Investment and Institutions

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Abstract

We study how financial systems and institutional environments affect investment efficiency using a sample of some 300,000 firm-years from 48 countries. Based on a canonical investment model, we identify two possible channels by which institutional environments may affect investment: firm-level financial frictions and the macro-level required rate of return. We find that a good institutional environment, in particular strong corporate governance, reduces financial frictions and lowers the required rate of return, thereby enhancing efficiency in capital allocation. This result is broadly consistent with previous literature, but the mechanism identified here is novel and more precise.

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I. INTRODUCTION

Research in the last decade has documented many country characteristics, including institutional characteristics, which appear to be related to economic performance and overall development. Some of this research has tried to identify channels running from the institutional environment to economic performance. For example, the literature has documented important roles for financial-sector and corporate-governance institutions in fostering an efficient use and allocation of capital, central to economic performance.

A separate literature has used Tobin's Q as a measure of efficiency in the use of capital, where deviations of Tobin's Q from its steady state value indicate inefficiency: a high Q firm should add more capital because the marginal benefit of acquiring capital goods exceeds the marginal cost. This investment, in turn, should lead the firm's Q to adjust back towards its steady-state level from above (Tobin, 1969).

We estimate the effects of institutional qualities using a formula that describes how Tobin's Q evolves over time. Based on a canonical investment model, we identify two opposite forces affecting the speed at which Tobin's Q converges back to one or to its firm specific steady state values (from above). On the one hand, a low risk premium made possible by good institutions allows for a large decline in Tobin's Q to its steady state level. On the other hand, low financial frictions brought about by good institutions create a smaller sensitivity of investment to current cash flows. We show below that, somewhat counter-intuitively, this "improvement" translates into smaller adjustments in Tobin's Q, for any given level of profits and any initial level. Thus, the overall effect of good institutions on the speed of convergence of Tobin's Q to its steady state is theoretically unclear.

We use this theoretical model to empirically decompose the effects of institutional quality into these two channels, macro-level (the required rate of return), and micro-level (financial frictions). Specifically, we construct the expected end-of-the-period Tobin's Q using the model; then, we pin down the best estimates for the effects of institutions on Tobin's Q through the two channels by minimizing the one-period ahead forecast errors between the constructed expected value and the observed realization value of Tobin's Q.

For a sample of about 300,000 firm-years from 48 countries, we find that country-specific institutional features, especially good corporate governance, are positively related with both a lower required rate of return and reduced financial frictions. The effect of good corporate governance is economically substantial on both. By contrast, other institutional variables are not strongly correlated with the adjustment speed of Tobin's Q. Thus, our results outline a novel mechanism by which good institutions, and in particular, good corporate governance, improve the allocation of capital.

The rest of the paper is organized as follows. Section II reviews the literature; Section III introduces a canonical investment model; Section IV explains the estimation strategy and empirical approach; Section V describes the data set used for this study; Section VI presents the estimation results; Section VII examines measurement error issues and Section VIII concludes.

II. LITERATURE REVIEW

Investment is known to be related to Tobin's Q (Mussa, 1977; Abel, 1983; Abel and Eberly, 1994), although the relationship is possibly nonlinear (Abel and Eberly, 1994), and even the sign of the impact of cash flows on investment, for example, is difficult to predict in the presence of financial frictions (Gomes, 2001; Hennessy, Levy, and Whited, 2007) and other market imperfections (Abel and Eberly, 2008). Nevertheless, these studies have identified several factors which explain Tobin's Q and established a canonical form of the equilibrium law of motion of Tobin's Q which we use in the present paper. However, the existing literature has focused primarily on the U.S. or other developed economies, so that the importance of institutional factors in determining investment and the associated movements in Tobin's Q, especially in emerging market economies, has not been studied.

In a broader context, the present paper is related to a large number of previous empirical attempts to measure the efficiency of countries in allocating capital across sectors using a variety of measures, typically not related to Tobin's Q and often lacking theoretical underpinnings. Efficiency in allocating capital is sometimes measured simply by GDP or TFP growth (e.g., Beck, Loayza, and Levine, 2000; De Nicolo, Laeven, and Ueda, 2008), by industry growth (e.g., Rajan and Zingales, 1998; Wurgler, 2000), or by the dispersion of firm-level productivity (e.g., Abiad, Oomes, and Ueda, 2008; Hsieh and Klenow, 2009). Particularly close to the present study is Wurgler (2000), who uses a measure of industry-specific investment opportunities derived from value growth. He shows that, in a sample of 65 countries, financially more developed countries allocate more capital to growing industries and less to declining sectors. Also closely related is Abiad, Oomes, and Ueda (2008) who show that, under certain conditions and after controlling for industry and age effects, the cross-sectional dispersion of Tobin's Q measures the efficiency of capital allocation across firms. For a sample of five developing countries, they find that the within-industry allocation of capital improves (that is, the dispersion of Q declines) after financial liberalization. However, the dispersion of Tobin's Q is less useful for cross-country (rather than within-country over time) comparisons, as the steady state values of Tobin's Q are firm- and country-specific. Hsieh and Klenow (2009) use the U.S. distribution of the ex-post marginal product of capital as a natural benchmark for an efficient allocation of capital and find a much larger dispersion in the marginal product of capital across industrial plants in China and India than in the U.S. They view this wide dispersion as evidence of an inefficient allocation of capital, but with only three countries in their sample, statistical assessments of inefficiency and its sources are difficult.[1]

Our study also relates to a large literature in financial economics which develops measures of institutional and financial development in order to allow for comparisons of financial systems around the world (e.g., Demirguc-Kunt and Levine, 2001, Morck et al, 2000, La Porta et al., 2008). Within this literature, the present paper is particularly related to Rajan and Zingales (1998) and to subsequent papers showing that industries that depend on external finance tend to grow faster in more developed financial systems. Unlike most of studies in this line of research, we do not rely on general measures of financial development (such as market capitalization to GDP ratios), but rather estimate the direct adjustment costs, financial frictions, and required returns associated with investment.

[1] Unlike dispersion in the *ex ante* (expected) marginal product of capital across industries, dispersion *ex post* is not necessarily linked to inefficiency. For example, good financial systems may enable firms to take higher-risk-higher-return projects which produce a large dispersion in the marginal product capital *ex post*. A variety of additional measures have been used in the literature to gauge the efficiency of capital allocation: Acharya, Imbs and Sturguess (2007) use a mean-variance measure of industrial output for each U.S. state and show that financial deregulation brings a state closer to the efficient frontier. Other studies (e.g., Galindo, Schiantarelli, and Weiss, 2007) use more conventional *ex post* rate of return-based measures to show the impact of financial and other reforms on the allocation of capital.

III. Model

We use a theory-based law-of-motion of Tobin's Q to relate institutions with Tobin's Q. The theory is based on the investment model of Abel and Blanchard (1986) and Abel and Eberly (1994), with a general financial friction in the spirit of Gomes (2001) and Hennessy, Levy, and Whited (2007), and also with a market imperfection and varying discount factors in the spirit of Abel and Eberly (2008).

In each period, timing is as follows. Given the exiting capital stock of the previous period, K^{-}, and the (revealed) productivity at the beginning of the current period, ε, investment I is determined, adjustment costs are paid, and a new capital stock K is formed immediately.[2] Using the new capital stock, K, goods are produced with productivity ε. This formulation is consistent with the continuous time model of Abel and Eberly (1994), as well as with discrete time models with short-period lags between investment expenditure and the productive use of new machines.[3]

Within-period finance using credit lines or trade credit is assumed to incur little cost as in Rajan and Zingales (1998).[4] Over-the-period external finance B is, however, costly and determined at the end of the period when gross profits (or the return to capital) π are realized. We assume simple convex costs of external finance and insert into the firm's objective function following Gomez (2001) but generalizing his linear cost function.

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[2] In this formulation, there is no "time-to-build." This assumption allows firm managers to postpone their investment decisions until after the revelation of productivity and affects both the theoretical dynamics and the empirical interpretations of the estimated coefficients, as discussed below whenever relevant.

[3] Note that, in this formulation, both the current Q and the next period's Q matter for investment, in contrast with the one-year required "time-to-build" model of Barnett and Sakellaris (1999), in which only the next period's Q matters, so that there is no equilibrium law of motion of Q.

[4] An observationally equivalent assumption is that the within-period credit is also costly but its transaction volume is proportional to the end-of-period net borrowing.

Profits (the return to capital) are denoted by $\pi(K_t, \varepsilon_t)$. We do not model the labor decisions of the firm, but the labor market is assumed to be competitive with a constant-returns-to-scale production function, *f*, and a competitive wage *o* such that:

$\pi(K_t, \varepsilon_t) = \varepsilon_t f(K_t, L_t) - o_t L_t$,

with the usual marginal condition: $o_t = f_{Lt}$.

The product market can be either competitive or monopolistic (although not forever).[5] We also assume that the shocks, *ε*, to productivity (or rents) can be serially correlated with a probability distribution function $P(\varepsilon^+|\varepsilon)$. The firm's capital stock increases with investment, *I*, but is subject to depreciation at a rate of *δ*:

$$K_t = (1-\delta)K_{t-1} + I_t. \tag{5}$$

A firm faces adjustment costs of investment - $\phi(I_t, K_t; X_t, W, \varepsilon_t)$. *X* denotes fundamental characteristics (such as industry and the age of a firm), which can be time-varying but are assumed to be non-stochastic and predictable (e.g., age). *W* denotes "institutional quality," which agents assume to be time-invariant and exogenous. Indeed, institutional quality is known to be quite stable or slow-moving over time.

