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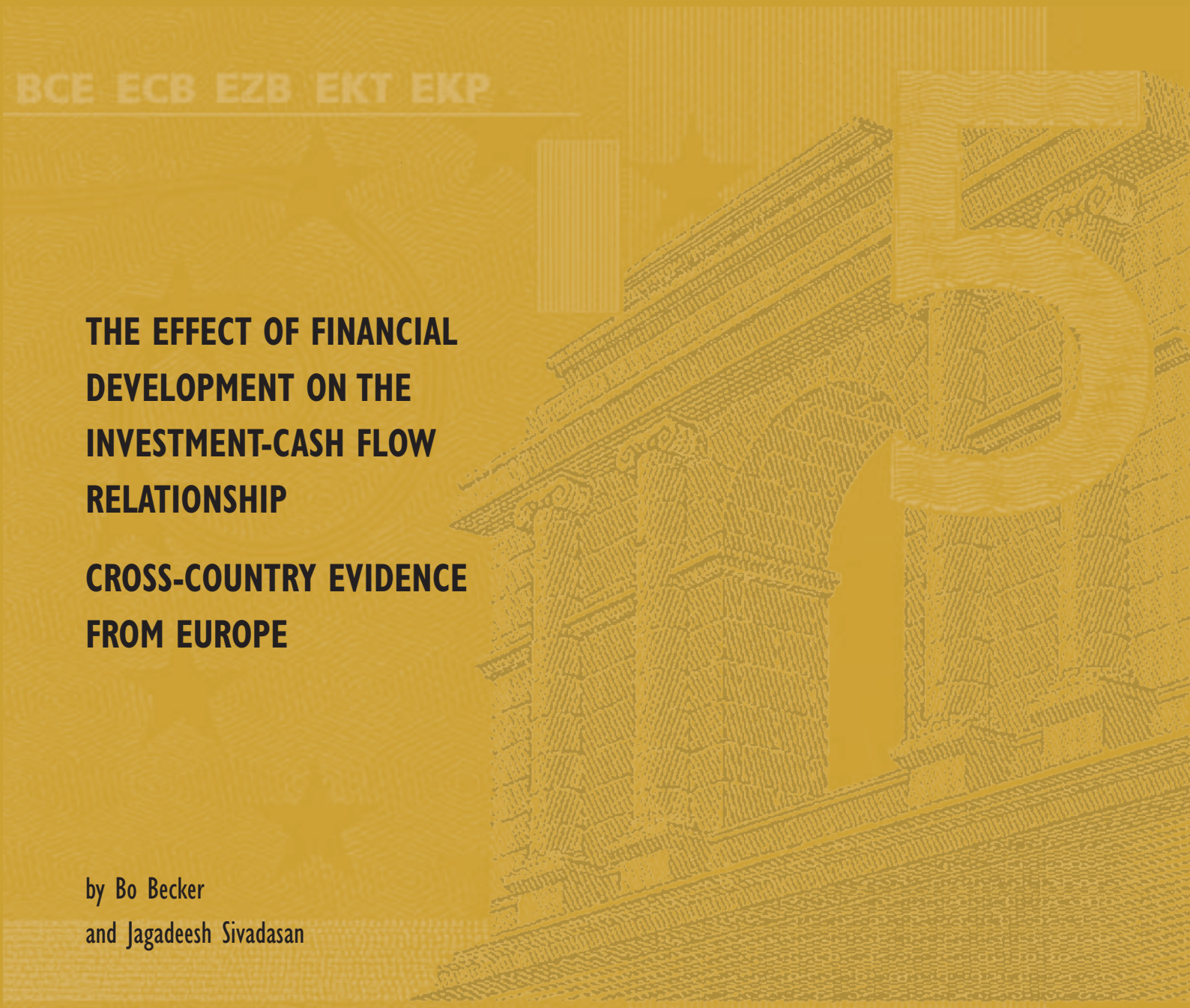

THE EFFECT OF FINANCIAL DEVELOPMENT ON THE INVESTMENT-CASH FLOW RELATIONSHIP

CROSS-COUNTRY EVIDENCE FROM EUROPE

by Bo Becker
and Jagadeesh Sivadasan

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CONTENTS

Abstract We investigate financing constraints in a large cross-country data set covering most of the European economy. Firm level investment sensitivity to cash flow is used to identify financing constraints. We find that the sensitivities are significantly positive on average, controlling for country and industry fixed effects, as well as firm level controls. Most importantly, the cash flow sensitivity of investment is lower in countries with better-developed financial markets. This suggests that financial development may mitigate financial constraints. This effect is weaker in conglomerate subsidiaries, which are likely to have access to internal capital markets and depend less on the outside financial environment, and possibly for firms in industries with highly liquid assets as well. This result sheds light on the link between financial and economic development.

JEL Codes: E22, E44, G31, L10.
Key words: Financial Constraints, Investment, Europe, Financial Development

Non-technical summary

A large research literature has established that firms tend to invest more when they have more internal resources available. This has been interpreted as a sin that external finance is not available for all firms at all times (at least not on attractive terms). Firms whose investment is limited because of a lack of internal resources and a lack of access to external financing are referred to as "financially constrained". Our research compares financial constraints across European countries. We examine companies of various sizes in a large cross-country data set covering most of the European economy. As is standard in the literature, we identify financial constraints with investment to cash flow sensitivity at the firm level, i.e. we take firms in a country to be more financially constrained if their investment responds more to internal cash flow (than that in other countries). In line with the previous literature, we find that the sensitivities are significantly positive on average, meaning that firms invest more when internal resources are plentiful. This holds when we control for country and industry effects, as well as firm characteristics.

Most importantly, the cash flow sensitivity of investment is lower in countries with better-developed financial markets. Countries such as Switzerland and the Netherlands (which rank high on both our measures of financial development) exhibit a lower impact of firm cash flow on investment, on average, than countries such as Hungary, Finland and Italy (which rank relatively low). This suggests that financial development reduces the impact of financial constraints, presumably by allowing easier access to external finance for those firms that need it.

Conglomerate subsidiaries have access to internal capital markets (i.e. transfers from the parent company) and therefore depend less on outside finance. It is therefore predicted that they should face lower financial constraints, and, consequently, benefit less from financial development, than free-standing firms. Indeed, we find that the effect of financial development is weaker in conglomerate subsidiaries. This supports the theory that financial development reduces constraints to outside financing. Our results shed light on the link between financial and economic development, and provides a mechanism for how financial development may help economic growth.

1. Introduction

Recent research has emphasized that firm heterogeneity in productivity is substantial, even within narrow sectors, and that productivity variation within industries is important relative to cross-industry differences. Firm- and plant-level evidence shows that the reallocation of capital from less productive to more productive establishments plays a significant role in accounting for aggregate productivity growth.[1] The research has proved that resource allocation across firms is an important determinant of aggregate (or average) productivity and reallocation is an important driver of productivity growth. There are ample reasons to suspect that the allocation and reallocation of resources across firms is affected by input market contracting. For example, Bertrand, Schoar and Thesmar (2004) show that bank deregulation in France changed the allocation of credit toward profitable firms and firms with good investment opportunities.

This study compares investment constraints across European countries, allowing us to identify some institutional factors that affect investment constraints. We use a firm-level data set across 38 European countries (of which 21 have the required country-level data and are used in regressions). We adopt the broad methodology originally suggested by Fazzari, Hubbard and Petersen (1988), who proposed that positive coefficient on cash flows to assets in a regression of investment on cash flow and market to book value (Q) suggested presence of financial constraints. [2] Because we focus on a large number of firms without stock prices (since these are unlisted) and hence without data on Q, we attempt to control for investment opportunities with alternative controls. We use two alternative sets of controls, one based on an Euler equation and one based on introducing a dynamic error structure to a static capital demand equation. These specifications are drawn from the literature examining the investment

[1] See Bartelsman and Doms (2000) for a survey of research on firm-level productivity differences. See e.g. Davis and Haltiwanger (1996) about productivity growth and Foster, Haltiwanger and Krizan (1998) for an overview and evidence on both growth and levels. See Roberts and Tybout (1996) for non-US evidence.

