Intangible Capital Around the World*

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Abstract

We estimate the market value of intangible capital around the world using a neoclassical investment model with two quasi-fixed inputs, physical and intangible capital. Across publicly listed firms in 80 economies (77 countries and 3 territories), installed intangible capital accounts for more than half of firm value, with wide variation across countries. Intangible capital is substantially more costly to adjust than physical capital in almost every country. This adjustment cost varies mainly across countries rather than across industries. Stronger intellectual property protection, shareholder rights, and director liability each lower the cost of adjusting intangible capital, while stronger creditor rights lower the cost of adjusting physical capital.

Key Words: Valuation, Neoclassical Investment, Structural Estimation, Intangible Capital

JEL Classification: D21, D22, E22, E24, G12, G32

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1 Introduction

What is the market value of a firm's intangible capital stock? What determines the cost of investing in intangible capital? To address these questions, we estimate a neoclassical investment model with two quasi-fixed inputs—physical capital (e.g., plants and machinery) and intangible capital (e.g., brand names, patents, and organizational know-how)—using data on publicly traded firms across 80 economies (77 countries and 3 territories) from 2007 to 2023. We find that installed intangible capital accounts for more than half of firm value globally, with wide cross-country variation, and is substantially more costly to adjust than physical capital in almost every country. This adjustment cost varies mainly across countries rather than across industries. A country's institutional environment explains much of that variation: stronger intellectual property protection, shareholder rights, and director liability each lower the cost of adjusting intangible capital, while stronger creditor rights lower the cost of adjusting physical capital.

The market value of intangible capital, like that of any asset, is a quantity times a price: the stock of intangible capital a firm has accumulated, and the price the market places on an installed unit. Most of this capital never appears on the balance sheet, so existing studies measure the quantity by capitalizing past spending on R&D, advertising, and selling, general, and administrative expenses into a book stock of intangible capital (Eisfeldt and Papanikolaou, 2013; Peters and Taylor, 2017). But book value is not market value. The same stock can be worth more to one firm than to another, and more in one country than in another, depending on how costly the capital is to accumulate, protect, finance, and redeploy. Valuing intangible capital therefore requires a price as well as a quantity.

We recover that price with a neoclassical investment model. Investment is costly: beyond the purchase price, firms incur adjustment costs when they change their capital stock. Some of these costs are technological. Installing plant and equipment takes time and disrupts production; brands, patents, and organizational know-how are slow to build and hard to reverse— abandoning an established product, for example, can damage the firm's reputation. But adjustment costs need not be purely technological. Under costly external finance, the curvature of the financing cost enters the investment problem exactly like an adjustment cost, so the estimated coefficients admit a financing-frictions reading. In the spirit of business-cycle accounting (Chari, Kehoe, and

McGrattan, 2007), we treat them as reduced-form objects and, in Appendix C, map them to one concrete friction—costly external finance, governed by the pledgeability of each capital type and the premium on external equity.

In the model, the value of an installed unit of capital is its shadow price: the marginal market value of one more unit. Physical and intangible capital carry separate shadow prices. The first-order condition for investment ties each price to the corresponding investment rate, so investment reveals the price—a firm investing heavily in intangible capital reveals a high value of installed intangible capital, while one investing little, or letting it depreciate, reveals a low value. Physical investment reveals the value of physical capital in the same way. We estimate, for each country, how steeply each shadow price rises with its own investment rate—that is, the cost of adjusting each type of capital. Total firm value is then the sum of a physical and an intangible component, each a price times a stock—an additive decomposition that extends Hayashi (1982) to two capital inputs.

We estimate the model using data on a large cross section of publicly traded firms around the world. To measure each firm's capital stocks, we use accounting data from Compustat (North America and Global). Physical capital is reported directly on the balance sheet. Most intangible capital is not, so we follow Eisfeldt and Papanikolaou (2013) and Peters and Taylor (2017) and build an off-the-books stock from Selling, General, and Administrative (SG&A) expense. SG&A is well populated across our countries and, as Lev and Radhakrishnan (2005) show, is a comprehensive measure of intangible investment: it captures spending on a skilled workforce (training), knowledge (often including R&D), and brands (advertising). Accumulating this spending by the perpetual inventory method yields the internally generated, off-the-books stock. Unlike most prior work, we also add an on-the-books stock built from reported balance-sheet intangibles (Compustat item INTAN), which arise mostly from acquisitions. This on-the-books component is small for most firms—about 2% of intangible capital at the world median, so the off-the-books stock dominates, as in the U.S.-focused literature—but it is sizable in some countries, such as Ireland, the Netherlands, and Italy, where it reaches 27–30% of the intangible capital stock.