Given the law of motion of capital (5), the adjustment costs of investment can be expressed as

$$\hat{\phi}(I(K_{t-1}, K_t), K_t; X_t, W, \varepsilon_t) = \phi(K_t - (1-\delta)K_{t-1}, K_t; X_t, W, \varepsilon_t). \tag{6}$$

The firm also faces financial transaction costs, $\lambda(B_t, K_t; X_t, W, \varepsilon_t)$, where *B* denotes external finance. This matters only when net external finance is positive, that is, when the

[5] This type of imperfectly competitive market is studied by Abel and Eberly (2008) who show that profits (or cash flows) measure rents or "growth opportunities" and that they affect Tobin's Q.

investment is greater than cash flows. Hence, the financial transaction costs can be expressed as

$$\hat{\lambda}(B(K_{t-1},K_t,\epsilon_t),K_t;X_t,W,\varepsilon_t) = \lambda(K_t-(1-\delta)K_{t-1}-\pi(K_t,\varepsilon_t),K_t;X_t,W,\varepsilon_t), \text{ if } B_t>0; \quad = 0, \text{ otherwise.} \tag{7}$$

Note that we treat the adjustment cost of investment, $\phi(I_t,K_t;X_t,W,\varepsilon_t)$, as related to purely technological issues, not to financing activities. This assumption is consistent with investment models without financial frictions, as well as with Gomes' (2001) model which includes financial frictions. However, this treatment of investment costs differs from the assumption made by Hennessy, Levy, and Whited (2007) who treat this term as the adjustment cost of equity finance. Unlike them, in this paper, we do not make any distinction between the equity and debt finance, and $\lambda(B_t,K_t;X_t,W,\varepsilon_t)$ is defined as the transaction cost of any form of external finance. By contrast, Hennessy, Levy, and Whited (2007) regard this second cost as the cost of debt finance. Implicitly, we assume that if a firm reaches a limit in its ability to issue debt, it can issue equity at a high cost, which is nevertheless lower than the prohibitive cost of borrowing. Thus, we assume that the overall cost function of external finance is convex, and never reaches a limit. This assumption is not far from reality: Because our sample consists of listed firms, they are surely able to issue equity to finance investment. An implication of this approach is that there are no debt dynamics — debt, with equity, can expand without limits as long as they are used to build up capital.

A related issue is the firm's maximization objective. We assume that the firm maximizes the value of capital, representing all capital owners, that is, both shareholders and creditors. This is in line with the vast majority of the investment literature, which does not distinguish between various types of financing. Indeed, profits, π, includes returns to both creditors and shareholders in the form of interest payments, dividends, and retained earnings.

Both the adjustment cost function of investment and the financial transactions costs are at the firm level, or *internal*. There is also *external* or general-equilibrium adjustment cost of investment (Mussa, 1977), appearing in our model as the (certainty equivalent) form of the required rate of return on investment, r. The required rate of return should differ across countries depending on their institutional quality, W, that may affect overall investment risk (e.g., due to bankruptcy procedures or to the possibility of nationalization). The required rate of return may also vary with firm characteristics, X. For example, the depreciation rate, δ, can be different across industries as well as across different vintages of machines and equipment (related to firm age). The required rate of return is also likely to be affected by macroeconomic factors such as the risk free rate, r_{Ft} (which represents the stationary value of the marginal product of capital), the inflation rate and macroeconomic volatility, which represents country-level risk, in line with Abel and Eberly (2008). More formally, in a general equilibrium formulation, the reciprocal of the required rate of return is the expected stochastic discount factor, m, which should include the expected state-dependent inter-temporal marginal rate of substitution between "today" and "tomorrow."

We assume that each firm's productivity shock, ε, is observable by firm management, but the aggregate and industry-specific common components of the shock are unknown to management when making investment decisions. Therefore, the discount factor becomes deterministic after expectations are taken over aggregate and industry-specific common shocks. Moreover, the current profits, frictions, and the value of the next-period capital stock can be considered as non-stochastic with respect to the current firm-level shock. Firm characteristics, *X*, and the institutional quality, *W*, are also assumed to be non-stochastic (see Appendix for more details).

Finally, the discount factor, *m*, can, by assumption, vary with country-specific expected macro-economic conditions, denoted by *E[θ]* (risk-free rate, inflation, and growth volatility). The discount factor can also vary depending on firm characteristics, but firms within the same industry are assumed to have the same covariance term with respect to the country-level market portfolio, except that firm age may matter. We therefore include industry dummies and age variables in the vector of firm characteristics, *X*. More importantly, we conjecture that a better institutional environment, *W*, is associated with a lower required rate of return. This is one of the hypotheses to be tested.

In summary, in equilibrium, the required rate of return, given the current value of the firm, should equal the next period's profits minus investment adjustment costs and financial frictions, plus capital gains:

$$\begin{aligned}\left(1+r\left(E\left[\theta\right],X,W\right)\right)V(K^{-};X,W,\epsilon)=\max_{K}\pi(K,\epsilon)-\phi(I,K;X,W,\epsilon)\\ -\lambda(B,K;X,W,\epsilon)+E\left[V(K;X^{+},W,\epsilon^{+})\right].\end{aligned}\tag{8}$$

Here, the minus-sign, –, in superscript denotes one-period past values and the plus-sign, +, one-period next values.

Assuming positive investment and positive external finance, the first-order condition can be written as:

$$\phi_1+\lambda_1=\pi_1+\lambda_1\pi_1-\phi_2-\lambda_2+E\left[V_1\right].$$

And the envelope condition is therefore:

$$(1+r)V_1^{-}=(1-\delta)(\phi_1+\lambda_1).$$

By combining the two conditions together, we obtain:

$$\frac{1+r}{1-\delta}V_1^- = (1+\lambda_1)\pi_1 - \phi_2 - \lambda_2 + E\left[V_1\right].$$

By definition: $Q = V_1$. Using the approximation, $1+r+\delta \approx \frac{1+r}{1-\delta}$, we simplify the condition to:

$$(r+\delta)Q^- = E\left[Q - Q^-\right] + (1+\lambda_1)\pi_1 - \phi_2 - \lambda_2 . \quad (9)$$

This is the equilibrium law-of-motion of Tobin's Q, which is almost exactly the same as the one derived by Abel and Eberly (1994). The left-hand-side is the required rate of return on the beginning-of-the-period value of capital. The right-hand-side is the expected capital gains and profits, net of expected costs associated with investment and external finance. By rearranging (9), we obtain a formula which is useful for the empirical tests below:

$$E\left[Q\right] - Q^- = (r+\delta)Q^- - (1+\lambda_1)\pi_1 + \phi_2 + \lambda_2 . \quad (10)$$

We assume that financial friction costs are paid only when there is positive external finance. Therefore, all λ terms vanish from Equation (8) when external finance is non-positive (this is consistent with the Kuhn-Tucker conditions which arise when we solve the equation with this condition incorporated explicitly). Similarly, we assume that, when investment is non-positive, the investment adjustment cost function equals zero (i.e. consists of only of δK), so that ϕ term drops from (8).[6]

Many studies investigate financial constraints by regressing investment on cash flows and Tobin's Q, under the assumption that the sensitivity of investment to current cash flows

[6] These assumptions are in line with much of the literature, although we admit that we omit the potentially important effect of costly disinvestment (Abel and Eberly, 1994; Abel, Dixit, Eberly, and Pindyk, 1996). One reason is that information on asset sales is not widely available in our cross-country panel data, in contrast with U.S.-only data sets.

reflects credit constraints (Tobin's Q is used in these regressions to control for growth opportunities). However, several recent studies argue that investment regressions using Q are often difficult to interpret (Gomes, 2000; Abel and Eberly, 2008): with auto-correlated productivity shocks, current profits contain information on future profits, making it difficult to argue that the sensitivity of investment to cash-flows represents financing constraints. Moreover, investment is nonlinearly related to the current and the next period's values of *Q*, so that the coefficient on Tobin's Q reflects not only growth opportunities but partially also credit constraints. There is also a macroeconomic effect on the value of Tobin's Q through the required rate of return. We avoid these issues here because we only use the equilibrium law of motion of *Q* without any specific predictions on investment.

Although better institutions bring about more efficient investment allocation, the relationship between the adjustment speed of Tobin's Q and the institutional environment is theoretically ambiguous. To see this, we slightly transform equation (10) as follows:

$$\frac{Q^{-} - E[Q]}{Q^{-}} = \frac{(1+\lambda_1)\pi_1 - (1+\delta)(\phi_2 + \lambda_2)}{Q^{-}} - (r+\delta)\,. \qquad (11)$$

Equation (11) shows that the adjustment speed of Q to its steady state value from above is determined by both the required rate of return, *r*, and the (marginal) financial frictions of investment, λ_1, but with opposite signs. We conjecture that better institutions should lower both.[7] Equation (11) implies that the lower required rate of return, *r*, allows a larger decline in Tobin's Q, thereby facilitating adjustment. By contrast, in Equation (11), the marginal

[7] For example, investors should require for a lower risk premium for a firm in a country with good corporate governance, which *ceteris paribus* ensures efficient management and little misuse of funds. In addition, good institutions may improve macro-economic stability and lower the risk-free rate, but those effects are controlled for and not included in our estimates.

financial frictions of investment, λ_1, are multiplied by profits, π_1. This implies that, for a given level of profits, firms in a country with better institutions adjust investment less, and accordingly Tobin's Q will adjust more slowly as well. This is an equilibrium phenomenon: the divergence of Tobin's Q from its steady state is small to begin with for firms in a country with lower financial frictions, and therefore the adjustment is also smaller. In sum, from a theoretical perspective, better institutions need not necessarily make Tobin's Q adjust faster.

IV. Estimation Methodology

A. Minimizing Forecast Errors due to Productivity Shocks

We assume that both the adjustment costs and the financial frictions are linear functions of the real environment and its characteristics, X, and of the institutional factors, W. We therefore rewrite equation (10) as:

$$E[Q \mid \varepsilon] = \begin{bmatrix} 1 & X & W \end{bmatrix}' Q^{-} \alpha + \begin{bmatrix} 1 & X & W \end{bmatrix}' Z \beta . \qquad (12)$$

where $Z = -(1+\lambda_1)\pi_1 + \phi_2 + \lambda_2$. The expectation over the next period's shock, ε^{+}, is taken on the left-hand side, given the current period's shock, ε. This yields the expected values for the end-of-the period Tobin's Q and for capital gains (using the realized values of the current profits and financial frictions).

We also observe the realized values of the end-of-the period Tobin's Q in the data. The difference is the one-period ahead forecast errors, that is:

$$\xi = Q - E\left[Q \mid \varepsilon\right].$$

This is serially uncorrelated even if the underlying productivity shocks are serially correlated. Thus, OLS estimates, which minimize the square-sum of the forecast errors, are unbiased and consistent.[8]

As Gomes (2001) shows, the typical investment equation — investment as the dependent variable, and Tobin's Q and cash flows as right-hand-side variables — is fraught with problems related to the identification of financial frictions. That is, financial constraints are reflected both in the coefficient of Tobin's Q (as a discounted sum of future profits) and in the sensitivity of investment to cash flows. Also, persistent productivity shocks ("growth opportunities") are contained in both Tobin's Q and in the current cash flows. Our approach circumvents these technical problems by minimizing the one-period-ahead forecast errors based on the equilibrium law of motion of Tobin's Q. Nevertheless, we may still encounter other measurement error issues outlined in the literature on Q. These are discussed in the last section.

B. Parameterization

As in many previous studies, we use a parameterized version of linearly homogeneous and convex adjustment costs of investment:

$$\phi(I, K, \varepsilon) = a_1 I + a_2 K + \frac{a_3}{2}\left(\frac{I}{K}\right)^2 K .$$

The derivative with respect to capital *K* is

$$\phi_2 = a_2 - \frac{a_3}{2}\left(\frac{I}{K}\right)^2 .$$

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[8] Because firms within a country are most likely to be subject to correlated shocks (heteroskedasticity) each year, we use robust standard errors with clustering at country-year level.

