of the banking sector, the fragility of banks in terms of leverage, and the deepness of financial markets.

We exploit two sources of exogenous variation. First, following Rajan and Zingales (1998) we assume that an industry's need for external finance is determined by structural characteristics of that industry and is therefore common for an industry across countries and over time. Rajan and Zingales argue that this dependency can be measured using data from the market with the smallest financial frictions, the US, a measure which is not affected by differences in financial market structures and industry characteristics between countries.

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Second, we identify the impact of financial market structure on industry growth by treating the 2007–2008 financial crisis as an exogenous shock to credit supply. The drop in demand associated with the crisis in these and later years is controlled for by using fixed effects for industry–year and country–year pairs.

Our data sample contains 68 industries from 29 OECD countries for the period from 2002 to 2009. We use two measures for an industry's dependence on external finance. First, the original Rajan and Zingales (1998) measure, defined as capital expenditures minus cash flows from operations divided by capital expenditures for industries in the United States. It measures the proportion of capital investment that is not financed by internal cash flows. Second, a measure introduced in Raddatz (2006), defined as inventories over sales. It measures the need for short-term liquidity, which is often provided through credit lines with banks. We consider three indicators for financial market structure: (1) the level of bank credit to the private sector, (2) the leverage ratio of banks, and (3) the total value of shares traded relative to GDP.

We find that industries that are more dependent on external finance or that have higher short-term liquidity needs were hit harder during the 2007–2008 financial crisis. Leverage turns out to be especially important in this respect: a credit crunch hits more financially dependent industries harder in those countries where banks were more fragile due to higher leverage. The impact is unaffected by the depth of financial markets.

Our paper relates to several studies. Dell'Ariccia et al. (2008) show that banking crises cause lower growth in more financially dependent industries. Kroszner et al. (2007) find that the negative impact of banking crises on financially dependent industries is larger in more financially developed countries. Importantly, both papers find no significant effects for developed countries. In contrast to these papers, we do find a significant and economically important effect for developed countries. Laeven and Valencia (2013) find that only bank recapitalization is effective as a policy intervention in response to the financial crisis. This falls in line with our result that financially dependent industries were hit harder in those countries where the banks were more leveraged.

2. Method

We estimate the following model

$$
\begin{aligned}
g_{cit} = {} & \alpha_{ci} + \beta_{ct} + \gamma_{it} + \gamma_1 \, C_{ct} \cdot DEF_i + \gamma_2 \, C_{ct} \cdot LN_i \\
& + \delta_1 C_{ct} \cdot DEF_i \cdot Z_c + \delta_2 C_{ct} \cdot LN_i \cdot Z_c \\
& + \mu \, SIZE_{ci,t-1} + \varepsilon_{cit}.
\end{aligned}
\tag{1}
$$

Here g_{cit} is the growth rate of industry i in country c during year t; α_{ci}, β_{ct} and γ_{it} denote country–industry, country–year and industry–time fixed effects; and C_{ct} is a crisis dummy with $C_{ct} = 1$ for $t = 2009$ and $C_{ct} = 1/4$ for $t = 2008$ (because the actual crisis started in the last quarter of 2008) if country c experienced a banking crisis according to Reinhart and Rogoff (2009) and Laeven and Valencia (2013).[2] DEF_i is the long-term dependence on external finance, LN_i stands for the short-term liquidity needs, and $SIZE_{cit}$ is the logarithm of the relative size of and industry $SIZE_{cit} = \ln(\text{value added}_{cit}) - \ln(\sum_j \text{value added}_{cjt})$. In line with the literature we include the relative size because larger industries are expected to grow slower due to convergence.

In addition, we include

$$
Z_c = [CREDIT_c \ VTRAD_c \ LEV_c] \tag{2}
$$

where regressors Z_c are measured in 2007. In robustness checks we also use 2006. CREDIT is the credit extended by financial intermediaries to the private sector relative to GDP, see e.g., Levine et al. (2000) and Beck et al. (2000b). VTRAD is value of shares traded relative to GDP, see e.g., Levine and Zervos (1998). LEV is leverage of depositor banks in a country defined as total assets over capital plus reserves.

3. Data

The measure of dependence on external finance and of liquidity needs is taken from Raddatz (2006). The industry data on value-added comes from INDSTAT, 2013 edition. We use the years 2003–2009, after the Asian financial crisis and the dot-com bubble. For later years, the sample is still very incomplete. The current version of INDSTAT uses ISIC Rev. 3 classification. We follow ISIC Rev. 2 classification, for which DEF and LN measures are available. Rev. 3 is more detailed, therefore we make a one-to-many correspondence from Rev. 3 to Rev. 2 and then aggregate INDSTAT data over Rev. 2 industries.

We deflate the nominal value-added on a country basis using a GDP deflator from the World Bank, and then compute the real growth rates. In our base-line regression we drop the top and bottom 2.5% of industry growth rates.

Data on total value traded in stock markets relative to GDP come from World Bank's WDI and GDF database. Leverage is computed as a ratio of total bank assets to capital plus reserves, using data from the ECB, OECD Bank Profitability Statistics, the Central Bank of the Republic of Turkey, and the Reserve Bank of Australia. Private credit comes from the Database of Financial Development and Structure (Beck et al., 2000a). We normalize the following regressors to a unit interval: DEF, LN, CREDIT, VTRAD, LEV.

4. Results

Table 1 presents our estimation results for Eq. (1). The first two columns, where we only include the interaction term of our crisis dummy with credit to the private sector, includes fixed effects for country–industry and country–year combinations. In the other regressions we also include industry–year fixed effects.

Column (1) reports the results from regressing the production growth on the lagged industry size and on Rajan and Zingales' measure of dependence on external finance. The results show that the industries with higher dependence on external finance experienced relatively lower growth rates after the onset of the crisis. The coefficient on lagged industry size has a negative sign implying that larger industries tend to grow slower.

In column (2) shows the relation between value-added growth and liquidity needs. In line with the results in column (1) we find that industries with higher liquidity needs exhibit a larger reduction in value-added growth since the onset of the crisis than industries with smaller liquidity needs.

In column (3) and (4) we add an interaction with financial market structure for the two indicators of long-term and short-term dependence separately. In column (5) we include all variables.

Together, these columns show several things. First, the shock caused industries with higher long-term dependence on external finance to grow slower in countries with more leveraged financial sectors. Second, the shock hit industries with higher short-term dependence on external finance harder in countries with more leveraged financial sectors. These results are consistent with the hypothesis that banks with high leverage are more vulnerable to shocks. Third, industries with higher short-term dependence on external finance are less impacted by the crisis in countries with a higher level of credit to the private sector. This suggests that for

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[2] These two classifications are the same except for Sweden (which did experience a borderline banking crisis according to Laeven and Valencia).