[2] All our results should be interpreted keeping in mind important critiques of using cash flow sensitivity of investments as a proxy for financial constraints. These critiques are discussed in more detail in Section 1.1.

behavior of unlisted firms (and are especially close to the specifications in Bond, Elston, Mairesse and Mulkay (2003)).

We find that in our dataset there is a strongly positive coefficient on the cash flow, suggesting the presence of financial constraints. We also find that the cash flow sensitivity of investment is lower in countries with better finance, which suggests that investment is less likely to be constrained in countries with better financial development. In other words, better input markets reduce the dependence of firms on internal resources. This finding is consistent with Demirgüç-Kunt and Maksimovic (1998) who show that fewer firms are constrained in countries with better financial systems. Our results extend the Bond et al (2003) study to larger sample of countries, and our results suggest a somewhat different effect of financial development on firm-level investment behavior.[3]

We undertake a number of additional robustness checks and extensions of our basic results. First, we examine the cash-flow sensitivity and the role of financial development on the investment behavior of conglomerate firms. We find that conglomerate firms, which have access to internal capital markets, show lower cash flow sensitivities of investment. Further, we find that better financial markets have weaker influence on financial constraints for conglomerate firms. This is what could be expected if conglomerates indeed ameliorate cash flow constraint at their subsidiary firms through reallocation of capital through an internal capital market (though there may still be constraints on group level investment).

Second, we examine if our results are driven by the presence of firms in the financial services and real estate sectors, where measured investment behavior could be driven by a number of factors specific to the industry. These firms comprise only a small fraction of our total sample and we find our results robust to the exclusion of these firms.

Third, we check if our results are driven simply by broad differences in investment behavior for Eastern European firms, by examining the basic regressions separately for Western

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[3] Bond et al (2003) cautiously interpret their findings of a higher coefficient on cash flows for the United Kingdom as suggesting that "the market oriented financial system in the United Kingdom performs less well in channeling investment funds to firms with profitable investment opportunities than do the continental European financial system". They caution that their results could be subject to other interpretations. Our findings suggest that a better developed banking and bond market may in fact help to reduce the dependence of firms on internal finances for undertaking investments.

and Eastern European firms. The identification of the effects we are interested in is weakened by the reduction of sample sizes, especially for Eastern Europe – we are left with only seven countries in Eastern Europe. Our findings provide no evidence for differences in the importance of financial development between East and West.[4]

Fourthly, we examine investment behavior of firms in industries with highly liquid assets vs. industries with less liquid assets. The expected effects are somewhat ambiguous. On the one hand, firms with liquid assets are more likely to be able to use their assets as collateral for external financing. Their financial constraints are therefore perhaps less related to financial development and financial sophistication. On the other hand, Myers and Rajan (1998) suggest that banks may be more reluctant to lend to firms with highly liquid assets as they may fear that managers could more easily manipulate assets in these industries. To test these ideas, we use a liquidity ranking of industries based on US data on asset trades by industry, which we assume is applicable to the same industries in Europe. Our results suggest, tentatively, that firms in industries with less liquid assets may benefit more from financial development.

The rest of the paper is organized as follows: Section 1 presents related research, section 2 discusses our theoretical predictions, Section 3 discusses data sources the sample and Section 4 presents the baseline results. In Section 5 we examine extensions of the baseline specifications and conduct some robustness checks. Section 6 concludes.

2. Background and literature

The closest paper to this is Demirgüç-Kunt and Maksimovic (1998) who find that countries with better financial development see relatively more firms growing faster than predicted by internal accounting data. There are several differences. We use firm level data in our main regressions, rather than country averages. This difference in methodology means that we exploit more variation in the data, at the cost of some added complexity. We also make different assumptions on firm growth and investment in order to identify the effect of external finance. Most importantly, we study the effect of internal cash flow on investment, rather than the fraction of firms growing faster than predicted. In that sense, we extend Demirgüç-Kunt and

[4] We also undertook a country-by country analysis of investment, and results here confirmed our findings (see Appendix).

Maksimovic's results: better financial development not only helps some firms grow faster, it also particularly helps firms which are likely to be financially constrained.

2.1. Cash flow sensitivity of investment

We use the sensitivity of investment to cash flow as a measure of the frictions involved in the allocation of resources to firms as first suggested by Fazzari, Hubbard and Petersen (1988). They argued that if external financing is available without frictions and at zero cost, a firm's investment should be determined only by its investment opportunities, not by its internal resources. Empirically, Fazzari et al argue that Q (market value of equity over book value) captures investment opportunities and that cash flow captures internal resources. They find that cash flow often predicts investment, but that Q often does not. Importantly, non-dividend paying firms in the US (Fazzari et al) and firms in Japan not affiliated with a Keiretsu business group (Hoshi, Kashyap Scharfstein 1991) exhibit higher correlations between cash flows and investment than other firms. This is consistent with these firms being more constrained than others.[5]

A large literature has followed these early findings (see e.g. Bond and van Reenen (2006) for a recent survey), attempting to use cash-flow sensitivity as a sign of financial frictions. However, concerns have been raised about the validity of the methodology. In an influential paper, Kaplan and Zingales (1997) make two points. First, they argue that the theoretical predictions are more ambiguous than Fazzari et al suggest. Second, they argue that empirically, dividend payers are not necessarily less constrained than other firms. These critiques have been expanded and developed. For example, Alti (2003) shows that young firms will naturally have less informative Q than more mature firms (because of their skewed future payoffs). Young firms' investment may be correlated with cash flow not because they are constrained but because their cash flow contains information about short term investment opportunities beyond Q. Abel and Eberly (2002) make a related point: small, fast-growing firms may exhibit cash flow sensitivity because their Q does not quite capture investment opportunities, even if their financing is frictionless. Gomes (2001) also suggest that Q will not properly capture underlying shocks. All these papers imply that non-zero coefficients cannot necessarily be interpreted as

[5] See e.g. Campello (2004) for more recent evidence from US banks.

evidence of constraints. Note, however, that Gomes does find consistently higher cash flow coefficients when constraints are higher (table 5, 9, 15).[6]

Given these important critiques, we will not focus on the existence of positive cash flow coefficients per se, but instead test whether they systematically vary with levels of financial development. We are essentially testing if some countries have higher sensitivity of investment to cash flow because their markets for external capital provision are less well developed. We do not compare firms, as much of the previous literature does, but countries. Interpreting higher cash flow sensitivities in a country as a negative effect of worse financial development is less ambiguous.

Perhaps the most closely related paper in this group is Bond et al. (2003) which studies the role of cash flow in investment equations for European firms from four countries. Like us, they study the differences in cash flow coefficients across countries. We extend their methodology of comparing countries, but because we have a larger sample with more countries, we can do this more rigorously, i.e. we test formally whether cash flow coefficients are related to measures of financial development.[7]

2.2. Firm size distributions, entry and exit

Our paper is related to evidence on how growth, entry and exit depends on frictions and institutions in Europe. Using a similar data set, Klapper, Laeven and Rajan (2003) show that financial development and labor regulation as well as entry regulation affect entry rates across

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[6] See also Moyen (2004), who shows that financing constraints may generate data similar to Fazzari et al's and later findings.