Although this is new to the literature, we think it is natural to assume a similar functional form for the financial frictions, which can be considered as a generalized version of Gomes (2001):

$$\lambda(B,K,\epsilon)=b_1B+b_2K+\frac{b_3}{2}\left(\frac{B}{K}\right)^2K\,.$$

The derivative with respect to external finance is therefore:

$$\lambda_1=b_1+b_3\left(\frac{B}{K}\right),$$

and the derivative with respect to capital K is

$$\lambda_2=b_2-\frac{b_3}{2}\left(\frac{B}{K}\right)^2.$$

We assume that each one of the coefficients, a_2, a_3, b_1, b_2, and b_3, in the adjustment cost function and in the financial frictions function is a linear function of the real environment characteristics, X and of the institutional factors, W. We also make a similar assumption with respect to the required rate of return r, which constitutes a coefficient c on the lagged Q, so that we write $c(X, W)$. We use *Total Asset, A,* as the measure of capital.

In sum, based on equation (10), we formulate our regression equation as follows:

$$
\begin{aligned}
Q_{i,j,k,t} &= const. + \gamma_1 \pi_{1,i,j,k,t} + \gamma_2 \left(X_{j,k,t}, W_k \right) \\
&+ c\left(X_{j,k,t}, W_k \right) Q_{i,j,k,t-1} \\
&- b_1 \left(X_{j,k,t}, W_k \right) \pi_{1,i,j,k,t} \chi_{i,j,k,t} \\
&+ b_2 \left(X_{j,k,t}, W_k \right) \chi_{i,j,k,t} \\
&- b_3 \left(X_{j,k,t}, W_k \right) \left\{ \left(\frac{B_{i,j,k,t}}{A_{i,j,k,t}} \right) \pi_{1,i,j,k,t} + \frac{1}{2} \left(\frac{B_{i,j,k,t}}{A_{i,j,k,t}} \right)^2 \right\} \chi_{i,j,k,t} \qquad (12) \\
&+ a_2 \left(X_{j,k,t} \right) \Psi_{i,j,k,t} \\
&- a_3 \left(X_{j,k,t} \right) \left(\frac{I_{i,j,k}}{A_{i,j,k,t}} \right) \Psi_{i,j,k,t} \\
&+ \xi_{i,j,k,t},
\end{aligned}
$$

where the last term represents forecast errors and the indicator function is defined as:

$$
\begin{aligned}
\Psi_{i,j,k,t} &= 1, \text{ if } =\mathrm{I}_{i,j,k,t} > 0, \\
&= 0, \text{ otherwise; and}
\end{aligned}
$$

$$
\begin{aligned}
\chi_{i,j,k,t} &= 1, \text{ if } B_{i,j,k,t} > 0, \\
&= 0, \text{ otherwise.}
\end{aligned}
$$

The marginal return is approximated by

$$
\pi_{1,i,j,k,t} = \frac{\pi_{i,j,k,t} - \pi_{i,j,k,t-1}}{A_{i,j,k,t} - A_{i,j,k,t-1}}.
$$

V. Data Description

All variable definitions, data sources and some sample statistics are presented in Table 1. We use firm level data from the Worldscope database, provided commercially by Thomson Financial.[9] The data set used for this study is from January 2009, covering the period 1990 to 2007, and containing over 380,000 firm-year observations from 48 countries.

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[9] The variable names below correspond to those of Worldscope unless otherwise noted.

We eliminate some observations from the underlying data for a number of reasons: First, observations are dropped when values are economically not meaningful, such as when the value of sales is negative. Second, observations are dropped on a statistical basis, by eliminating observations in excess of two standard deviations from the mean for that variable. Third, in the resulting data set, countries which have less than 15 non-financial companies with non-missing values for Tobin's Q in the year 2000 are dropped (Egypt, Morocco, Slovakia, Slovenia and Zimbabwe). Fourth, in both the U.S. and the global samples, 2-digit SIC industries which have less than five firms with non-missing values for age and Tobin's Q in the year 2000, as well as all unclassified companies (SITC 99), are dropped. In the basic regressions, we end up with about 300,000 firm-year observations.

The marginal profit, π_I, is approximated by the increase in earnings divided by the increase in total assets. More precisely, we use (*Operating Income + Depreciation and Amortization)* as a measure of earnings. For robustness, we also use *(Net Income before Extraordinary Items and Preferred Dividends + Interest Expense on Debt + Depreciation and Amortization*). The main difference is that the latter is an after-tax measure which is perhaps more susceptible to accounting adjustments, while the former is a pre-tax measure. Although the accounting adjustments may be legitimate (e.g., reflecting tax credits for R&D expenditures or for future losses), those may sometimes hide the true performance of a firm.

For investment, *I*, we use *Capital Expenditure* as the benchmark, but also check the robustness of our results using (*Capital Expenditure + Change in Cash and Short-Term Investment*). The latter concept covers a broader definition of investment as it includes equity investments in other companies as well as holdings of Treasury bonds.

For external finance, *B*, we use a concept in line with that of external financial dependence used by Rajan and Zingales (1998): *(Capital Expenditure + Change in Cash and Short-Term Investment – Cash Flow from Operation – Decrease in Inventory – Decrease in Receivables – Increase in Payables)*. The change in cash is added to the original Rajan and Zingales (1998) definition because it is included in our broader measure of investment. For robustness, we also use an external finance concept excluding trade credit, that is, (net increase in *Total Debt + Net Proceeds from Sale/Issue of Common and Preferred Stocks*). Note that the inclusion of equity finance is in line with our theory which does not distinguish between debt and equity.[10]

We use *Total Asset* as a proxy for capital stock and define Tobin's Q by *(Market Capitalization + Total Asset – Total Equity)/Total Asset*. It is measured at fiscal-year end, usually right after the ex-dividend date. This measure of Q is commonly used in the cross-country corporate finance literature because the short time dimension of the panel data prevents more elaborate calculations of capital stocks. Our choice is also constrained by the fact that our data set includes only 16 years; a much longer time dimension would have been needed to calculate capital stocks on the basis of the permanent inventory method (Blanchard, Rhee, and Summers, 1994). Also, if corporate bond rates were available for a wide range of countries in our sample, the market value of debt should have been calculated. Unfortunately, in most of the sample countries, corporate bond markets are not well developed. We discuss these issues in Section VII.

For firm characteristics, industry dummies and firm age (on the basis of the variable *Founded Date*) are included. Firm size is not included because it is an endogenous variable

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[10] This is a departure from Gomes (2001) who uses net increase in the *Total Debt* to measure financial frictions.

determined by investment and financial frictions. For the macroeconomic environment, we include the real short-term risk free rate (i.e., short-term government Treasury bill rate minus CPI inflation), CPI inflation rate, and macroeconomic volatility, measured by the standard deviation of real GDP growth for the period 1995-2006. The last two variables are drawn from the World Development Indicators, while short-term government Treasury bill rates are from various sources, but mainly from the IMF's *International Financial Statistics*.

To capture the effects of country-level institutional factors, *W*, we include several institutional dimensions, covering both the *de jure* and the *de facto* characteristics. Specifically, we test whether the speed of adjustment of Tobin's Q varies systematically with five dimensions of the institutional environment: the quality of corporate governance (*CorpGov*), creditor rights (*Creditor*), general institutional quality (*Institution),* product market competition (*Compet*), and financial market development (*FinMkt*).

We have several candidate indicators for each institutional measure (Table 1). In the benchmark regression, as a measure of corporate governance quality (*CorpGov*), we use the anti-director rights (La Porta et al., 1998), which is a commonly used measure of shareholder protection in the literature. For the degree of creditor protection, we use the strength of legal protection for borrowers and lenders (World Bank, Doing Business Survey, 2008). For general institutional quality (*Institution*), we use the measure of property rights from La Porta et al. (1998). We use a measure of trade barriers (*World Economic Forum*, 2007) as a proxy for product market competition (*Compet*) — this measure may not capture domestic competition perfectly, but it is less likely to contain other institutional factors. For financial market development (*FinMkt*), we use the stock market-capitalization-to-GDP ratio as of 2005 (*World Development Indicators*).

In sum, we write each of the coefficients in (12) as, for example,

$$\begin{aligned} c(X_{j,k,t,}W_k) = {} & \sum\nolimits_j c_{1j} IndustryDummy_j + c_2 Age_{i,j,k,t} + c_3 RiskFreeRate_k \\ & + c_4 Inflation + c_5 Macro + c_6 CorpGov + c_7 Creditor + c_8 Institution \quad (13) \\ & + c_9 Compet + c_{10} FinMkt. \end{aligned}$$

We assume that the vector of institutional factors, *W* (corporate governance, creditor protection, general institutional quality, and product market competition) does not affect *φ*, the technological adjustment of the investment. Nevertheless, we revisit this issue below.

VI. Estimation Results

A. One-by-One Effects

Tables 2a-2e show the benchmark regression results when the institutional factors are included one by one. In the first column, the coefficient ***c*** on lagged Q captures the effects of institutions and firm variables on the required rate of return. Good corporate governance and general institutional quality significantly lower the required rate of return, while more product market competition seems to be associated with a higher risk premium.

The second to fourth columns present estimates of the effects of institutions and other variables on firm-level financial frictions: The second column presents the effects on the base-level cost $\boldsymbol{b_1}$ which is proportional to the size of external finance. The third column presents the effects on $\boldsymbol{b_2}$ which is proportional to the size of current capital stock. The coefficient thus captures the size discount (or small-firm premium) — the positive coefficient implies that the large firms pay more (small firms pay less) than the world average. The fourth column presents the estimated effects of institutional quality on the curvature of those costs, $\boldsymbol{b_3}$, which are assumed to be increasing in the ratio of external finance to capital. Note that the second and fourth columns are supposed to have opposite signs (i.e., $\boldsymbol{-b_1}$ and $\boldsymbol{-b_3}$) as implied by equation (12).

The regression results show that better corporate governance lowers the curvature, $\boldsymbol{b_3}$, significantly, that is, good corporate governance makes the increase in marginal costs of capital less steep. Although good corporate governance increases the base marginal cost, $\boldsymbol{b_1}$, slightly, the net effect of institutional quality on the reduction in the marginal cost curve is beneficial for almost all firms, given the relative size of the two coefficients. The effect of having deep financial markets is qualitatively similar but quantitatively almost negligible. Column 3 suggests that the size discount (small-firm premium $-\boldsymbol{b_2}$) on financial frictions is also lowered by better corporate governance and general institutional quality, while more competition in product market appears to entail higher costs from small firms.