To estimate the adjustment-cost parameters for physical and intangible capital, we minimize the difference between observed and model-implied valuation ratios, where the valuation ratio is market equity plus net debt scaled by installed capital. To mitigate firm-level measurement error, we estimate at the portfolio level within each market. Countries with enough listed firms enter on a standalone basis; the remaining, more thinly covered markets are pooled into regional groups and estimated jointly. This yields 42 standalone markets and five regional groups, covering 80 economies from 2007 to 2023. This benchmark specification places no restrictions across countries or regions. The estimated adjustment costs imply shadow prices for physical and intangible capital, which we use to decompose firm value into physical and intangible components in each country.

Our main empirical findings can be summarized as follows. First, the neoclassical model with two capital inputs fits the data well. It explains most of the cross-sectional variation in valuation ratios, with a median cross-sectional R^2 of 0.82, and a smaller but still substantial share of their variation over time, with a median time-series R^2 of 0.38. Intangible capital is the dominant component of firm value: it accounts for a median of about 60% of the market value of installed capital, and for more than 80% in the largest developed markets—Sweden, the United Kingdom, the United States, and Finland—while falling to around 27% in a few emerging and transition economies.

Second, intangible capital is more costly to adjust than physical capital in almost every country. The median adjustment-cost coefficient for intangible capital is about six times that for physical capital. At a common 15% investment rate, adjusting intangible capital costs about 12% of the installed intangible stock, against 2% for physical capital. The cross-country dispersion in the intangible capital adjustment cost is also substantially larger than that for physical capital.

Third, the variation in the intangible capital adjustment cost is cross-country, not cross-industry. A variance decomposition of the country-by-industry estimates attributes nearly three-quarters of that variation to differences across countries, and almost none to differences across industries. The benchmark model, which lets adjustment costs vary across countries but not industries, therefore captures the relevant dimension of heterogeneity for intangible capital.

Finally, we ask which country characteristics explain the cross-country variation in adjustment costs. We estimate a restricted version of the benchmark in which the adjustment costs depend on a few observable country characteristics rather than on a free coefficient for each country. Stronger intellectual property protection, shareholder rights, and director liability each lower the cost of adjusting intangible capital, while stronger creditor rights lower the cost of adjusting physical capital. This pattern matches a financing-frictions reading of the adjustment costs: intangible capital is less pledgeable than physical capital, so intellectual property protection, which makes it more verifiable, transferable, and pledgeable, lowers the intangible capital adjustment cost. Shareholder rights and director liability lower the premium on outside equity, a margin especially important for intangible investment, while creditor rights raise the collateral value of tangible assets and lower the physical capital adjustment cost. Appropriability, by contrast, raises the value of intangible capital rather than its adjustment cost. The magnitudes are large. At a common 15% investment rate, countries with weak intellectual property protection face an intangible capital adjustment cost of about 19% of the installed intangible capital stock, compared with about 11% in countries with strong protection. Stronger institutions are also associated with more accumulated intangible capital and a higher intangible share of firm value.

Taken together, our findings show that intangible capital is a central component of firm value around the world, and that the institutional environment in which firms operate affects both its accumulation and its value.

Related Literature. Our paper is most closely related to the literature on firm valuation and production-based asset pricing, with a focus on intangible capital. Hall (2001) argues that the market value of firms in the late 1990s was high relative to the cost of their installed physical capital, and points to omitted intangible capital as a candidate explanation. Belo et al. (2022) decompose the value of North American firms into physical capital, labor, and two intangibles—brand and knowledge capital—and Crouzet and Eberly (2021) use their adjustment-cost estimates to trace the long-run evolution of firm valuation. Peters and Taylor (2017) add organization capital to the book capital stock to construct an intangible-adjusted Tobin's Q that better explains firm investment, and Eisfeldt and Papanikolaou (2013) show that firms with more organization capital are riskier. Intangible capital also improves asset-pricing factor models (Eisfeldt, Kim, and Papanikolaou, 2020; Gulen et al., 2022), and a related literature studies its risk characteristics and its exposure to customer-base shocks (Hansen, Heaton, and Li, 2012; Baker, Baugh, and Sammon, 2023). This work is almost entirely about the United States. To our knowledge, ours is the first paper to quantify the market value of intangible capital across a large set of countries, and we find that intangible capital is more costly to adjust than physical capital in almost every one of them.