[7] The Bond et al paper also undertakes a careful GMM based estimation of the regression specifications. Our investigations of different GMM specifications yielded highly imprecise and noisy results across specifications -- the GMM approach appears to demand too much of our data. (Also given our large data sizes, GMM estimations are extremely resource and time intensive, even when run separately country-by-country). Since we focus on differences in cash flow/profitability coefficients across countries, we expect any endogeneity issues biasing coefficients up or down to not be a severe issue insofar as the amount of bias is uncorrelated with financial development. This expectation is supported by results in Bond, et al (2003) – while they get different coefficients for variables across GMM and within group specifications, their conclusion about which countries have the higher coefficient is unchanged.

Europe. Scarpetta, Hemmings, Tressel and Woo (2002) also show that rates of entry and exit at the national level are affected by regulation. Since entry and exit decisions take place mostly at the bottom of the size distribution, our results are somewhat different in that they look at investment, i.e. at already existing firms. Desai, Gompers and Lerner (2003) show that political, legal and regulatory variables affect entry and exit in emerging markets (i.e. Eastern Europe) but not in Western Europe. They also show some that these variables impact average size and the skewness of size distributions. Kumar, Rajan and Zingales (2001) find that firm size is increasing in various measures of financial development. Our results concern the determinant of investment, i.e. growth, rather than static size distribution of firms.

2.3. Allocations

Our findings on cross-firm investment allocations are complementary to research on cross-industry investment allocations. The latter have been shown to respond more to productivity differences when external financial markets are more developed. In particular, Wurgler (2000) shows that the cross-industry allocation of investment is more responsive to sector-level productivity in countries with better developed stock markets. These findings are consistent with our results, but do not concern within-industry allocations (we analyze how investment depends on cash flow and productivity holding industry fixed).

2.4. Aggregate frictions

Finally, our results shed light on research establishing a link between input market frictions and aggregate economic performance (see King and Levine (1993) and Rajan and Zingales (1998) regarding financial markets; Besley and Burgess (2004) for labor markets; see also Blanchard and Giavazzi (2004) for a model of product and labor market frictions). We provide new evidence on the costs of financial frictions, suggesting a channel for these aggregate effects.

3. Predictions

In this section, we summarize the theory behind our empirical research design. We analyze investment-cash flow sensitivities and compare their magnitude across countries. First, we test if on average, cash flow has a positive correlation with investment after controlling for industry-time-country interaction fixed effects as well as firm level controls. This would

indicate some kind of constraints on the financing of firms or some kind of friction in financial markets.

In our tests, we will not use firm level Q (market to book value of assets) as a control. Measuring Q is problematic for listed firms, and for all practical purposes impossible for non-listed firms. Since our intent is to include the largest possible set of firms, we cannot hope to use Q. To some extent we are reassured by the general finding in the literature that firm Q generally has a weak relation with investment. However, we do attempt to mitigate the possible omitted variable bias from not controlling for investment opportunities by including firm level variables. We use two specifications, both based on Bond et al (2003).

The first specification is based on an Euler equation derived from a dynamic optimization model, assuming a quadratic adjustment cost. The model does not yield neat closed form solutions and ideally requires knowledge of the firm specific rental rate of capital. Following Bond et al, we substitute industry-year fixed effects and log output to capital ratio to proxy for the unobserved rental rates. The regression equation is:

$$I_{i,t} = \alpha_1 I_{i,t-1} + \alpha_2 I_{i,t-1}^2 + \alpha_3 (\log Y_{i,t-1} - \log K_{i,t-1}) + \alpha_4 ROA_{i,t-1} + \eta_{j,t} + \varepsilon_{i,t} \qquad (1)$$

where $I_{i,t,}$ is gross investment normalized by fixed assets by firm i in period t, ROA is EBITDA/Fixed Assets (same normalization as investment), $Y_{i,t-1}$ is lagged output, $K_{i,t-1}$ is lagged capital and $\eta_{j,t}$ denotes industry-year fixed effects. Note that ROA based on cash flow before interest and taxes (EBITDA), not net cash flow. The reason for using EBITDA is that it is predicted by the Euler equation to enter (negatively). A positive coefficient can then be interpreted as signifying financial constraints.[8] Hereafter we refer to the specification in Equation 1 as the Euler equation model.

The second model is derived by introducing second order (ADL (2,2)) dynamics into a static capital demand equation (obtained from profit maximization subject to constant returns to scale and a CES production function):

[8] Since the EBITDA variable is closely correlated with cash flow measures, the results from this specification could be expected to be similar to those using the more traditional cash flow variable (see specification below).

$$I_{i,t} = \alpha_1 I_{i,t-1} + \alpha_2(\log Y_{i,t} - \log Y_{i,t-1}) + \alpha_3(\log Y_{i,t-1} - \log Y_{i,t-2}) + \alpha_4 \text{ error} + \alpha_5 CF_{i,t} + \alpha_6 CF_{i,t-1} + \eta_{j,t} + \varepsilon_{i,t} \quad (2)$$

where It and Yt are as defined in equation 1 above, error stands for the error correction term ($\log K_{i,t-2} - \log Y_{i,t-2}$). Hereafter, we refer to the specification in equation 2 as the Econometric model.

We examine the effect of financial development on constraints for investments by interacting the ROA term (in the Euler equation model) and the CF term (in the Econometric model) with a proxy for financial development. A negative (positive) coefficient on the interaction term would be interpreted as a indicating a decrease (increase) in financial constraints with financial development.[9] In Section 5 below, we consider a number of extensions and robustness checks of our basic specifications.

4. Data

4.1. Amadeus

Our firm-level data is taken from Amadeus, a commercial database provided by Bureau van Dijk. It contains at least some financial information on over 7 million private and publicly owned firms across 38 European countries. The database includes up to 10 years of information per company and is created by collecting data from 35 information providers across Europe, generally the office of the Registrar of Companies, and standardizing it. We use a sample of larger firms, for which data quality and coverage is likely to be better than the smallest firms.

We use the 2004 edition of Amadeus for large and medium firms, including all firms with operating revenue of at least €1M, total assets of at least €2M and 20 employees or more (for the UK, Germany, France, Italy, Ukraine and Russia the number are €1.5M, €3M, and 20, respectively). This sample contains approximately 1.5M firms. We then limit our sample by

[9] In the appendix, we report results from running the basic specifications country-by-country and examining the coefficients against financial development. As discussed in the appendix, the regression of the estimated coefficients needs to adjust for the standard errors of the estimated cash flow coefficients. Since we cluster our standard errors at the country level, the standard error on the interaction specification implicitly adjusts for this.

imposing the restriction that value added, capital and sales or turnover variables must be available. The database includes firm-level accounting data in standardized format for balance sheet and income statement items. Despite EU harmonization and international convergence in accounting standards and practices, there are differences in the accounting and these transformed accounts should therefore be interpreted with some caution. We use gross investment, defined as {(Fixed Assets in year t) – (Fixed Assets in year t-1) + Depreciation (t)} divided by (Fixed assets in year t-1).

Our cash flow variable is net income plus changes in deferred taxes, normalized by fixed assets (the same normalization as that used for investment). Profits are defined as EBITDA normalized by total assets. The cash flow and profit variables were winsorized at 0.5% and 99.5% to eliminate effects from extreme outliers.

In addition to financial information, Amadeus also provides other firm-level information. We use firm-level employment to measure labor inputs. Second, Amadeus provides various industry classifications – e.g. national industry codes, 3-digit European industry classification codes (NACE) and US NAICS codes – which we use to classify firms and construct industry dummy variables. In our analysis, we use 4-digit NAICS codes to construct industry dummies, and also categorize all firms by a 2-digit level NAICS code for industry interaction terms (see below). We classify firms as belonging to a conglomerate if Amadeus reports an ultimate holding company id number.[10]

The regular Amadeus files do not include banks, but it does include other financial firms. As one of our robustness checks, we exclude all firms classified as belonging to NAICS 52 and 53 (both finance and real estate).