Firm age reduces the base marginal cost of firm-level financial frictions slightly, as predicted.[11] It also slightly increases the required rate of return. This is likely to be due to the size effect: as firms grow older and bigger, their returns comove more with the aggregate economy (or the market portfolio), making them less attractive to investors. Higher interest rates make financial frictions, $\boldsymbol{b_3}$, higher, as expected. At the same time, higher real interest rates make real investment adjustment, $\boldsymbol{a_2}$, costlier whereas higher inflation has the opposite effect.

B. Combined Effects

Next, we include all factors together in the regression, so that we can identify the effect of a specific factor, controlling for all other factors. Table 3 shows the benchmark regression: the results are almost the same as in the one-by-one regressions. Only corporate

[11] It sometimes steepens the curvature of the marginal friction function, but this result is not robust.

governance significantly lowers the required rate of return, as reflected by the coefficient ***c***. The magnitude of the effect is sizable: The mean Q will be lowered by 0.16 for the average firm (with Q=3) by a one-standard-deviation improvement (increase of 1.3) in anti-director rights. More product market competition raises the required rate of return, and so does firm age, as in the one-by-one regressions. Other factors do not robustly change the required rate of return, except that a lower risk free rate naturally lowers also the required rate of return.

While good corporate governance slightly increases the base cost, b_1, associated with financial frictions, it substantially reduces the curvature, b_3. A one standard deviation improvement in corporate governance (increase of 1.3) lowers marginal financial frictions by 2.5% of total assets for the average firm (with B/K=0.8); this is a sum of an increase in the base cost (0.0038) and a reduction in slope (0.029) for the average firm. Extra costs that small firms need to pay (the small-firm premium, $-b_2$) are lower in countries with better corporate governance (column 3): A one standard deviation improvement in corporate governance lowers this premium by about 3 percent of total assets.

Better general institutional quality also lowers the base cost, b_1, for external finance (column 3): A one standard deviation improvement (0.8) lowers this premium by about 4 percent of total assets. Other factors do not have robust effects on firm-level financial frictions.

C. Robustness Checks

To verify that the results are not driven by the specific measures we use for the five factors, we examine a number of alternative proxies. Specifically:

- As discussed earlier, we examine different definitions of the accounting variables. In Table 4, we use after-tax income rather than before-tax income as in the benchmark regression. In Table 5, we use a broader concept of investment, including financial investments, in addition to fixed capital investment as in the benchmark. In Table 6, we use narrower concept of external finance, excluding trade credit from the benchmark specification.

- For the corporate governance measure (*CorpGov*), we use in Table 7 Spamann's version of the anti-director rights (Spamann, 2009), which (he argues) is a better measure of shareholder protection. We also use in Table 8 the anti-self-dealing index, developed by Djankov et al. (2008): while anti-director rights are a *de jure* index reflecting written laws and regulations, the anti-self-dealing index is based on surveys of lawyers and reflect actual practice. De Nicolo, Laeven, and Ueda (2008) develop another *de facto* measure of corporate governance quality (CGQ) at the country level, which measures disclosure and transparency of firms. In Table 9, we use the 1995-2003 average of this index.[12]

- For creditor rights (*Creditor*), we use in Table 10 a narrower definition that does not take into account the borrower-side sub-indices (Djankov, et al., 2007). We also use in Table 11 a measure of bankruptcy efficiency (Djankov, et al., 2009), which is survey-based measure of how smooth bankruptcy procedures.

[12] This index measures *de facto* level of corporate governance in three dimensions: disclosure (number of accounting items disclosed, an updated version of CIFAR, 1993), transparency (disparity of earnings before and after accounting adjustments following Leuz, Nanda, and Wysocki, 2003), and stock price comovement (following Morck et al., 2000). Note that Doidge et al. (2007) report that, in cross-country studies, country-level corporate governance matters much more than the firm-level corporate governance.

- As an alternative measure of institutional quality (*Institution*), we use the rule of law in Table 12 (drawn from Kaufman, Kraay, and Mastruzzi 2003); and trust in people in Table 13 (from the World Values Survey, www.worldvaluessurvey.org).

- As an alternative measure of product market competition (*Compet*), we use the degree of new entry in business (*World Development Indicators,* 2008) in Table 14, with the caveat that this *de facto* measure is also related to other institutional factors governing financial sector development. We also use the cost of business start-ups (World Bank Doing Business Survey, 2008) in Table 15.

- As an alternative measure of financial development (*FinMkt*), we use private credit to GDP from the IMF's IFS in Table 16; and the absence of foreign ownership restrictions in Table 17 (both are from *World Economic Forum*, 2007).

- We also conduct robustness checks for the measures of macroeconomic volatility (*Macro*): We use the coefficient of variation of the exchange rate and the standard deviation of inflation rate (not tabulated). Both are from *World Development Indicator*s.

- Finally, the regression results in the benchmark are based on non-financial firms, but the results remain similar when using either all firms or manufacturing firms only (not tabulated).

Overall, the benchmark results are broadly replicated in most of these regressions. Corporate governance, especially minority-shareholder protection, matters consistently. This suggests that differences in financial frictions are primarily in equity finance. However, listed firms may choose to use equity finance when the cost of debt finance becomes prohibitive. Thus, although most of the external finance used is debt finance, the financial frictions function is largely influenced by the costs of equity finance. Moreover, better corporate governance is likely to ensure a more efficient use of funds for both debt and equity financing, and is also likely to lower the required rate of return.

We list below the most notable differences across the regression specifications:

- Regressions with different measures of accounting items broadly replicate the benchmark results. A slight change appears when we use after-tax income (Table 4) or a narrower concept of external capital (Table 6). In these regressions with less accurately measured accounting items, better corporate governance no longer lowers the curvature of the financial frictions function.

- Other measures of corporate governance broadly support the conclusion that good corporate governance reduces financial frictions, although the effect varies. Spamann's (2009) definition of anti-director rights (Table 7) is associated with no curvature effect, but corporate governance lowers the base cost of financial frictions. The anti-self-dealing index (Table 8) and the CGQ index (Table 9) both lower the small-firm premium. All three variants, however, do not support the evidence that better corporate governance lowers the required rate of return.

- Improvements in creditors rights under a narrower definition, without taking into account borrower protection, works in the opposite direction by raising the small firm premium (Table 10). This is in contrast with most of other regressions in which creditor rights do not matter.

- Higher trust as a general institutional quality appears to lower base financial frictions although the level of statistical significance is only 10 percent (Table 13). In addition, better rule of law appears to have the opposite effect, but, again, the level of statistical significance is low (10 percent, see Table 12).

- When using new firm entry (Table 14) or business start-up costs (Table 15) as measures of product market competition, the effects are similar to those of corporate governance: high entry is associated with a slightly higher base cost and a lower small-firm premium; and low start-up costs are associated with a lower curvature of the financial frictions function. These effects may reflect more intense competition in the product market, but may also capture broader financial characteristics that facilitate new firm entry and lower start-up costs.

D. Real Adjustment of Investment and Institutions

Good institutions may affect the speed of investment not only by lowering financial frictions but also by reducing real investment frictions, for example, managerial entrenchment (e.g., Myers and Majluf (1984), Gaudet, Lasserre, and Van Long (1998)) or workers' sabotage (Parente and Prescott, 2000). We therefore include all the institutional variables in the coefficients that characterize the real adjustment costs of investment. The results (Table 18) confirm that better corporate governance lowers both the base cost and the curvature of the real adjustment costs of investment (other factors do not matter). Note that all the effects in the financial frictions function and the required rate of return remain virtually unchanged from the benchmark regression.

E. Summary

In several specifications, the curvature effect of corporate governance loses statistical significance. In contrast, the slight increase in the base cost of external finance and the substantial reduction in the small-firm premium are robustly observed. Good corporate governance also lowers the required rate of return in almost all specifications (although not in the regressions using alternative measures of corporate governance). In sum, corporate governance appears to affect the adjustment speed of Tobin's Q primarily by reducing the small-firm premium in financial frictions.

VII. Measurement Errors

A. Source of Measurement Errors

Stock Price Movements

Measurement errors may be severe in our data. Stock markets may not always reflect fundamental values (see, for example, Abel and Blanchard, 1986; Blanchard, Rhee, and Summers, 1994). In contrast with U.S.-based data that the investment literature has been using, our panel data is short in its time dimension. As such, we cannot construct the Tobin's Q series on the basis of a long time series of past marginal products, as done by Abel and Blanchard (1986), nor can we utilize corporate bond prices, as done by Phillippon (2009). Note that, given that price movements are quite volatile, the measurement errors, if any, should have little auto-correlation. This is an important feature when we use instruments below.

Accounting Issues

Since Hayashi (1982), differences between the marginal and average Q have been recognized in the literature. We follow conventional assumptions and allow for industry and age specific effects in order to control for production and cost function differences that generate the disparity between the marginal and average Q. In addition, as discussed above, we run robustness checks using different measures for the main variables.

As Blanchard, Rhee, and Summers (1994) show, there may be discrepancies between the market valuation of debt (in the numerator) and the replacement cost of capital (in the denominator) when constructing Tobin's Q. With a long time series for U.S. firms, Blanchard, Rhee, and Summers (1994) construct the capital stock from past investment and use the bond rates to estimate the market value of debt. Again, with our short time-dimension panel data, we cannot implement their approach and have to take the data as they are. The errors are therefore subject to volatility in the price of bonds as well as replacement costs. Together with intentional and unintentional misreporting, the overall measurement errors from various accounting practices are again likely to exhibit little auto-correlation.

Different Timing Assumptions

Timing assumptions are also critical in this case. Again, the time-to-build assumption would create no relationship between the last period Q^- and the current Q, so that α would be zero (Barnett and Sakellaris, 1999). As we see in our regression results, this is not the case. Without the time-to-build assumption (i.e., with immediate use of capital after investment), investment always follows just after the revelation of productivity shocks.

Still, we can think of different timing assumptions regarding the revelation of the current productivity shock. So far, we have assumed that the current productivity shock is revealed at the beginning of the current period, so that the last period Q^- can be observed with information on the current shock. As such, it is treated as non-stochastic from the viewpoint of the beginning of the current period.

It may be the case that the shock is not reveled at the beginning of the current period. In this case, decisions on investment will still be made after the realization of the shock, but we observe $E[Q^-|\varepsilon^-]$, not Q^-. If so, there will be no observation errors in the next period Q, as we observe $E[Q|\varepsilon]$ in the data. However, we have another form of forecast errors in Q, which could be classified as broad measurement errors. In reality, decisions are made on the basis of the realized value of Q^- but we only observe the forecast value $E[Q^-|\varepsilon^-]$. Since these measurement errors are one-step-ahead forecast errors, they should not exhibit any auto-correlation.