Our focus on the institutional determinants of adjustment costs connects to a literature on how institutions affect investment and growth. Crouzet et al. (2022) argue that the limited pledgeability and contractibility of intangible capital constrain its accumulation, while Antill et al. (2023) model how patent-litigation rules affect innovation. Consistent with the pledgeability channel, we find that stronger intellectual property protection lowers the cost of adjusting intangible capital. On the broader legal environment, Djankov et al. (2003) document the higher procedural cost of civil-law systems and Acemoglu and Johnson (2005) link weak institutions to lower long-run growth. We connect these institutional features to firm value through a specific channel—the cost of adjusting each type of capital—and separate the institutions that matter for intangible capital (intellectual property protection and governance) from those that matter for physical capital (creditor rights and the pledgeability of collateral).

Our work also speaks to the literature on the modern corporate sector in international finance. Karabarbounis and Neiman (2014) document a global decline in the labor share of income, Chen, Karabarbounis, and Neiman (2017) a rise in corporate saving, and Falato et al. (2022) link the two to the shift toward intangible capital; Altomonte et al. (2021) relate frictions in intangible investment to the dispersion of markups across firms. We measure how costly intangible investment is across countries, and show that a high valuation of intangible capital can reflect the shadow price the market assigns to it, not just the quantity (book value) of capital.

Finally, we build on the literature on cross-country differences in valuation and investment. La Porta et al. (2002) show that stronger investor protection raises firm value, and McLean, Zhang, and Zhao (2012) show that investment is more sensitive to value where investor protection is stronger. This work typically treats capital as homogeneous. By allowing for two types of capital, we find that governance institutions (shareholder rights and director liability) primarily lower the cost of adjusting intangible capital, whose payoffs are uncertain and hard for outside investors to monitor, while creditor rights primarily lower the cost of adjusting physical capital. A related literature studies how specific frictions affect intangible-intensive firms, from brand and advertising (Chemmanur and Yan, 2009; Larkin, 2013) to labor protection and innovation (Acharya, Baghai, and Subramanian, 2014; Calcagnini, Ferrando, and Giombini, 2014; Bena, Ortiz-Molina, and Simintzi, 2022). We map a small set of institutions to the cost of adjusting each type of capital, and show that these institutions account for much of the cross-country variation in the value of intangible capital.

The remainder of the paper is organized as follows. Section 2 presents the model. Section 3 describes the empirical specification and estimation procedure, and Section 4 the data. Section 5 presents the benchmark estimates: the contribution of intangible capital to firm value, the cost of adjusting each type of capital, and the result that this heterogeneity varies across countries rather than industries. Section 6 models the adjustment costs as functions of country characteristics. Section 7 addresses robustness, and the final section concludes. Additional results and robustness analyses are reported in the online Appendix.

2 The Model of the Firm

We consider a neoclassical model of the firm with two quasi-fixed inputs: physical and intangible capital. We study the problem of a firm operating in an arbitrary country, leaving the role of the country environment to the empirical specification in Section 3. Section 2.1 describes the setup and technology, Section 2.2 the tax treatment and payouts, and Section 2.3 solves the firm's problem and derives the valuation equation.

2.1 Setup and Technology

Time is discrete and the horizon is infinite. In each period, firms first choose costlessly adjustable inputs, such as materials and energy, taking their prices as given, to maximize operating profits. Firms then choose physical investment, intangible investment, and debt to maximize the market value of equity.

To simplify notation, let $\boldsymbol{K}_{it} = (K_{it}^P, K_{it}^I)$ denote firm i's vector of capital stocks at time t, where K_{it}^P is physical capital and K_{it}^I is intangible capital. Similarly, let $\boldsymbol{I}_{it} = (I_{it}^P, I_{it}^I)$ denote the corresponding vector of investments, where I_{it}^P is investment in physical capital and I_{it}^I is investment in intangible capital.

The law of motion of the firm's capital inputs is

$$K^P_{it+1} = (1-\delta^P_{it})K^P_{it} + I^P_{it} \quad (1)$$

$$K^I_{it+1} = (1-\delta^I_{it})K^I_{it} + I^I_{it} \quad (2)$$

where δ^P_{it} and δ^I_{it} are the exogenous depreciation rates of physical and intangible capital, respectively.

