



## Firm dynamics and financial development

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### ABSTRACT

Using comprehensive firm-level datasets, this paper studies the impact of cross-country variation in financial market development on firms' financing choices and growth. In less financially developed economies, small firms grow faster and have lower leverage than large firms. As financial development improves, the growth difference between small and large firms shrinks, while the leverage difference rises. The paper then develops a quantitative model where financial frictions drive firm growth and debt financing through the availability of credit and default risk. The model explains the observed cross-country variations in firm size, leverage and growth in response to changes in financial frictions.

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### 1. Introduction

Financial restrictions can hinder firms' ability to use inputs efficiently and affect firm growth. Recent theoretical models of firm dynamics predict that limited credit makes inefficiently small and young firms grow faster than large firms.<sup>1</sup> However, evidence for the magnitude of these effects in actual firm-level data is scarce.<sup>2</sup> The central goal of this paper is to use cross-country variation in financial market development to evaluate empirically and quantitatively the impact of financial frictions on firms' financing choices and growth rates with firm-level datasets.

Consider two countries with varying financial market development: the United Kingdom and Bulgaria. Fig. 1 plots the growth–size and leverage–size relations for firms in the two countries.<sup>3</sup> In both countries, small firms grow faster than large firms, but the difference in growth rates is larger in Bulgaria with worse financial market development. The difference in leverage ratios across firms and countries is striking. Small firms in Bulgaria have lower leverage ratios than large firms, whereas in the United Kingdom the relation is reversed.

This paper documents that these patterns of financial development with firm size, growth and leverage are robust across many countries. We use comprehensive firm-level data from 27 European countries and focus on the *relative* behavior of firms of different sizes across countries with *varying* financial development, as indicated by the ratio of private credit to GDP, the banks' overhead costs relative to assets, and the coverage of credit information for consumers and firms.

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<sup>1</sup> Cooley and Quadrini (2001), Albuquerque and Hopenhayn (2004), Quadrini (2004), Clementi and Hopenhayn (2006), and DeMarzo and Fishman (2007), among others.

<sup>2</sup> Two exceptions are Huynh and Petrunia (2010) and Midrigan and Xu (2010), who document for Canadian, Colombian, and Korean firms that financial factors, such as leverage, impact growth rates for new firms.

<sup>3</sup> Growth is measured by annual sales growth, leverage is measured by the ratio of total debt to total assets, and size is measured by five asset quantiles. For more details on these definitions see Section 2.

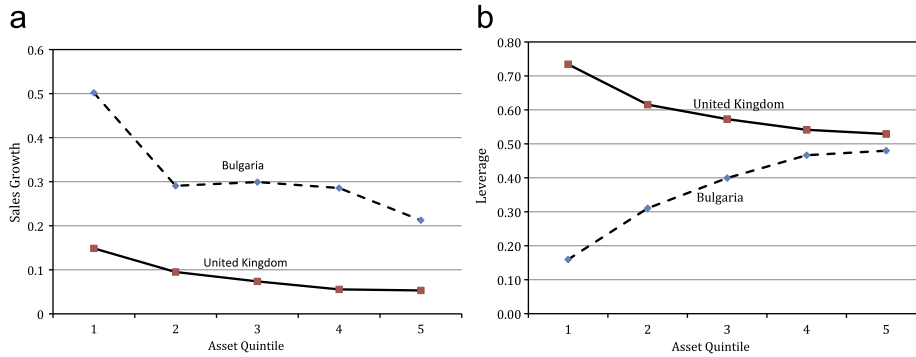


Fig. 1. Firm size, leverage and sales growth. (a) Size and growth. (b) Size and leverage.

Consistent with theories of financial frictions, small and new entrant firms grow disproportionately faster than large and mature firms especially in less financially developed countries. Small firms also tend to have lower leverage ratios than large firms on average. However as financial markets improve, the leverage ratio of small relative to large firms increases, although by less for new entrant firms. The relations among size, growth, leverage and financial development are not only statistically significant but also economically important. For example, consider a 120 percentage points difference in the ratio of credit to GDP as found between the United Kingdom and Bulgaria. The difference in growth rates between two firms with assets equal to 1% and 0.01% of the economy's assets is 54 percentage points across these two economies. Importantly, all these findings are robust to controlling for country, industry, or age-specific characteristics.

The paper then develops a model to highlight the mechanisms that link firm growth to financial conditions, and perform a counterfactual exercise as well as a quantitative assessment of the theory. Credit restrictions arise in our model because firms can default and lenders incur a fixed cost when issuing debt. A large fixed credit cost induces high default risk, and in turn limits credit, which proxies a low degree of financial market development. Debt is restricted disproportionately for small firms in less financially developed economies and these restrictions make their scale inefficient. These small firms grow faster because they can expand their scale. Modeling financial frictions with a fixed credit cost allows the model to account for the empirical findings that small firms in less financially developed economies have disproportionately less debt financing and higher growth rates.

The framework is a dynamic stochastic model where firms use a decreasing returns to scale technology to transform capital into output and face uncertain productivity. They finance investment and dividends with debt and profits and have the option to default on their debt. Firms face debt schedules that encode their default risk net of any recovery value as well as the economy wide credit cost. These schedules impact firms' debt financing and capital choices. Increasing debt is useful for financing investment and dividends, but larger loans are costly because of higher default risk. Hence, firms prefer to shrink their size and become inefficiently small to avoid excessively large loans, especially after a history of low shocks. However, small loans are costly due to the fixed credit cost. Small firms that are particularly financially constrained prefer to shrink even more to avoid credit markets completely.

The firm-specific debt schedules together with the dynamics of debt determine firms' size, growth, and leverage. Small firms are more likely to be inefficient in scale because they face more restricted schedules or are closer to their borrowing limits. Small firms grow faster in response to good shocks because they use the additional output to increase their scale to a more efficient level. In terms of leverage, small firms have on average low leverage due to their tight constraints and the fact that they avoid borrowing at all. In economies with better financial development, loans become more accessible and small firms can respond to low productivity shocks by building up debt and hence leverage. Moreover, with better financial development, small firms have more efficient scales, which implies that growth rates are more equal among all firms.

The paper quantitatively evaluates the model implications in rationalizing the cross-sectional financing and growth patterns jointly. The calibration uses the firm-level data of Bulgaria and chooses parameters capturing the financial frictions to match the averages and standard deviations of growth and leverage. The calibrated credit cost relative to loan equals 1.3%. The calibrated model can account well for the observed variation in leverage across firms but it overestimates the variation in growth rates. Nevertheless in the model as in the data, small firms have higher growth rates and lower leverage ratios.

With the calibrated model, the paper analyzes the consequences of improving the development of financial markets in Bulgaria by reducing the credit cost to zero. Consistent with the data, following this experiment the size–leverage relation and the size–growth relation becomes flatter. In particular, the difference in growth rates between small and large firms declines from 57% to 8%, and the difference in leverage ratios increases from  $-32\%$  to  $-5\%$ .

Varying financial markets also has a differential effect on the growth and leverage of entrant versus incumbent firms. The model predicts that in less financially developed economies, the relation of size and growth is more negative and the relation of size and leverage is more positive for entrants than for incumbents. For economies with better financial

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