B. Instrumental Variable Estimation

All three forms of measurement errors possibly affect the observed values of Tobin's Q. However, each type of measurement error is likely to exhibit little auto-correlation and therefore measurement errors as a whole should present very little auto-correlation, given that large swings in stock prices are likely to drive the major part of the measurement errors.

Hence, we can use lagged constructed *E[Q]* as an instrumental variable for lagged Q. The lagged *E[Q]* differs from the lagged *Q* due to lack of the last period one-step-ahead forecast errors. Also, because the lagged *E[Q]* is constructed from twice lagged *Q* and other relevant variables, the measurement errors in the lagged *E[Q]* are also twice lagged. Because twice lagged measurement errors are not very correlated with the lagged measurement errors in the lagged *Q*, we can expunge measurement errors by using the lagged *E[Q]* as an IV for the lagged *Q*. Technically, it is a standard two-stage-least-squares or IV estimation using lagged values (e.g., Almeida and Campello, 2009).[13] The results (not reported) are not very far from those estimated by the OLS.

VIII. CONCLUDING REMARKS

We investigate how institutional environments affect investment. Standard models suggest that investment should be affected by both financial frictions at the firm level and by the required rates of return at the macro level. We therefore develop an estimation strategy to identify the effects of institutional quality on both financial frictions and the required rate of return.

Our main result is that good corporate governance (shareholder protection) is a major driving force in lowering both the required rate of return and financial frictions, reflected in the base cost, the curvature, and the small-firm premium. In other words, good corporate governance leads to speedier investment adjustment and to an efficient capital allocation. One interpretation of this finding for (firm-level financial frictions) is that good corporate governance affects the cost of external equity finance and it is this cost that determines the overall cost of external finance even where most firms rely on debt finance. This is because listed firms can mitigate their debt burdens by issuing equity. For the required rate of return,

[13] By construction, the equation is just identified and the error term is not subject to serial correlation. Hence, the two stage least square is consistent and efficient. We do assume potential heteroskedasticity (i.e., correlation in error terms) among firms in each country and each year, and corrected this by clustering at country-year level.

good shareholder protection may directly lower the both the debt and the equity holders' required risk premium for the possibility of a misuse of funds and of inefficient management.

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Table 1. Descriptive Statistics

Variable	Definition/Source	Mean	Std	25%	Median	75%	Obs	Number of Zero Obs
Worldscope Data								
q	Tobin's q	3.0	141.3	1.0	1.2	1.7	360545	
age	Company Age	34.3	37.3	23.0	50.0	85.0	326829	
size	Sales in USD	1079994	6063282	21519	99924	420293	381643	
MarProfit1	change in Net Income plus ID over change in total asset	-0.2	77.4	-0.1	0.1	0.3	330356	
MarProfit2	change in operating income over change in total assets	0.0	55.8	-0.1	0.0	0.3	327180	
Inv1	capital expenditure plus change in cash over total assets	0.1	0.4	0.0	0.1	0.1	220959	63122
Inv2	capital expenditure over total assets	0.1	0.5	0.0	0.0	0.1	333537	19703
ExtFin1	change in total debt over total assets	0.2	10.2	0.0	0.1	0.1	155957	174234
ExtFin2	capital expenditure plus change in cash minus (CF + DF + DR + IP)	0.8	29.9	0.0	0.1	0.2	114664	121408
Country Level Variables								
interest	Interest Rate/IFS	6.9	9.6	2.4	4.0	7.4	252	
inflation	Inflation Rate/IFS	16.4	112.8	1.8	3.1	7.9	814	
CorpGov	One minus country-specific R-squared (synchronicity of stock prices)/ Morck et al. (2000)	0.8	0.1	0.8	0.8	0.9	40	
	Corporate Governance Quality Index/ De Nicola, Leaven and Ueda (2008)	0.6	0.1	0.6	0.6	0.6	42	
	Antidirector Rights Index/ La Porta et al. (1998)	3.2	1.3	2.0	3.0	4.0	45	
	Self Dealing Index/ Djankov et al. (2007)	0.5	0.2	0.3	0.5	0.7	48	
CredRight	Strength of Legal Right Index /Doing Business (2007)	6.1	2.3	4.0	7.0	8.0	48	
	Creditor Rights / Shleifer et all (2008)	1.9	1.1	1.0	2.0	3.0	45	
	Efficiency of Bankruptcy Law/ Global Competitiveness Report (2004)	5.2	1.0	4.3	5.2	6.0	48	
Inst	Property Rights/ Heritage Foundation and Wall Street Journal Index of Economic Freedom (1997)	4.3	0.8	4.0	4.5	5.0	40	
	Legal origin/La Porta (1996)	0.3	0.5	0.0	0.0	1.0	47	
	Rule of Law/ Kraay and Kaufman(2000)	1.0	1.0	0.2	1.3	2.0	41	
	Trust in People/ World Values Survey 1990-1993	0.4	0.2	0.3	0.4	0.5	26	
Compet	Number of listed firms per millions of people/WDI	26.0	30.8	5.4	13.3	33.9	48	
	Barriers to Trade in 2007/World Economic Forum Global Competitiveness Report (2007)	5.0	0.8	4.2	5.1	5.5	48	
	Business Entry Rate(New Registrations as a % of Total	9.9	3.6	6.7	9.9	12.7	38	
	Cost of Starting a Business(% of income per capita)/Doing Business (2007)	12.9	16.99	2.35	7.7	19.75	48	
FinMkt	Market Capitalization to GDP in 2006 / WDI	112.7	133.7	44.0	83.9	126.0	47	
	Access to Local Equity Markets/ World Economic Forum Global Competitiveness Report (2007)	5.6	0.7	5.2	5.8	6.2	48	
	Total Credit over GDP/ IFS	2.2	1.3	1.0	2.0	3.1	41	
	Foreign Ownership Restrictions/ World Economic Forum Global Competitiveness Report(2007)	5.4	0.7	5.0	5.5	6.0	48	
Macro	Standard Deviation of GDP growth/ WDI	2.7	1.4	1.5	2.4	3.8	47	
	Coefficient of Variation of Exchange Rate/WDI	0.3	0.2	0.1	0.2	0.3	48	
	Standard Deviation of inflation/ WDI	66.8	268.7	1.6	3.3	9.4	47	

Table 2a. Benchmark Regression—Corporate Governance

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0481	-0.0069	0.0248	0.0397		
	[-4.375]***	[-2.812]***	[5.635]***	[2.151]**		
Real Factors						
Firm Age	0.0028	0.0001	-0.0005	-0.0001	0.0039	0.0148
	[4.602]***	[3.519]***	[-0.888]	[-0.283]	[1.389]	[1.125]
Risk Free Rate	0.0041	-0.0004	0.0023	-0.0154	0.0244	-0.0750
	[0.470]	[-0.346]	[0.865]	[-2.235]**	[3.231]***	[-1.090]
Inflation	-0.0086	0.0035	-0.0020	-0.0213	-0.0268	0.1098
	[-0.897]	[1.132]	[-0.555]	[-0.882]	[-3.664]***	[1.198]
Macro Volatility	-0.0398	-0.0028	-0.0016	0.0156	0.1224	-0.0235
	[-1.248]	[-1.370]	[-0.143]	[0.504]	[1.181]	[-0.087]
Observations	74296					
R-squared	0.504					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 2b. Benchmark Regression—Creditor Rights

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0169	-0.0027	0.0056	-0.0144		
	[-1.389]	[-1.618]	[1.004]	[-0.663]		
Real Factors						
Firm Age	0.0031	0.0002	-0.0007	-0.0005	0.0033	0.0174
	[5.891]***	[3.127]***	[-1.093]	[-1.844]*	[1.211]	[1.303]
Risk Free Rate	0.0033	-0.0008	0.0019	-0.0071	0.0246	-0.0682
	[0.398]	[-0.694]	[0.750]	[-1.026]	[3.387]***	[-1.017]
Inflation	-0.0080	0.0032	-0.0016	-0.0211	-0.0273	0.1012
	[-0.847]	[1.095]	[-0.460]	[-0.856]	[-3.777]***	[1.170]
Macro Volatility	-0.0261	-0.0006	-0.0079	-0.0439	0.1219	0.1923
	[-0.785]	[-0.363]	[-0.674]	[-1.125]	[1.185]	[0.696]
Observations	75792					
R-squared	0.499					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 2c. Benchmark Regression—General Institutional Quality

	Required Return [1]	(-) Fin. Friction Coeff. Ext. Fin. [2]	Fin. Friction Coeff. Capital [3]	(-) Fin. Friction Curvature [4]	Inv. Adj. Cost Coeff. Capital [5]	Inv. Adj. Curve Curvature [6]
Institutional Factors						
Corporate Governance	-0.0587	-0.0085	0.0457	-0.0840		
	[-2.022]*	[-1.204]	[3.348]***	[-1.073]		
Real Factors						
Firm Age	0.0031	0.0001	-0.0007	-0.0006	0.0039	0.0150
	[5.394]***	[3.851]***	[-1.109]	[-2.450]**	[1.361]	[1.120]
Risk Free Rate	0.0026	-0.0009	0.0034	-0.0117	0.0239	-0.0573
	[0.285]	[-0.886]	[1.168]	[-1.752]*	[3.344]***	[-0.857]
Inflation	-0.0074	0.0031	-0.0021	-0.0232	-0.0264	0.0989
	[-0.711]	[1.171]	[-0.611]	[-0.952]	[-3.746]***	[1.146]
Macro Volatility	-0.0264	0.0019	-0.0066	-0.0637	0.1149	0.0301
	[-0.762]	[3.146]***	[-0.560]	[-2.139]**	[1.108]	[0.109]
Observations	74249					
R-squared	0.502					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 2d. Benchmark Regression—Product Market Competitiveness

	Required Return [1]	(-) Fin. Friction Coeff. Ext. Fin. [2]	Fin. Friction Coeff. Capital [3]	(-) Fin. Friction Curvature [4]	Inv. Adj. Cost Coeff. Capital [5]	Inv. Adj. Curve Curvature [6]
Institutional Factors						
Corporate Governance	0.0782	0.0124	-0.0318	-0.1346		
	[2.121]**	[1.706]*	[-1.946]*	[-1.536]		
Real Factors						
Firm Age	0.0031	0.0002	-0.0006	-0.0005	0.0035	0.0179
	[6.063]***	[2.814]***	[-1.012]	[-1.976]*	[1.240]	[1.326]
Risk Free Rate	0.0023	-0.0006	0.0021	-0.0178	0.0233	-0.0534
	[0.257]	[-0.501]	[0.845]	[-2.062]**	[3.256]***	[-0.837]
Inflation	-0.0068	0.0031	-0.0015	-0.0157	-0.0268	0.1043
	[-0.689]	[1.056]	[-0.447]	[-0.711]	[-3.590]***	[1.347]
Macro Volatility	-0.0086	0.0034	-0.0133	-0.0317	0.1205	0.1420
	[-0.307]	[2.651]**	[-1.029]	[-1.320]	[1.143]	[0.539]
Observations	75792					
R-squared	0.5					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 2e. Benchmark Regression—Financial Market Development