[10] Briefly, an ultimate owner is indicated as the largest shareholder company, if the largest shareholder company has at least 24.99% shareholding. If the immediate parent company is in turn owned by multiple companies, the ownership path is followed upward on the largest shareholding path. The upward trace is stopped when they reach a firm with no known single shareholder. Each trace upward is made only if a single shareholder has at least 24.99% holding. We only consider the existence of an ultimate owner, not that owner's identity.

4.2. Other data sources

Finance. The ideal measure of financial development would capture the ability of firms with good investment opportunities (positive NPV) to find outside financing in case of need. Such a measure is difficult to come by across many countries, so we use two alternative measures, each of which has its strengths and weaknesses. Our two measures focus on banks on the one hand, and banks as well as debt markets on the other. Based on the financial database of Beck, Demirgüç-Kunt and Levine (2001), we calculate the total volume of bank credit to the private sector, divided by GDP. The number refers to 1995, ahead of almost all of our Amadeus firm observations. Secondly, we use the market value of all outstanding bonds + private credit, normalized by GDP, as a measure of financial market development. This measure is also from Beck et al (2001). By taking these variables to represent finance, we disregard the role of outside equity. However, for almost all firms in our sample, outside equity is likely to be very limited. Furthermore, different measures of financial development are highly correlated across countries. We have tried using broader measures of finance, including equity markets, but find that our results are very similar.

Asset liquidity. We use an industry-level measure of asset liquidity. We use US data to avoid endogeneity issues. Using this measure as a proxy for liquidity assumes that industries rank similarly in the European sample in terms of asset liquidity. This seems fairly innocuous since technological features of assets are likely to be fairly similar across different (rich) economies, but we cannot verify that it is correct.

Our liquidity measure is defined as sales of PPE (plant, property and equipment) divided by net PPE, aggregated at the industry level (4-digit NAICS).[11] In order to make the measure capture time-invariant features of industry asset liquidity, we take averages for 1985-95, the ten years preceding the sample of firm data we use. Alternatively, we have used an average spanning the 1971-2004 period, maximizing the amount of data, which gives very similar results (not reported).[12]

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[11] We thank Efraim Benmelech for sharing this with us.

[12] We have also tried triple interactions of liquidity interacted with financial development and firm cash flow. The results are similar, but requires interpreting a larger number of coefficients.

4.3. Sample overview

Following the practice in the literature, we restrict the sample to those with strictly positive investment i.e. drop firm observations for which gross investment is negative. Also, to avoid outliers we eliminate observations for which CF/A is larger than ten.

Table 1 reports financial variables for each country. We report two measures: private credit (later called PCBank) and private credit plus bond market capitalization (PCBB). As expected, richer countries tend to have higher values for both measures. Also, Western European countries tend to have the highest values. The highest numbers, corresponding to the most developed banking systems, are for Switzerland (1.66), Germany (1.14), Sweden (1.17) and the UK (1.14). Including the bond market does not change the rankings much: the correlation between the measures is 0.88 and the rank correlation is 0.84. The levels are much higher in many countries, however, notably Switzerland (3.96), the UK (2.62) and the Netherlands (2.00).

Table 2 reports summary statistics across firms in our sample. We report three categories of variables: those used throughout, those used for the Euler equation model and those used for the econometric model. All-in-all there is about 1.9 million observations, though we often have fewer observations when all missing data is taken into account. The general variables are PCBank and PCBB, the conglomerate dummy, the number of employees, firm age and investment. Investment is 0.50 on average, and the median is 0.22. There is a tail of considerably higher values. This may seem large, but note that the sample excludes all negative investment firms. Average firm age is approximately 17 years and half the firms are less than 12 years old. For the Euler Equation model, we use the following additional variables -- squared investment, lagged capital intensity and ROA (EBITDA over fixed assets). Profitability averages 0.116 and has a median of 0.105. For the Econometric model, we also use the variables output growth, capital-output ratio and cash flow (after taxes and interest, normalized by fixed assets). Cash flow averages 0.589 and has a median of 0.304.

5. Results

This section presents the basic regression of investment on contemporaneous cash flow and controls. As pointed out above, we cannot control for Q because most companies in our sample are unlisted. To control for desired investment (in the absence of frictions), we therefore employ two regression specifications as described in Section 2 above. We refer to these as the

Euler equation model and the Econometric specification. For each table, we report two panels of results, one for each method.

Table 3 shows our basic regression: investment regressed on cash flow, firm level controls and country-industry-year dummies. For the Euler equation model, column (1) shows that cash flow enters with a positive and significant coefficient, which we interpret (subject to caveats discussed in Section 1.1) as reflecting financial constraints. The estimated effect on investment is small. Changing profits from the 25th to the 75th percentile implies that the right hand side variable is higher by 0.0448, i.e. investment is higher by 4.5% of fixed capital. Increasing profits by one standard deviation increases investment by about a tenth of a standard deviation. Column (2) repeats the same regression for the sample of firms for which we have financial development data. Column (3) includes an interaction of financial development and firm level profits, using the broader measure of financial development PCBB. The regression shows that profits have a muted impact on investment in countries with higher financial development: the interaction coefficient is negative and significant. The negative coefficient suggests that financial constraints are less severe when there is better financial development. This is our main finding. The magnitude of this effect is large, and suggests that moving from the 25th to the 75th percentile of financial development (across firms) will reduce the effect of profits by about 27% (from 0.088 to 0.064). Column (4) represents the regression for the subset for which there is financial development data for the more restricted measure of financial development (PCBank) and column (5) presents a regression with PCBank interacted with firm level profits. The interaction for this measure is significant (but less so than the previous interaction) and slightly larger in magnitude. Here, moving from the 25th to the 75th percentile of financial development is estimated to reduce the effect of profits by approximately three quarters.

The second panel presents similar results for the Econometric model. The effect of profits and cash flow in this specification is smaller but also highly significant, suggesting that financial constraints are significant. Importantly, the interaction with financial development is negative and significant for PCBB, here moving from the 25th to the 75th percentile of financial development reduces the effect of cash flow by approximately half. The result for PCBank is insignificant, i.e. in this specification, higher financial development does not reduce the cash-

flow sensitivity of investment. This is in contrast to the Euler-equation results using PCBank and the results for both models using PCBB.

6. Extensions and robustness

This section presents a series of extensions and robustness tests. We have also tried restricting the sample to those country-industry-year cells which include 20 observations or more, and found very similar results, confirming that our results are not driven by outlier industries, countries or years (not reported).

6.1. Conglomerates

Hoshi, Kashyap, and Scharfstein (1991) find that firms that form part of a conglomerate have lower cash flow-investment sensitivities.[13] We now test whether this is the case in our sample. Table 4, column (1) to (3), reproduce results from Table 3, i.e. our baseline specification, for both models.[14] In columns (4) to (6), we restrict the sample to conglomerate firms, i.e. firms which have a specified large shareholder which is also a firm. Profits and cash flow seem to matter less for these firms, which is consistent with such firms having access to internal capital markets, or facing lower financing constraints for some other reason.

Our results suggest that financial development helps conglomerate firms, but less than non-conglomerate firms. The interactions with financial development are significant in all cases, but always lower than for non-conglomerate firms.[15] On possible function of conglomerates is to finance investment using resources, reallocated through internal capital markets. If this makes individual divisions less dependent on the external finance, we expect financial development to

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[13] See also Campello (2004) regarding internal capital markets and investment. Note that we look at the effect of subsidiary level cash flow on investment at the subsidiary level; results could differ for the effect of firm-level aggregate cash flow on investment at the subsidiary or firm level (see e.g. Lamont (1997) regarding conglomerate level cash flows and firm investment).