The operating profit function for firm i at time t is $\Pi_{it} = \Pi(\boldsymbol{K}_{it}, \boldsymbol{X}_{it})$, where $\boldsymbol{X}_{it}$ denotes a vector of exogenous aggregate and firm-specific state variables affecting profitability. We assume that Π is homogeneous of degree one. Because intangible capital is quasi-fixed, we exclude intangible investment from operating profits; it instead accumulates into the intangible capital stock through the law of motion (2).[1]

Investment is costly. Beyond the direct purchase cost of capital, firms incur adjustment costs $C_{it} \equiv C(\boldsymbol{I}_{it}, \boldsymbol{K}_{it})$. For parsimony we adopt the quadratic specification

$$C_{it} = \frac{\theta^P}{2}\left(\frac{I^P_{it}}{K^P_{it}}\right)^2 K^P_{it} + \frac{\theta^I}{2}\left(\frac{I^I_{it}}{K^I_{it}}\right)^2 K^I_{it}. \quad (3)$$

This function is increasing and convex in investment, decreasing in each capital stock holding investment fixed, and homogeneous of degree one. The costs are symmetric in investment and disinvestment and depend on gross investment flows.[2]

The adjustment cost coefficients θ^P and θ^I are the central parameters of our analysis, because—as we show below—they determine the value the market assigns to each installed capital input, and hence the decomposition of firm value. Part of what they capture is genuine technological frictions: installing machinery disrupts production, and building a brand, an R&D team, or organizational knowledge takes time and cannot be undone without loss. More broadly, the same coefficients may also reflect frictions induced by the economic and institutional environment in which firms operate. A firm accumulating intangible capital where intellectual property protection is weak finds that capital harder to verify, transfer, and pledge when raising external finance; a firm investing

[1] As we show below, we do not need to specify Π for the empirical analysis.

[2] Belo et al. (2022) discuss these assumptions in more detail and show, in U.S. data, that relaxing them changes little: allowing the adjustment-cost function to be asymmetric—capturing investment irreversibility as in Abel and Eberly (1994) and Abel and Eberly (1996)—or estimating its curvature rather than fixing it at the quadratic value leaves model fit and the estimates nearly unchanged.

in physical capital where creditor rights are weak cannot pledge its assets effectively as collateral; and weak investor protection raises the premium on external equity, particularly for intangible capital, whose payoffs are harder to monitor. Whatever their origin—technological, financial, or institutional—these frictions enter firm value in our estimation only to the extent they raise the cost of adjusting the capital stock, and are then absorbed into θ^P and θ^I.[3]

In the empirical implementation, we allow the adjustment cost coefficients in equation (3) to vary across countries: we estimate one pair (θ_c^P, θ_c^I) for each country c. This country-level specification is our benchmark. It imposes no cross-country restrictions and lets us measure how adjustment costs differ across countries. These differences might instead reflect industry composition, so we also estimate specifications in which the coefficients vary across industries and across country-industry pairs (Section 5).

The benchmark identifies how much adjustment costs differ across countries, but not which country attributes drive those differences. In Section 6 we therefore let θ_c^P and θ_c^I depend on observable country characteristics, tracing the cross-country variation in adjustment costs to its economic sources.

2.2 Taxable Profits and Firm's Payouts

Firms can issue debt to finance their operations. At the beginning of time t, firm i issues an amount of debt, denoted B_{it+1}, which must be repaid at the beginning of time $t+1$. r_{it}^B denotes the gross corporate bond return on B_{it}.[4]

Taxable corporate profits, denoted TCP, equal operating profits minus intangible capital investment (expensed), physical capital depreciation, adjustment costs, and interest expense:

$$TCP_{it} = \Pi_{it} - I_{it}^I - \delta_{it}^P K_{it}^P - C_{it} - (r_{it}^B - 1)B_{it}.$$

Adjustment costs are thus expensed, consistent with treating them as foregone operating profits.

[3] This interpretation is consistent with a literature showing that convex adjustment costs and external financing frictions are hard to distinguish in valuation data (Cooper and Ejarque, 2003; Hennessy, Levy, and Whited, 2007; Bolton, Chen, and Wang, 2011): both produce a similar reduced-form link between investment and value, so θ^P and θ^I absorb both; Appendix C develops this financing-frictions interpretation and its mapping to the country characteristics.

[4] We include debt because, in the data, total firm value equals the sum of the market value of debt and equity. For parsimony, we keep the financing side of the model as simple as possible.