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0003	-0.0002	0.0002	0.0011		
	[-1.398]	[-2.099]**	[1.158]	[1.888]*		
Real Factors						
Firm Age	0.0031	0.0001	-0.0006	-0.0002	0.0033	0.0184
	[6.205]***	[2.856]***	[-1.034]	[-0.836]	[1.207]	[1.359]
Risk Free Rate	0.0035	-0.0004	0.0020	-0.0135	0.0245	-0.0615
	[0.415]	[-0.317]	[0.786]	[-2.185]**	[3.368]***	[-0.910]
Inflation	-0.0080	0.0031	-0.0014	-0.0185	-0.0272	0.0973
	[-0.842]	[1.018]	[-0.401]	[-0.764]	[-3.717]***	[1.134]
Macro Volatility	-0.0189	-0.0011	-0.0092	-0.0050	0.1150	0.1588
	[-0.568]	[-0.661]	[-0.705]	[-0.190]	[1.126]	[0.586]
Observations	75792					
R-squared	0.499					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 3. Benchmark Regression—All Together

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0421	-0.0038	0.0244	0.0281		
	[-3.290]***	[-3.661]***	[5.278]***	[2.185]**		
Creditor Rights	-0.0073	0.0014	-0.0085	0.0167		
	[-0.338]	[0.431]	[-1.342]	[0.518]		
Institution	-0.0031	-0.0067	0.0527	-0.1528		
	[-0.074]	[-0.473]	[2.560]**	[-1.029]		
Competitiveness	0.0737	0.0023	-0.0115	-0.1039		
	[2.381]**	[0.276]	[-0.616]	[-0.930]		
Financial Markets	0.0001	0.0000	-0.0001	-0.0008		
	[0.320]	[-0.682]	[-1.083]	[-1.338]		
Real Factors						
Firm Age	0.0028	0.0001	-0.0005	-0.0004	0.0040	0.0145
	[4.772]***	[2.362]**	[-0.826]	[-1.282]	[1.347]	[1.126]
Risk Free Rate	0.0023	-0.0002	0.0045	-0.0247	0.0241	-0.0708
	[0.241]	[-0.140]	[1.465]	[-1.810]*	[3.375]***	[-1.173]
Inflation	-0.0070	0.0026	-0.0025	-0.0218	-0.0264	0.1145
	[-0.672]	[1.036]	[-0.755]	[-0.955]	[-3.664]***	[1.443]
Macro Volatility	-0.0352	0.0005	-0.0070	-0.0284	0.1148	0.0377
	[-1.271]	[0.196]	[-0.687]	[-0.748]	[1.055]	[0.148]
Observations	74249					
R-squared	0.506					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 4. Regression Using After-Tax Income

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0410	-0.0028	0.0241	0.0236		
	[-3.278]***	[-3.138]***	[4.952]***	[1.385]		
Creditor Rights	-0.0077	-0.0043	-0.0097	0.0414		
	[-0.365]	[-1.596]	[-1.398]	[1.594]		
Institution	0.0018	0.0097	0.0541	-0.2358		
	[0.042]	[1.079]	[2.365]**	[-2.015]*		
Competitiveness	0.0748	0.0004	-0.0104	-0.0981		
	[2.470]**	[0.088]	[-0.517]	[-1.115]		
Financial Markets	0.0001	0.0000	-0.0001	-0.0004		
	[0.329]	[0.114]	[-1.260]	[-0.916]		
Real Factors						
Firm Age	0.0028	0.0001	-0.0004	0.0000	0.0036	0.0148
	[4.889]***	[1.456]	[-0.750]	[-0.042]	[1.258]	[1.112]
Risk Free Rate	0.0031	0.0003	0.0037	-0.0243	0.0209	-0.0878
	[0.310]	[1.026]	[1.287]	[-4.115]***	[3.164]***	[-1.566]
Inflation	-0.0075	0.0026	-0.0018	-0.0203	-0.0229	0.1259
	[-0.711]	[0.769]	[-0.563]	[-0.718]	[-3.444]***	[1.612]
Macro Volatility	-0.0376	-0.0029	-0.0039	0.0019	0.1282	0.0904
	[-1.349]	[-0.800]	[-0.431]	[0.065]	[1.169]	[0.365]
Observations	74272					
R-squared	0.49					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 5. Regression Using A Broad Concept of Investment (incl. Security Investment)

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0443	-0.0040	0.0255	0.0282		
	[-3.534]***	[-3.803]***	[5.578]***	[2.063]**		
Creditor Rights	-0.0084	0.0014	-0.0082	0.0151		
	[-0.390]	[0.417]	[-1.327]	[0.474]		
Institution	-0.0085	-0.0073	0.0535	-0.1415		
	[-0.208]	[-0.512]	[2.709]***	[-0.955]		
Competitiveness	0.0738	0.0016	-0.0104	-0.0964		
	[2.366]**	[0.198]	[-0.582]	[-0.887]		
Financial Markets	0.0001	0.0000	-0.0001	-0.0008		
	[0.371]	[-0.754]	[-1.557]	[-1.278]		
Real Factors						
Firm Age	0.0028	0.0001	-0.0003	-0.0004	0.0043	-0.0022
	[4.673]***	[2.025]**	[-0.723]	[-1.123]	[1.383]	[-0.888]
Risk Free Rate	0.0033	-0.0004	0.0047	-0.0217	0.0253	-0.0889
	[0.322]	[-0.255]	[1.420]	[-1.615]	[3.445]***	[-3.527]***
Inflation	-0.0076	0.0027	-0.0015	-0.0225	-0.0259	0.0211
	[-0.705]	[1.013]	[-0.485]	[-0.929]	[-3.780]***	[0.287]
Macro Volatility	-0.0365	0.0000	-0.0057	-0.0223	0.1197	-0.1178
	[-1.298]	[0.013]	[-0.595]	[-0.622]	[1.074]	[-1.117]
Observations	74249					
R-squared	0.511					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 6. Regression Using A Narrow Concept of External Finance (excl. Trade Credit)

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0120	-0.0007	0.0186	0.0173		
	[-0.846]	[-0.848]	[3.275]***	[1.438]		
Creditor Rights	-0.0300	0.0007	0.0014	-0.0126		
	[-1.511]	[0.951]	[0.181]	[-0.856]		
Institution	0.0045	-0.0011	0.0099	0.0000		
	[0.111]	[-0.540]	[0.631]	[.]		
Competitiveness	0.0259	-0.0006	-0.0279	0.0410		
	[0.833]	[-0.377]	[-1.432]	[1.279]		
Financial Markets	0.0008	0.0000	-0.0003	-0.0004		
	[3.188]***	[0.190]	[-1.580]	[-0.904]		
Real Factors						
Firm Age	0.0031	-0.0001	-0.0009	0.0010	0.0116	0.0152
	[5.522]***	[-1.275]	[-1.719]*	[0.968]	[1.185]	[1.279]
Risk Free Rate	0.0048	-0.0010	0.0038	0.0125	0.0125	-0.0897
	[0.408]	[-0.994]	[1.519]	[1.043]	[0.812]	[-1.965]*
Inflation	-0.0037	0.0008	-0.0070	-0.0161	-0.0265	0.0570
	[-0.297]	[0.990]	[-1.700]*	[-1.040]	[-2.422]**	[1.113]
Macro Volatility	-0.0573	0.0020	-0.0019	-0.0410	0.4655	0.3910
	[-1.869]*	[1.149]	[-0.190]	[-1.385]	[1.328]	[1.700]*
Observations	81530					
R-squared	0.292					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 7. Spamann's Version of Anti-Director Rights as Corporate Governance

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	0.0203	0.0109	-0.0255	-0.0647		
	[1.755]*	[3.843]***	[-3.825]***	[-1.663]		
Creditor Rights	-0.0150	0.0015	-0.0042	-0.0012		
	[-0.797]	[0.431]	[-0.719]	[-0.036]		
Institution	-0.0125	0.0004	0.0566	-0.1216		
	[-0.328]	[0.030]	[3.074]***	[-0.758]		
Competitiveness	0.1028	0.0083	-0.0385	-0.1055		
	[2.627]**	[1.203]	[-2.079]**	[-0.984]		
Financial Markets	-0.0001	0.0000	0.0001	-0.0010		
	[-0.208]	[0.518]	[0.594]	[-1.101]		
Real Factors						
Firm Age	0.0028	0.0000	-0.0004	-0.0001	0.0037	0.0130
	[5.887]***	[-0.267]	[-0.926]	[-0.369]	[1.299]	[1.061]
Risk Free Rate	0.0015	0.0001	0.0046	-0.0218	0.0216	-0.0503
	[0.151]	[0.050]	[1.590]	[-1.501]	[3.446]***	[-0.802]
Inflation	-0.0054	0.0033	-0.0017	-0.0277	-0.0266	0.1241
	[-0.505]	[1.247]	[-0.563]	[-1.181]	[-3.545]***	[1.742]*
Macro Volatility	-0.0246	0.0049	-0.0140	-0.0226	0.1095	0.0227
	[-0.851]	[1.504]	[-1.416]	[-0.628]	[1.017]	[0.080]
Observations	74249					
R-squared	0.507					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 8. Self-Dealing Index as Corporate Governance