[14] From this point on, in order to save some space, we suppress the estimated coefficients for control variables and report only the coefficients for cash flow and the cash flow interactions.

[15] The difference between conglomerates and the overall sample is significant at the 5% level in all cases except the Econometric model using PCBank (where the difference is barely significant at the 10% level).

matter less for divisions. Therefore this finding is consistent with the theory that financial development reduces financial constraints for firms that are more dependent on external capital markets.[16]

6.2. Excluding financial and real estate firms

Financial firms, as well as real estate firms, may have accounting data of a very different nature from other sectors which might affect results. While the Amadeus files do not contain banks, several firms are classified as belonging to NAICS 52 (Financial activities) or 53 (Real estate and rental and leasing). We exclude these firms, to make sure that they do not drive the main results of Table 3. In Table 5, we report profit and cash flow coefficients for the sub-sample without NAICS 52 and 53. The sample size is reduced marginally in both panels. The coefficients and significance is virtually unaffected by this exclusion, confirming that our results are general to the sample and not driven by the small number of financial firms and real estate firms.

6.3. Western versus Eastern Europe

Our sample covers the much richer Western European countries as well as the poorer Eastern countries. These have a much lower financial development as well as overall economic, regulatory, and political development. We now turn to a geographical split of our sample, to rule out the possibility that the financial development indicator matters simply because it separates Western European from Eastern European countries (Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Poland, Romania, Slovenia, and Ukraine). By separating the samples, we test in effect whether the Portugal-Germany difference or the Latvia-Czech Republic difference affect cash flow coefficients, ignoring any differences between east and west.

Table 6 reports results allowing financial development to exert different effects in the two parts of Europe separately. Column (1) of both panels shows a regression with no interaction, recapping previous results. The rest of the regressions suggest two things. First, this

[16] As Wolfenzon and Almeida (2006) point out, conglomerates may reduce financial constraints for divisions but still make finance more restricted for the central corporation through equilibrium effects. Our results are quiet about this prediction since we only include divisions in the regression in Table 4.

does not change our main inference: in all cases (the Euler Equation model as well as the Econometric model, PCBB as well as PCBank) cash flow exerts a smaller effect on investment when financial development is better, as in out overall cases. Second, the evidence for a different effect in Eastern Europe is weak at best, with three insignificant interactions (Panel 1, column (3) and (5) as well as Panel 2 column (3)) and one significant (Panel 2 column (5)) of unexpected sign and unreasonable magnitude. However, this result must be interpreted with great care. We cluster standard errors by country, being as conservative as possible, but this means that we essentially have as many observations as we have countries (when we evaluate the significance of the financial development interactions). With seven countries in Eastern Europe, our t-tests are unreliable, and clustered standard errors may be untrustworthy. Considering the differences between East and West is therefore fraught with difficulty arising from data limitations. Overall, we conclude that financial development improves financial constraints on investment for the sub-sample of Western European countries and that Eastern Europe is not likely to be different.[17]

6.4. Asset liquidity

If firms are often financially constrained, this may affect behavior particularly in industries where assets are bad collateral. We might expect industries with plenty of assets suitable for collateralization to be much less affected. To test this, we compare industries with more or less liquid assets. The advantage of using industry characteristics, as opposed to estimated of actual firm asset liquidity, is that we do not have to worry about endogeneity. For example, perhaps firms in poor financial development countries chose to have more liquid assets (to cope with poor availability of external finance). They may be more financially constrained, but in fact look like they should be less (they have lots of liquid assets!). Using an invariant, industry-based measure gets around this. Our liquidity is exogenous to firms, so if firms in low liquidity industries react more to financial development, we can interpret this as a causal relationship with more confidence.

[17] Our results from undertaking a country-by-country analysis (see Appendix) confirm the general conclusion that investment constraints are lower in better developed financial markets. Subject to limitations of sample size, the result seems to hold true also for the sub-sample of Western European firms.

Regressions by asset liquidity group are presented in Table 7. We divide the sample by industry, based on our US data on used asset turnover. The sample of high liquidity firms are those in the industries with above the 50th percentile of US asset turnover rates. There are slightly more firms in the low liquidity sample because industries are of uneven size.

Table 7, column (1) of both panels shows a regression with no interaction, recapping previous results. In panel 1, presenting the Euler Equation model, liquidity interactions are insignificant. This suggests that liquidity is not important for cash flow constraints, neither directly not indirectly through the effect of financial development. Panel 2, presenting the Econometric model, does suggest a role for liquidity. In both column (3) and (5) the liquidity triple interaction enters significantly and negatively. This suggests that the ameliorating effect of financial development (i.e. financial development => internal cash flow matters less) is *weaker in high liquidity industries*. In other words, firms in low liquidity industries are more affected by financial development than firms in high liquidity industries, as predicted.

7. Conclusions

In frictionless financial markets, investment does not depend on internal cash flows. In a large European data set, we find that firms invest more on average when they have higher cash flow. We contribute to the literature by testing formally if the coefficient on internal resources (cash flow) is related to a country's financial development. Comparing countries, we find that the cash flow effect is indeed stronger in countries with weaker financial development. This suggests that financial constraints are strongest when financial development is low.

The effect is weaker inside conglomerates and is probably not driven by the East-West difference. This is consistent with the idea that conglomerates ease internal financial constraints. Industries with few low liquid assets may experience bigger benefits of financial development (i.e. the cash flow coefficient is reduced more by financial development in low liquidity industries). However, the evidence for this is mixed.

Our findings suggest that financial frictions operate in Europe. They suggest that financial development is beneficial because it reduces financial constraints at the firm level and therefore relaxes the correlation between internal resources and investment.

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Table 1 – Financial development across countries

This table summarizes two measure of financial development for sample countries. All numbers are averaged across available years for 1995-2003, and are taken from the Structural Database (Beck 2001). Private credit is the total value of credit from banks to the private sector, divided by GDP. Private credit & private bonds is the sum of private credit and total private bond market capitalization divided by GDP.

Country	Country Code	Private credit 1995-2003 average (PCBank)	Private credit plus private bonds 1988 (PCBB)
Austria	AT	.	1.33
Bosnia-Herzegovina	BA	.	.
Belgium	BE	.	1.24
Bulgaria	BG	0.06	.
Switzerland	CH	1.66	2.06
Serbia And Montenegro	CS	.	.
Cyprus	CY	.	.
Czech Republic	CZ	0.68	0.59
Germany	DE	1.14	1.68
Denmark	DK	0.33	1.79
Estonia	EE	0.24	.
Spain	ES	0.81	1.04
Finland	FI	0.51	0.81
France	FR	.	.
United Kingdom	GB	1.16	1.51
Greece	GR		0.46
Croatia	HR	0.38	.
Hungary	HU	0.23	0.29
Eire	IE	0.83	0.96
Iceland	IS	0.64	.
Italy	IT	0.57	1.01
Liechtenstein	LI	.	.
Luxemburg	LU	.	.
Latvia	LV	0.12	0.17
Monaco	MC	.	.
Macedonia	MK	.	.
Malta	MT	.	.
Netherlands	NL	0.70	1.82
Norway	NO	0.86	1.04
Poland	PL	0.22	.
Portugal	PT	0.88	1.29
Romania	RO	0.09	.
Sweden	SE	1.17	1.37
Slovenia	SI	0.29	.
Ukraine	UA	0.05	.

Table 2 – Summary statistics

Summary statistics for key variables for the basic models, the Euler equation model and the Econometric model. Investment is normalized by fixed assets in the previous year. PCBank is private credit and PCBB is private credit plus bond market capitalization, both divided by GDP. Cash flow is defined by Amadeus (the data sources) and corresponds to net income plus depreciation plus changes in deferred taxes.