Let τ_t be the corporate tax rate. The firm's payout, denoted D_{it}, is then given by:[5]

$$D_{it} \equiv (1-\tau_t)[\Pi_{it} - C_{it} - I^I_{it}] - I^P_{it} + B_{it+1} - r^B_{it} B_{it} + \tau_t \delta^P_{it} K^P_{it} + \tau_t (r^B_{it} - 1) B_{it}, \tag{4}$$

in which $\tau_t \delta^P_{it} K^P_{it}$ is the depreciation tax shield, and $\tau_t(r^B_{it} - 1)B_{it}$ is the interest tax shield. The two capital inputs enter asymmetrically. Intangible investment is expensed and lowers taxable profit in the period it occurs, so it appears inside the $(1-\tau_t)$ bracket. Physical investment is capitalized and subtracted at full cost, with its tax relief deferred and delivered over time through the depreciation tax shield.

2.3 Valuation

Firm i takes the stochastic discount factor, denoted M_{t+s}, from period t to $t+s$ as given when maximizing its cum-dividend market value of equity:

$$V_{it} \equiv \max_{\{\mathbf{I}_{it+s}, \mathbf{K}_{it+s+1}, B_{it+s+1}\}_{s=0}^{\infty}} E_t \left[\sum_{s=0}^{\infty} M_{t+s} D_{it+s} \right], \tag{5}$$

subject to a transversality condition given by $\lim_{T\to\infty} E_t[M_{t+T} B_{it+T+1}] = 0$, and the laws of motion for the capital inputs given by equations (1) and (2).

Let $P_{it} \equiv V_{it} - D_{it}$ be the ex-dividend equity value. In Appendix B.1 we show that, given the homogeneity of degree one of the operating profit and adjustment cost functions, the firm's value maximization implies that

$$P_{it} + B_{it+1} = q^P_{it} K^P_{it+1} + q^I_{it} K^I_{it+1}, \tag{6}$$

in which

$$q^P_{it} \equiv 1 + (1-\tau_t)\frac{\partial C_{it}}{\partial I^P_{it}} = 1 + (1-\tau_t)\,\theta^P \frac{I^P_{it}}{K^P_{it}} \tag{7}$$

$$q^I_{it} \equiv (1-\tau_t)\left[1 + \frac{\partial C_{it}}{\partial I^I_{it}}\right] = (1-\tau_t)\left[1 + \theta^I \frac{I^I_{it}}{K^I_{it}}\right] \tag{8}$$

[5] The payout is the cash flow to equity holders net of corporate taxes. Before taxes, equity holders receive operating profits less adjustment costs and the two investments, plus net new borrowing: $\Pi_{it} - C_{it} - I^I_{it} - I^P_{it} + B_{it+1} - r^B_{it} B_{it}$. Corporate taxes are $\tau_t TCP_{it}$, with TCP_{it} defined above; substituting and collecting terms yields equation (4).

where the second equality in each line evaluates the derivative using the quadratic adjustment cost (3). Here q_{it}^P and q_{it}^I are the shadow prices of physical and intangible capital (the Lagrange multipliers on the two laws of motion). Following the timing convention of Liu, Whited, and Zhang (2009) and Belo et al. (2022), the shadow prices date t but price the end-of-period capital stocks K_{it+1} that period-t investment builds; the depreciation rates apply to the beginning-of-period stocks K_{it}. The valuation equation (6) extends Hayashi (1982)'s result to a setting with multiple capital inputs (Wildasin, 1984; Hayashi and Inoue, 1991). The shadow prices of the two inputs differ because of their different tax treatment (Section 2.2).

According to equation (6) the firm's market value is the sum of the value of its installed capital inputs. This additive feature lets us compute the fraction of firm value each input accounts for (henceforth "input-shares") as follows:

$$\mu_{it}^P = \frac{q_{it}^P K_{it+1}^P}{q_{it}^P K_{it+1}^P + q_{it}^I K_{it+1}^I} \tag{9}$$

$$\mu_{it}^I = \frac{q_{it}^I K_{it+1}^I}{q_{it}^P K_{it+1}^P + q_{it}^I K_{it+1}^I} \tag{10}$$

By construction, the two input-shares sum to one, $\mu_{it}^I = 1 - \mu_{it}^P$. The empirical analysis characterizes these input-shares, including their variation across countries and over time.

3 Empirical Specification

Section 3.1 derives the valuation ratio implied by the benchmark model, in which the adjustment costs are country-specific. Section 3.2 describes the portfolio-level estimation procedure, and Section 3.3 how we form the portfolios. We defer the country-characteristics model, in which the adjustment costs depend on observable country variables, to Section 6, after the benchmark results.