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.1726	-0.0283	0.1214	0.0225		
	[-1.355]	[-1.605]	[1.988]*	[0.116]		
Creditor Rights	-0.0102	0.0011	-0.0092	0.0191		
	[-0.477]	[0.327]	[-1.470]	[0.578]		
Institution	0.0011	-0.0040	0.0531	-0.1493		
	[0.027]	[-0.289]	[2.530]**	[-1.015]		
Competitiveness	0.1019	0.0033	-0.0257	-0.1336		
	[2.761]***	[0.362]	[-1.514]	[-1.037]		
Financial Markets	-0.0001	0.0000	0.0000	0.0000		
	[-0.243]	[-1.052]	[0.013]	[-0.057]		
Real Factors						
Firm Age	0.0029	0.0001	-0.0005	-0.0006	0.0038	0.0149
	[5.121]***	[2.604]**	[-0.910]	[-1.670]	[1.293]	[1.160]
Risk Free Rate	0.0021	-0.0001	0.0047	-0.0261	0.0239	-0.0568
	[0.224]	[-0.054]	[1.561]	[-1.840]*	[3.396]***	[-0.927]
Inflation	-0.0070	0.0025	-0.0023	-0.0197	-0.0260	0.1013
	[-0.661]	[0.970]	[-0.726]	[-0.860]	[-3.617]***	[1.283]
Macro Volatility	-0.0158	0.0045	-0.0211	-0.0481	0.1018	0.0632
	[-0.483]	[1.845]*	[-1.583]	[-1.339]	[0.925]	[0.239]
Observations	74249					
R-squared	0.505					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 9. CGQ Index as Corporate Governance

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.7143	-0.4338	1.2312	2.4052		
	[-1.135]	[-3.252]***	[4.638]***	[1.596]		
Creditor Rights	-0.0142	0.0029	-0.0123	-0.0009		
	[-0.699]	[0.764]	[-1.819]*	[-0.028]		
Institution	0.0143	0.0126	0.0260	-0.2336		
	[0.359]	[0.829]	[1.345]	[-1.231]		
Competitiveness	0.1341	0.0201	-0.0563	-0.2015		
	[2.520]**	[1.767]*	[-2.774]***	[-1.464]		
Financial Markets	0.0003	0.0001	-0.0002	-0.0013		
	[0.556]	[1.285]	[-0.919]	[-1.143]		
Real Factors						
Firm Age	0.0028	0.0001	-0.0004	-0.0005	0.0037	0.0146
	[5.044]***	[1.989]*	[-0.813]	[-1.596]	[1.234]	[1.178]
Risk Free Rate	0.0029	0.0015	0.0022	-0.0311	0.0212	-0.0430
	[0.297]	[1.056]	[0.803]	[-2.065]**	[3.179]***	[-0.686]
Inflation	-0.0072	0.0019	-0.0003	-0.0185	-0.0256	0.1044
	[-0.670]	[0.766]	[-0.113]	[-0.802]	[-3.396]***	[1.420]
Macro Volatility	-0.0254	0.0000	0.0104	-0.0377	0.1027	0.0960
	[-0.727]	[0.003]	[1.059]	[-0.813]	[0.933]	[0.344]
Observations	73597					
R-squared	0.51					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 10. Creditor Rights (Narrower Definition)

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0489	0.0017	0.0182	-0.0125		
	[-3.474]***	[0.524]	[3.151]***	[-0.240]		
Creditor Rights	-0.0054	0.0185	-0.025	-0.0937		
	[-0.238]	[1.979]*	[-2.344]**	[-0.964]		
Institution	0.0088	-0.0234	0.059	0.0270		
	[0.196]	[-2.084]**	[2.705]**	[0.329]		
Competitiveness	0.0721	0.0010	-0.0112	-0.0551		
	[2.630]**	[0.146]	[-0.632]	[-0.590]		
Financial Markets	0.0000	0.0001	-0.0001	-0.0007		
	[0.246]	[1.281]	[-1.018]	[-1.653]		
Real Factors						
Firm Age	0.0027	0.0001	-0.0005	-0.0007	0.0040	0.0152
	[4.634]***	[2.530]**	[-0.861]	[-2.166]**	[1.371]	[1.178]
Risk Free Rate	0.0034	0.0007	0.0042	-0.0211	0.0249	-0.0514
	[0.362]	[0.709]	[1.373]	[-2.371]**	[3.484]***	[-0.817]
Inflation	-0.0082	0.0020	-0.0027	-0.0218	-0.0275	0.1032
	[-0.794]	[0.892]	[-0.796]	[-0.992]	[-3.665]***	[1.276]
Macro Volatility	-0.0321	0.0008	0.0060	-0.0478	0.1193	-0.0361
	[-1.155]	[0.327]	[0.593]	[-1.520]	[1.100]	[-0.128]
Observations	73864					
R-squared	0.506					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 11. Bankruptcy Efficiency as Creditor Rights

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0460	-0.0048	0.0228	0.0269		
	[-3.894]***	[-3.422]***	[4.828]***	[2.399]**		
Creditor Rights	0.0230	-0.0044	0.0255	-0.1494		
	[0.919]	[-0.563]	[1.206]	[-1.093]		
Institution	-0.0293	0.0061	0.0315	-0.0481		
	[-0.919]	[0.579]	[1.793]*	[-0.362]		
Competitiveness	0.0482	0.0054	-0.0288	0.0302		
	[1.226]	[0.508]	[-1.598]	[0.200]		
Financial Markets	0.0000	0.0000	-0.0002	0.0000		
	[-0.063]	[0.339]	[-1.163]	[-0.016]		
Real Factors						
Firm Age	0.0027	0.0001	-0.0004	-0.0003	0.0040	0.0146
	[4.809]***	[1.960]*	[-0.843]	[-1.140]	[1.380]	[1.170]
Risk Free Rate	0.0019	0.0006	0.0041	-0.0164	0.0209	-0.0556
	[0.199]	[0.460]	[1.396]	[-1.131]	[3.431]***	[-0.945]
Inflation	-0.0062	0.0026	-0.0015	-0.0255	-0.0256	0.1194
	[-0.594]	[1.028]	[-0.509]	[-1.076]	[-3.488]***	[1.752]*
Macro Volatility	-0.0269	0.0000	0.0046	-0.0805	0.1178	0.0244
	[-0.908]	[0.022]	[0.487]	[-1.812]*	[1.097]	[0.087]
Observations	74249					
R-squared	0.507					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 12. Rule of Law as General Institutional Quality

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0583	-0.0027	0.0126	0.0728		
	[-3.260]***	[-1.577]	[1.796]*	[2.232]**		
Creditor Rights	-0.0150	0.0001	0.0004	0.0158		
	[-0.768]	[0.073]	[0.085]	[0.874]		
Institution	0.0446	-0.0104	0.0597	-0.1597		
	[1.190]	[-1.868]*	[2.221]**	[-1.438]		
Competitiveness	0.0658	0.0035	-0.0342	-0.0190		
	[2.199]**	[0.614]	[-2.342]**	[-0.288]		
Financial Markets	0.0001	0.0000	-0.0002	-0.0004		
	[0.500]	[0.023]	[-1.321]	[-0.814]		
Real Factors						
Firm Age	0.0027	0.0001	-0.0004	-0.0003	0.0038	0.0147
	[4.950]***	[3.141]***	[-0.715]	[-1.098]	[1.268]	[1.194]
Risk Free Rate	0.0020	0.0003	0.0030	-0.0226	0.0233	-0.0269
	[0.218]	[0.390]	[1.136]	[-2.099]**	[3.465]***	[-0.402]
Inflation	-0.0069	0.0028	-0.0021	-0.0192	-0.0268	0.0926
	[-0.679]	[1.018]	[-0.635]	[-0.840]	[-3.507]***	[1.169]
Macro Volatility	-0.0386	0.0034	-0.0091	-0.0157	0.1027	-0.0091
	[-1.418]	[0.985]	[-0.762]	[-0.350]	[0.917]	[-0.033]
Observations	74296					
R-squared	0.507					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 13. People’s Trust as General Institutional Quality

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0489	-0.0056	0.0194	0.0439		
	[-4.383]***	[-4.432]***	[3.610]***	[2.757]***		
Creditor Rights	-0.0340	-0.0023	0.0003	-0.0308		
	[-1.741]*	[-1.105]	[0.040]	[-1.414]		
Institution	0.3780	0.0462	0.1968	-0.9351		
	[2.454]**	[1.793]*	[2.335]**	[-3.011]***		
Competitiveness	0.0552	-0.0050	-0.0304	0.0325		
	[2.156]**	[-1.286]	[-1.317]	[0.777]		
Financial Markets	0.0002	0.0000	-0.0002	0.0001		
	[0.853]	[-1.234]	[-1.014]	[0.282]		
Real Factors						
Firm Age	0.0028	0.0001	-0.0004	-0.0004	0.0013	0.0177
	[4.239]***	[2.379]**	[-0.814]	[-1.091]	[0.892]	[1.262]
Risk Free Rate	0.0093	-0.0011	0.0049	0.0058	0.0304	-0.1039
	[1.058]	[-0.836]	[1.199]	[0.493]	[3.516]***	[-1.301]
Inflation	-0.0130	0.0036	-0.0039	-0.0427	-0.0329	0.1433
	[-1.356]	[1.330]	[-0.886]	[-1.431]	[-3.463]***	[1.717]*
Macro Volatility	-0.0789	-0.0025	-0.0071	0.0023	0.1286	0.1398
	[-2.309]**	[-0.874]	[-0.504]	[0.101]	[1.105]	[0.302]
Observations	67419					
R-squared	0.531					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 14. New Firm Entry as Product Market Competitiveness

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0497	-0.0048	0.0275	0.0714		
	[-3.505]***	[-3.207]***	[5.456]***	[2.300]**		
Creditor Rights	-0.0043	0.0048	-0.0228	-0.0019		
	[-0.163]	[1.108]	[-3.578]***	[-0.062]		
Institution	-0.0333	-0.0013	0.0625	-0.2152		
	[-0.711]	[-0.137]	[3.574]***	[-2.474]**		
Competitiveness	-0.0011	-0.0023	0.0059	0.0126		
	[-0.272]	[-4.012]***	[2.132]**	[1.203]		
Financial Markets	0.0003	0.0000	0.0001	-0.0023		
	[0.674]	[0.438]	[0.344]	[-2.088]**		
Real Factors						
Firm Age	0.0026	0.0001	-0.0004	-0.0006	0.0031	0.0129
	[4.209]***	[2.047]**	[-0.678]	[-2.519]**	[1.280]	[0.974]
Risk Free Rate	0.0050	0.0009	0.0039	-0.0217	0.0171	-0.0286
	[0.518]	[0.845]	[1.208]	[-2.516]**	[2.842]***	[-0.396]
Inflation	-0.0092	0.0025	-0.0016	-0.0269	-0.0163	0.0865
	[-0.892]	[1.092]	[-0.483]	[-1.216]	[-2.706]**	[0.959]
Macro Volatility	-0.0478	0.0066	-0.0175	-0.0589	0.0457	0.1465
	[-1.245]	[1.492]	[-1.749]*	[-1.256]	[0.738]	[0.567]
Observations	68023					
R-squared	0.51					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 15. Business Start-Up Cost as Product Market Competitiveness