Variable	N	Mean	St. Dev.	p10	p25	Median	p75	P90
PCBank	1,879,691	0.820	0.332	0.330	0.570	0.810	1.140	1.160
PCBB	1,879,691	1.454	0.661	0.750	0.930	1.370	1.570	2.620
Conglomerate dummy	1,834,346	0.165	0.371	0.0	0.0	0.0	0.0	1.0
Number of employees	2,111,378	172.7	2280.2	9.0	15.0	30.0	73.0	210.0
Firm age	2,401,227	17.198	17.917	3.0	6.0	12.0	22.0	37.0
Investment	1,128,477	0.500	0.908	0.029	0.083	0.220	0.518	1.132
Lagged Investment	813,484	0.511	0.914	0.031	0.089	0.230	0.535	1.156
Variables used in the Euler equation model								
Square of lagged investment	813,484	1.097	5.622	0.001	0.008	0.053	0.286	1.337
Lagged output to capital ratio	1,416,848	1.933	1.748	-0.063	1.016	1.986	2.990	3.930
Lagged ROA	1,292,284	0.78	1.45	0.02	0.17	0.41	0.93	2.09
Variables used in Econometric model								
Change in output	1,702,770	0.098	0.492	-0.163	-0.025	0.051	0.177	0.391
Lagged change in output	1,151,866	0.112	0.471	-0.139	-0.015	0.060	0.187	0.400
Twice lagged capital to output ratio (error correction)	954,973	-1.953	1.705	-3.908	-2.989	-2.002	-1.047	-0.011
Cash flow/capital	1,310,226	0.595	1.302	0.000	0.121	0.305	0.694	1.606
Lagged cash flow/capital	1,255,517	0.589	1.297	-0.001	0.120	0.304	0.689	1.588

Table 3 – Investment and cash flow: the effect of financial development

Dependent variable in all regressions is gross investment (normalized by assets). ROA is defined as operating cash flow over fixed assets, and cash flow is defined as cash flow after taxes and interest over fixed assets. PCBank is the average for the 1995-2003 period of the ratio of the total stock of credit to the private sector to GDP. PCBB is the average for the 1995-2003 period of the sum of private credit and total private bond market capitalization divided by GDP. Column 1 uses all observations. Column 2 and 6 uses observations only for countries for which the relevant financial development variable is available (in column 2, PCBB, in column 6, PCBank). Column 4 and 7 exclude Switzerland. All regressions include fixed effects for country-year-industry interactions. Standard errors are clustered by country-industry-year in column 1 and by country in other columns. A plus sign (+) denotes a significant coefficient at the 10% level, one star (*) denotes significance at the 5% level, two stars at the 1% level.

Euler equation model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	All obs.	PCBB sample	PCBB sample	Excluding CHE	PCBank sample	PCBank sample	Excluding CHE
Lagged investment	**0.161****	**0.159****	**0.158****	**0.158****	**0.161****	**0.16****	**0.16****
	[0.003]	[0.014]	[0.014]	[0.014]	[0.011]	[0.011]	[0.011]
Lagged investment squared	**-0.017****	**-0.017****	**-0.017****	**-0.017****	**-0.017****	**-0.017****	**-0.017****
	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]
Lagged output-capital ratio	**0.131****	**0.134****	**0.131****	**0.131****	**0.132****	**0.129****	**0.129****
	[0.002]	[0.008]	[0.009]	[0.009]	[0.006]	[0.007]	[0.007]
Lagged ROA	**0.059****	**0.062****	**0.122****	**0.122****	**0.059****	**0.098****	**0.098****
	[0.002]	[0.015]	[0.018]	[0.018]	[0.010]	[0.013]	[0.013]
Lagged ROA x PCBB			**-0.037****	**-0.037****			
			[0.011]	[0.011]			
Lagged ROA x PCBank						**-0.096****	**-0.096****
						[0.026]	[0.026]
R-squared	0.12	0.13	0.13	0.13	0.12	0.12	0.12
Observations	639,205	468,832	468,832	468,345	636,642	636,642	636,053
Number of clusters	12,200	21	21	20	18	18	18

Table 3 continued

Econometric model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	All obs.	PCBB sample	PCBB sample	Excluding CHE	PCBank sample	PCBank sample	Excluding CHE
Lagged investment	**0.005**	**0.001**	**0.001**	**0.001**	**0.006**	**0.006**	**0.006**
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
Change in output	**0.26****	**0.24****	**0.236****	**0.236****	**0.257****	**0.255****	**0.255****
	[0.010]	[0.027]	[0.026]	[0.026]	[0.033]	[0.033]	[0.033]
Lagged change in output	**0.194****	**0.199****	**0.195****	**0.195****	**0.190****	**0.188****	**0.188****
	[0.005]	[0.007]	[0.006]	[0.006]	[0.006]	[0.005]	[0.005]
Error correction	**-0.135****	**-0.141****	**-0.139****	**-0.139****	**-0.131****	**-0.131****	**-0.131****
	[0.002]	[0.008]	[0.009]	[0.009]	[0.008]	[0.008]	[0.008]
Cash Flow	**0.079****	**0.087****	**0.183****	**0.183****	**0.075****	**0.087****	**0.087****
	[0.004]	[0.030]	[0.042]	[0.042]	[0.023]	[0.023]	[0.023]
Lagged cash flow	**0.017****	**0.014****	**0.015***	**0.015***	**0.018****	**0.018****	**0.018****
	[0.065]	[0.07]	[0.007]	[0.007]	[0.006]	[0.006]	[0.006]
Cash Flow x PCBB			**-0.06****	**-0.06****			
			[0.019]	[0.019]			
Cash Flow x PCBank						**0.098**	**0.098**
						[0.065]	[0.065]
R-squared	0.13	0.14	0.14	0.14	0.12	0.12	0.12
Observations	503,660	370,675	370,660	370,298	469,436	469,436	469,059
Number of clusters	9,542	20	20	19	17	17	16

Table 4 – Conglomerates

Dependent variable is gross investment (normalized by assets). Column 1-3 use all observations, columns 4-6 conglomerate firms only. Coefficients for control variables (see table 3) are not reported. All regressions include fixed effects for country-year-industry interactions. Standard errors are clustered by country. A plus sign (+) denotes a significant coefficient at the 10% level, one star (*) denotes significance at the 5% level, two stars at the 1% level.

Euler equation model	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	All	All	Congl.	Congl.	Congl.
Lagged ROA	**0.059***	**0.122***	**0.098****	**0.024****	**0.056****	**0.050****
	[0.010]	[0.018]	[0.013]	[0.005]	[0.15]	[0.012]
Lagged ROA x PCBB		**-0.037****			**-0.014***	
		[0.011]			[0.007]	
Lagged ROA x PCBank			**-0.096****			**-0.043***
			[0.026]			[0.017]
R-squared	0.12	0.13	0.16	0.16	0.17	0.16
Observations	636,642	468,832	636,642	91,525	71,186	91,525
Number of clusters	25	21	25	25	21	25

Econometric model	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	All	All	Congl.	Congl.	Congl.
Cash Flow	**0.017****	**0.183****	**0.13****	**0.021**+	**0.067***	**0.061****
	[0.065]	[0.042]	[0.030]	[0.011]	[0.027]	[0.020]
Cash Flow x PCBB		**-0.060****			**-0.02**+	
		[0.019]			[0.012]	
Cash Flow x PCBank			**-0.148****			**-0.068***
			[0.044]			[0.024]
R-squared	0.13	0.14	0.07	0.17	0.18	0.17
Observations	503,660	370,675	501,167	70,149	54,249	70,149
Number of clusters	9,542	20	25	23	19	23

Table 5 – Excluding finance and real estate

Dependent variable is gross investment (normalized by assets). Firms with primary industry classification NAICS 52 or 53 are excluded. Coefficients for control variables (see table 3) are not reported. All regressions include fixed effects for country-year-industry interactions. Standard errors are clustered by country-industry-year in column 2 and 3 and by country in other columns. A plus sign (+) denotes a significant coefficient at the 10% level, one star (*) denotes significance at the 5% level, two stars at the 1% level.

Euler equation model	(1)	(2)	(3)
Sample	Non-financial, non-real estate firms		
Lagged ROA	**0.059****	**0.121****	**0.065****
	[0.002]	[0.019]	[0.008]
Lagged ROA x PCBB		**-0.037****	
		[0.012]	
Lagged ROA x PCBank			**-0.066**+**
			[0.038]
R-squared	0.12	0.13	0.11
Observations	639,208	454,117	583,300
Number of clusters	12,220	21	18

Econometric model	(1)	(2)	(3)
Sample	Non-financial, non-real estate firms		
Cash Flow	**0.079****	**0.184****	**0.138****
	[0.004]	[0.043]	[0.030]
Cash Flow x PCBB		**-0.061****	
		[0.020]	
Cash Flow x PCBank			**-0.15****
			[0.045]
R-squared	0.13	0.14	0.13
Observations	503,660	359,184	485,533
Number of clusters	9,542	20	25

Table 6 – Geographical subsamples

Dependent variable is gross investment (normalized by assets). Coefficients for control variables (see table 3) are not reported. All regressions include fixed effects for country-year-industry interactions. Standard errors are clustered by country-industry-year in column 1 and 4 and by country in other columns. A plus sign (+) denotes a significant coefficient at the 10% level, one star (*) denotes significance at the 5% level, two stars at the 1% level.

Euler equation model	(1)	(2)	(3)	(4)	(5)
Sample			All		
Lagged ROA	**0.059****	**0.122****	**0.120****	**0.066****	**0.100****
	[0.020]	[0.018]	[0.020]	[0.008]	[0.016]
Lagged ROA x PCBB		**-0.037****	**-0.036****		
		[0.011]	[0.012]		
Lagged ROA x PCBank				**-0.068**+	**-0.100****
				[0.038]	[0.031]
Lagged ROA x East			**-0.015**		**0.042**
			[0.041]		[0.046]
Lagged ROA x PCBB X East			**0.048**		
			[0.036]		
Lagged ROA x PCBank X East					**0.292**
					[0.184]
R-squared	0.12	0.13	0.13	0.11	0.12
Observations	639,208	468,832	468,832	602,175	636,642
Number of clusters	12,220	21	21	18	26

Econometric model	(1)	(2)	(3)	(4)	(5)
Sample			All firms		
Cash Flow	**0.079****	**0.183****	**0.182****	**0.138****	**0.14****
	[0.004]	[0.042]	[0.053]	[0.030]	[0.041]
Cash Flow x PCBB		**-0.06****	**-0.06***		
		[0.019]	[0.024]		
Cash Flow x PCBank				**-0.148****	**-0.160***
				[0.044]	[0.062]
Cash Flow x East			**-0.018**		**-0.102**
			[0.072]		[0.069]
Cash Flow x PCBB X East			**0.051**		
			[0.067]		
Cash Flow x PCBank X East					**0.686***
					[0.260]
R-squared	0.13	0.14	0.14	0.13	0.14
Observations	503,660	370,675	370,675	500,725	501,167
Number of clusters	9,542	20	20	23	25

Table 7 – Asset liquidity subsamples

Dependent variable is gross investment (normalized by assets). Coefficients for control variables (see table 3) are not reported. Hi_Liq is a dummy equal to one for all firms whose main industry is classified as having highly liquid assets. All regressions include fixed effects for country-year-industry interactions. Standard errors are clustered by country-industry-year in column 1 and 4 and by country in other columns. A plus sign (+) denotes a significant coefficient at the 10% level, one star (*) denotes significance at the 5% level, two stars at the 1% level.

Euler equation model	(1)	(2)	(3)	(4)	(5)
Sample			All		
Lagged ROA	**0.059****	**0.122****	**0.120****	**0.066****	**0.098****
	[0.020]	[0.018]	[0.039]	[0.008]	[0.018]
Lagged ROA x PCBB		**-0.037****	**-0.065**		
		[0.011]	[0.051]		
Lagged ROA x PCBank				**-0.068**+**	**-0.091***
				[0.038]	[0.035]
Lagged ROA x Hi_Liq			**-0.007**		**0.002**
			[0.020]		[0.011]
Lagged ROA x PCBB X Hi_Liq			**-0.065**		
			[0.051]		
Lagged ROA x PCBank X Hi_Liq					**0.004**
					[0.018]
R-squared	0.12	0.13	0.14	0.11	0.12
Observations	639,208	468,832	226,589	602,175	636,642
Number of clusters	12,220	21	21	18	26

Econometric model	(1)	(2)	(3)	(4)	(5)
Sample			All firms		
Cash Flow	**0.079****	**0.183****	**0.200****	**0.138****	**0.155****
	[0.004]	[0.042]	[0.047]	[0.030]	[0.032]
Cash Flow x PCBB		**-0.06****	**-0.064***		
		[0.019]	[0.024]		
Cash Flow x PCBank				**-0.148****	**-0.164****
				[0.044]	[0.053]
Cash Flow x Hi_Liq			**-0.024**		**-0.022***
			[0.013]		[0.010]
Cash Flow x PCBB X Hi_Liq			**0.015****		
			[0.005]		
Cash Flow x PCBank X Hi_Liq					**0.044***
					[0.018]
R-squared	0.13	0.14	0.15	0.13	0.14
Observations	503,660	370,675	179,354	500,725	243,043
Number of clusters	9,542	20	20	23	25

Appendix: results from running the Euler equation model and Econometric model separately by country

Table A.1: Country wise results for the Euler equation model

Dependent variable in all regressions is gross investment (normalized by assets). ROA is defined as operating cash flow over fixed assets. All regressions include the firm level variables and industry-year fixed effects used in the Euler equation model specifications in Table 1 (see text). Standard errors are clustered by industry-year. A plus sign (+) denotes a significant coefficient at the 10% level, one star (*) denotes significance at the 5% level, two stars at the 1% level.

Country Name	Lagged ROA Coefficient	Lagged ROA Standard Error
Austria	0.056	[0.114]
Bosnia And Herzegovina	0.208	[0.232]
Belgium	0.049**	[0.006]
Bulgaria	0.077**	[0.022]
Switzerland	-0.015	[0.037]
Serbia And Montenegro	0.12**	[0.040]
Czech Republic	0.092*	[0.038]
Germany	0.013	[0.022]
Denmark	0.026	[0.022]
Estonia	0.077**	[0.019]
Spain	0.087**	[0.005]
Finland	0.06**	[0.008]
France	0.053**	[0.004]
United Kingdom	0.019**	[0.003]
Greece	0.073**	[0.007]
Croatia	0.132**	[0.016]
Hungary	-0.127	[0.205]
Italy	0.095**	[0.005]
Luxembourg	-0.063	[0.049]
Latvia	0.235	[0.377]
Netherlands	0.036*	[0.014]
Norway	0.048**	[0.007]
Poland	0.045**	[0.012]
Portugal	0.033	[0.039]
Sweden	0.071**	[0.007]
Ukraine	0.089**	[0.028]

Figure A.1: Constraints versus financial development (Euler equation model)

This figure plots the coefficients on lagged ROA from the Euler equation model versus PCBB, for countries where the coefficient is significant. PCBB is the sum of private credit and total private bond market capitalization divided by GDP.