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0489	-0.0039	0.0236	0.0464		
	[-3.620]***	[-2.764]***	[5.056]***	[2.152]**		
Creditor Rights	0.0037	0.0011	-0.0107	0.0075		
	[0.166]	[0.338]	[-1.683]	[0.274]		
Institution	-0.0226	-0.0053	0.0571	-0.0710		
	[-0.475]	[-0.441]	[2.696]**	[-0.652]		
Competitiveness	0.0007	-0.0003	0.0002	0.0118		
	[0.386]	[-0.926]	[0.408]	[1.953]*		
Financial Markets	0.0001	0.0000	0.0000	-0.0004		
	[0.477]	[-0.759]	[0.067]	[-0.595]		
Real Factors						
Firm Age	0.0028	0.0000	-0.0005	-0.0003	0.0039	0.0146
	[4.512]***	[0.899]	[-0.867]	[-0.903]	[1.349]	[1.135]
Risk Free Rate	0.0032	0.0001	0.0041	-0.0183	0.0241	-0.0742
	[0.349]	[0.125]	[1.330]	[-2.282]**	[3.479]***	[-1.158]
Inflation	-0.0077	0.0023	-0.0021	-0.0298	-0.0266	0.1143
	[-0.765]	[1.079]	[-0.621]	[-1.290]	[-3.775]***	[1.335]
Macro Volatility	-0.0437	0.0005	-0.0061	-0.0613	0.1219	-0.0056
	[-1.178]	[0.177]	[-0.537]	[-1.381]	[1.152]	[-0.021]
Observations	74249					
R-squared	0.505					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 16. Private Credit/GDP as Financial Market Development

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0432	-0.0043	0.0239	-0.0049		
	[-3.872]***	[-2.808]***	[4.994]***	[-0.236]		
Creditor Rights	-0.0125	0.0004	-0.0103	0.0114		
	[-0.561]	[0.118]	[-1.541]	[0.380]		
Institution	-0.0049	-0.0053	0.0555	-0.1313		
	[-0.119]	[-0.405]	[2.513]**	[-0.906]		
Competitiveness	0.0785	0.0048	-0.0059	-0.1585		
	[2.612]**	[0.500]	[-0.338]	[-1.144]		
Financial Markets	0.0233	0.0019	-0.0011	0.0135		
	[1.170]	[0.479]	[-0.123]	[0.220]		
Real Factors						
Firm Age	0.0028	0.0001	-0.0005	-0.0005	0.0040	0.0156
	[4.726]***	[2.475]**	[-0.873]	[-1.341]	[1.355]	[1.108]
Risk Free Rate	0.0018	-0.0003	0.0051	-0.0238	0.0226	-0.0637
	[0.184]	[-0.212]	[1.667]	[-1.555]	[3.372]***	[-0.968]
Inflation	-0.0063	0.0028	-0.0032	-0.0220	-0.0249	0.1077
	[-0.590]	[1.091]	[-1.009]	[-0.918]	[-3.629]***	[1.317]
Macro Volatility	-0.0308	0.0005	-0.0088	-0.0412	0.1154	0.0747
	[-1.143]	[0.183]	[-0.804]	[-1.102]	[1.061]	[0.288]
Observations	73302					
R-squared	0.506					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 17. Lack of Foreign Ownership Restrictions as Financial Market Development

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0374	-0.0032	0.0226	0.0034		
	[-2.706]**	[-2.611]**	[5.962]***	[0.222]		
Creditor Rights	-0.0115	-0.0009	-0.0089	0.0180		
	[-0.574]	[-0.301]	[-1.299]	[0.608]		
Institution	-0.0038	-0.0054	0.0564	-0.1294		
	[-0.095]	[-0.422]	[2.642]**	[-0.994]		
Competitiveness	0.0560	-0.0036	-0.0039	-0.0978		
	[1.420]	[-0.404]	[-0.225]	[-0.861]		
Financial Markets	0.0347	0.0116	-0.0074	-0.0388		
	[0.600]	[1.980]*	[-0.460]	[-0.573]		
Real Factors						
Firm Age	0.0028	0.0001	-0.0005	-0.0006	0.0040	0.0144
	[4.747]***	[3.344]***	[-0.821]	[-1.865]*	[1.394]	[1.109]
Risk Free Rate	0.0018	-0.0003	0.0045	-0.0240	0.0228	-0.0740
	[0.182]	[-0.183]	[1.441]	[-1.756]*	[3.363]***	[-1.299]
Inflation	-0.0060	0.0026	-0.0019	-0.0212	-0.0261	0.1287
	[-0.576]	[1.018]	[-0.610]	[-0.914]	[-3.604]***	[1.830]*
Macro Volatility	-0.0404	0.0001	-0.0065	-0.0357	0.1217	0.0473
	[-1.521]	[0.026]	[-0.631]	[-0.908]	[1.134]	[0.187]
Observations	74249					
R-squared	0.506					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Table 18. Including Institutional Effects in Real Investment Adjustment

	Required Return	(-) Fin. Friction Coeff. Ext. Fin.	Fin. Friction Coeff. Capital	(-) Fin. Friction Curvature	Inv. Adj. Cost Coeff. Capital	Inv. Adj. Curve Curvature
	[1]	[2]	[3]	[4]	[5]	[6]
Institutional Factors						
Corporate Governance	-0.0412	-0.0038	0.0295	0.0272	-0.1684	-0.9241
	[-3.259]***	[-3.661]***	[5.297]***	[2.125]**	[-3.543]***	[-2.064]**
Creditor Rights	-0.0075	0.0013	-0.0082	0.0181	0.0198	-0.0259
	[-0.348]	[0.403]	[-1.229]	[0.564]	[0.226]	[-0.086]
Institution	-0.0024	-0.0061	0.0501	-0.1595	-0.1388	0.2567
	[-0.057]	[-0.436]	[2.808]***	[-1.065]	[-1.194]	[0.344]
Competitiveness	0.0747	0.0025	-0.0043	-0.1111	0.1600	-1.2193
	[2.407]**	[0.299]	[-0.203]	[-0.982]	[1.055]	[-1.633]
Financial Markets	0.0001	0.0000	-0.0001	-0.0008	0.0017	0.0043
	[0.333]	[-0.687]	[-1.045]	[-1.337]	[1.080]	[0.374]
Real Factors						
Firm Age	0.0028	0.0001	-0.0004	-0.0004	0.0029	0.0074
	[4.795]***	[2.228]**	[-0.782]	[-1.248]	[1.097]	[0.762]
Risk Free Rate	0.0022	-0.0001	0.0045	-0.0254	0.0219	-0.0915
	[0.233]	[-0.094]	[1.458]	[-1.864]*	[4.229]***	[-1.426]
Inflation	-0.0068	0.0026	-0.0025	-0.0215	-0.0263	0.1386
	[-0.665]	[1.023]	[-0.767]	[-0.945]	[-4.386]***	[1.704]*
Macro Volatility	-0.0349	0.0004	-0.0047	-0.0286	0.1313	-0.2957
	[-1.264]	[0.171]	[-0.499]	[-0.754]	[1.319]	[-0.723]
Observations	74249					
R-squared	0.506					

Note: (-) indicates that the effects enters in the opposite sign. Positive numbers imply reducing costs.

Appendix I. Assumptions on Shocks and the Value Function

Suppose in each period a firm receive shock $\varepsilon \in \mathrm{E}$ that follows a *cdf F.* This overall shock has three sources: an aggregate shock, $\theta \in \Theta$, which follows a *cdf G*; an industry-specific shock, $\omega \in \Omega$, which follows a *cdf H*; and an idiosyncratic shock, $\upsilon \in \Upsilon$. The three components are assumed to be orthogonal to each other and each component follows a probability distribution with support (0, ∞), for example, a log-normal distribution.

We assume that firm managers can infer the overall shock, ε, when making investment decisions, but does not know the size of each component. We assume this in a strict sense, that is, $E\left[\theta+\omega \mid \varepsilon\right]=E\left[\theta+\omega \mid \varepsilon'\right]$ for any pair $(\varepsilon, \varepsilon') \in \mathrm{E} \times \mathrm{E}$.

We also assume that firm characteristics, *X*, are either time invariant (e.g., industry), or non-stochastic and predictable (e.g., age). For the institutional characteristics, *W*, we assume that they are stable and that any changes are perceived by firm managers as (unexpected) regime changes.

Based on those assumptions, the stochastic discount factor can be simply represented by $m(\theta,\omega;X,W)$—it depends on aggregate shock θ and industry-specific shock ω, given firm characteristics X and institutions W. Note that it already factors in the predictable change in the firm characteristics, as defined below using the original discount factor $\tilde{m}(\theta,\omega;gX,W)$ with g, the deterministic growth of X:

$$\tilde{m}(\theta,\omega;X^{+},W)=\tilde{m}(\theta,\omega;gX,W)=h(g)\tilde{m}(\theta,\omega;X,W)=m(\theta,\omega;X,W),$$

where, for simplicity, $h(g)$ is assumed to be an increasing power function.

Using this normalized stochastic discount factor, the value function can now be expressed as

$$
\begin{aligned}
V(K^{-};X,W,\epsilon) &= \max_{K} \int_{\Theta\times\Omega} m(\theta,\omega;X,W)\left\{\pi(K,\epsilon)-\phi(I,K;X,W,\epsilon)\right. \\
&\quad \left. -\lambda(B,K;X,W,\epsilon)+\int_{\mathrm{E}} V(K;X^{+},W,\epsilon^{+})dF\right\} dGdH \\
&= \max_{K} \int_{\Theta\times\Omega} m(\theta,\omega;X,W)dGdH \left\{\pi(K,\epsilon)-\phi(I,K;X,W,\epsilon)\right. \\
&\quad \left. -\lambda(B,K;X,W,\epsilon)+\int_{\mathrm{E}} V(K;X^{+},W,\epsilon^{+})dF\right\} \qquad \text{(A1)} \\
&= \max_{K} \frac{1}{1+r\left(E\left[\theta\right],X,W\right)} \left\{\pi(K,\epsilon)-\phi(I,K;X,W,\epsilon)\right. \\
&\quad \left. -\lambda(B,K;X,W,\epsilon)+\int_{\mathrm{E}} V(K;X^{+},W,\epsilon^{+})dF\right\},
\end{aligned}
$$

where the expected discount factor is defined as:

$$
\frac{1}{1+r\left(E\left[\theta\right],X,W\right)} = \int_{\Theta\times\Omega} m(\theta,\omega;X,W)dGdH.
$$

This varies with firm characteristics, *X,* and with institutional quality, *W*. The industry-specific risk premium stemming from stochastic process ω is absorbed in the "industry effect" portion of firm characteristics, *X*. Unexpected regime changes in macro shocks and industry level shocks are also potentially allowed in this expression. Note that the last line of (A1) is equivalent to (8).