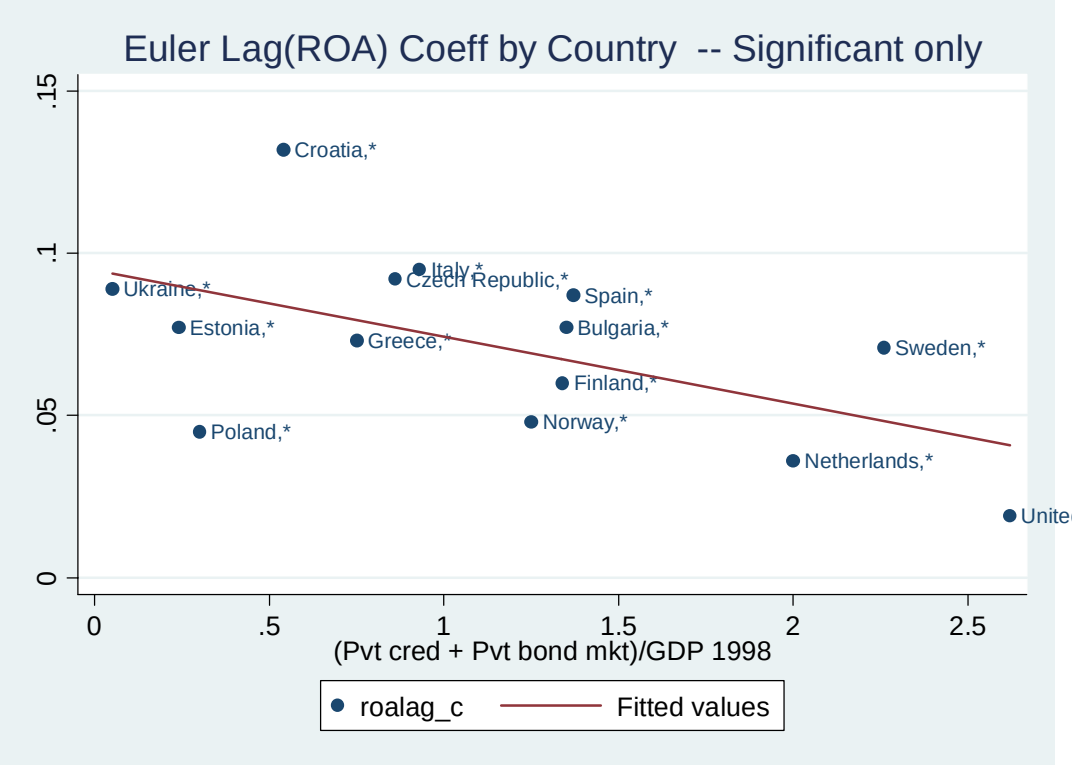

Table A.2: Country wise results for the Econometric model

Dependent variable in all regressions is gross investment (normalized by assets). Cash flow is defined as cash flow after taxes and interest over fixed assets. All regressions include the firm level variables and industry-year fixed effects used in the Econometric model specification in Table 1 (see text). Standard errors are clustered by industry-year. A plus sign (+) denotes a significant coefficient at the 10% level, one star (*) denotes significance at the 5% level, two stars at the 1% level.

Country Name	Lagged Cash flow Coefficient	Lagged Cash flow Standard Error
Austria	-0.028	[0.215]
Bosnia And Herzegovina	0.147	[0.140]
Belgium	0.071**	[0.012]
Bulgaria	0.058+	[0.030]
Switzerland	0.083	[0.122]
Serbia And Montenegro	0.309**	[0.078]
Czech Republic	0.227**	[0.037]
Germany	0.079+	[0.041]
Denmark	0.061+	[0.031]
Estonia	0.133**	[0.021]
Spain	0.098**	[0.009]
Finland	0.053**	[0.017]
France	0.055**	[0.005]
United Kingdom	0.014*	[0.006]
Greece	0.062**	[0.010]
Croatia	0.266**	[0.026]
Hungary	-0.781	[0.627]
Italy	0.199**	[0.010]
Luxembourg	0.255**	[0.058]
Latvia	-0.197	[0.225]
Netherlands	0.032	[0.035]
Norway	0.017	[0.014]
Poland	0.082**	[0.023]
Portugal	0.002	[0.071]
Sweden	0.102**	[0.013]
Ukraine	0.063	[0.043]

Figure A.2: Constraints versus financial development (Econometric model)

This figure plots the coefficients on lagged ROA from the Econometric equation model versus PCBB, for countries where the coefficient is significant. PCBB is the sum of private credit and total private bond market capitalization divided by GDP.

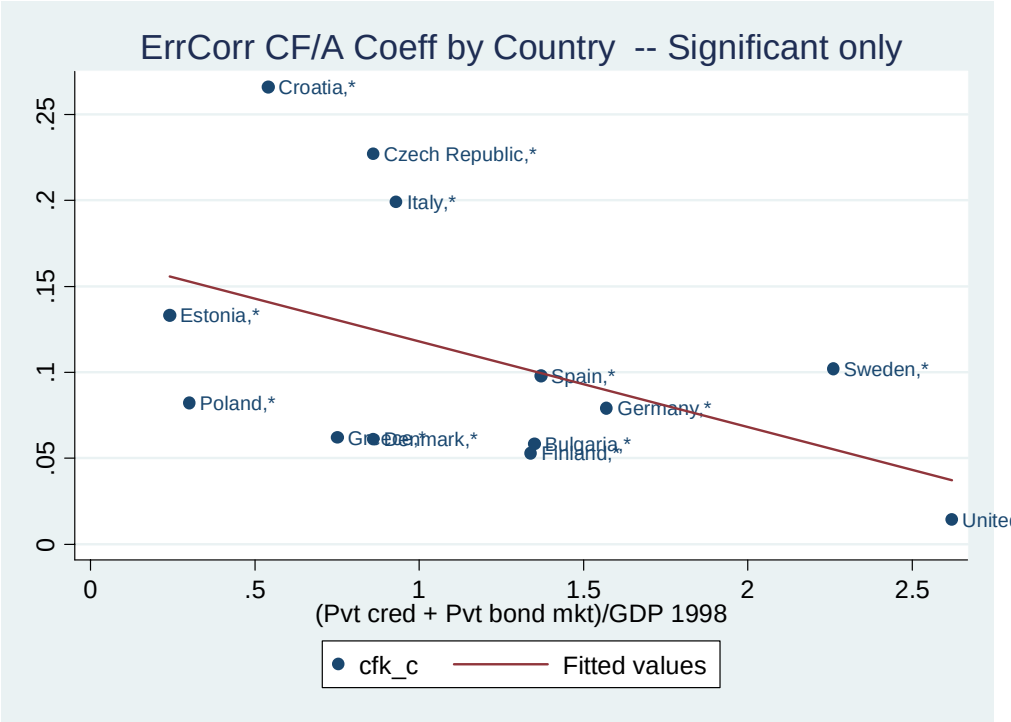

Table A.3: Regression of country-wise coefficients on financial development

Column (1) reports results from regression of the country-wise coefficients on Lagged ROA (reported in Table A.1) on PCBB. Column (2) reports results from regression of the country-wise coefficients on Cash flow (reported in Table A.1) on PCBB. PCBB is the sum of private credit and total private bond market capitalization divided by GDP. To account for the standard errors of the coefficients, each observation is weighted by the inverse of the estimated variance of the dependent variable.

	(1)	(2)
	Euler Equation Model	**Econometric Model**
PCBB	**-0.032****	**-0.050****
	[0.006]	[0.0151]
Constant	**0.109****	**0.155****
	[0.011]	[0.027]
R-squared	0.629	0.380
Observations	20	20

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