3.1 The Benchmark Model

In the benchmark model the adjustment cost coefficients are country-specific. Let $c(i)$ denote firm i's country, and $\theta_{c(i)}^P$ and $\theta_{c(i)}^I$ the coefficients we estimate separately for each country or region.

Define the valuation ratio $VR_{it} \equiv (P_{it} + B_{it+1})/A_{it+1}$, where $A_{it+1} = K_{it+1}^P + K_{it+1}^I$ is the firm's total installed capital.[6] Scaling by installed capital removes firm size, making the valuation ratio more stationary and comparable across firms and over time.

Substituting the shadow prices (7)–(8) into (6) and dividing by A_{it+1} gives

$$VR_{it} \;=\; \left[1 + (1-\tau_{c(i),t})\,\theta^P_{c(i)}\,\frac{I^P_{it}}{K^P_{it}}\right]\frac{K^P_{it+1}}{A_{it+1}} \;+\; (1-\tau_{c(i),t})\left[1 + \theta^I_{c(i)}\,\frac{I^I_{it}}{K^I_{it}}\right]\frac{K^I_{it+1}}{A_{it+1}}, \tag{11}$$

where $\tau_{c(i),t}$ is the corporate tax rate in firm i's country. The valuation ratio depends only on investment rates, tax rates, capital stocks, and the adjustment cost coefficients, not on the operating profit function. Thus our results do not depend on its form beyond the homogeneity assumption of Section 2.1.

3.2 Estimation Procedure

To mitigate the influence of firm-level measurement error on the estimation, we follow Belo et al. (2022) and work with portfolio-level moments. We also estimate the benchmark directly at the firm level, to assess how much the results depend on the portfolio approach (Section 5.4).

We proceed as follows. Within each country c (or geographic region, defined in Section 4.4) and at each date t, we sort firms into J portfolios indexed by j and compute the cross-sectional mean of both the observed valuation ratio VR_{it} and its model-implied counterpart $\widehat{VR}_{it}(\Theta)$ from equation (11):

$$\overline{VR}_{jt} = \frac{1}{N_{jt}}\sum_{i\in j} VR_{it}, \qquad \widehat{\overline{VR}}_{jt}(\Theta) = \frac{1}{N_{jt}}\sum_{i\in j}\widehat{VR}_{it}(\Theta),$$

where N_{jt} is the number of firms in portfolio j at time t and $\Theta = (\theta^P_c, \theta^I_c)$ collects the country-specific adjustment cost parameters.

We assume that portfolio-level moments are observed with error:[7]

$$\overline{VR}_{jt} \;=\; \widehat{\overline{VR}}_{jt}(\Theta) + \varepsilon_{jt}, \tag{12}$$

[6] Empirically, the firm-value numerator $P_{it} + B_{it+1}$ is measured net of cash—market equity plus net debt; see Section 4.2.

[7] Several sources contribute to ε_{jt}: the capital stocks are constructed from accounting data and so measured with error (the intangible stock especially; see Section 4), the market value of debt and cash are observed imperfectly, and the market value of equity can diverge temporarily from fundamental value. Portfolio-level averaging mitigates the firm-specific component of these errors.

and estimate Θ by minimizing the sum of squared errors:

$$\widehat{\Theta} \;=\; \arg\min_{\Theta} \frac{1}{TJ}\sum_{t=1}^{T}\sum_{j=1}^{J}\left(\overline{VR}_{jt} - \widehat{\overline{VR}}_{jt}(\Theta)\right)^2, \tag{13}$$

where T is the number of years in the sample and J is the number of portfolios within each country or region.

Minimizing the objective (13) is equivalent to an OLS regression. Collecting the terms in (11) that do not multiply an adjustment cost coefficient onto the left-hand side isolates the part of the valuation ratio due to adjustment costs, which is linear in θ_c^P and θ_c^I.[8] Define the modified valuation ratio

$$\overline{VR}_{jt}^M \;=\; \frac{1}{N_{jt}}\sum_{i\in j}\frac{P_{it}+B_{it+1}-K_{it+1}^P-(1-\tau_{c,t})K_{it+1}^I}{A_{it+1}},$$

and the portfolio-level regressors

$$\overline{IPA}_{jt} = \frac{1}{N_{jt}}\sum_{i\in j}(1-\tau_{c,t})\frac{I_{it}^P}{K_{it}^P}\frac{K_{it+1}^P}{A_{it+1}},$$

$$\overline{IIA}_{jt} = \frac{1}{N_{jt}}\sum_{i\in j}(1-\tau_{c,t})\frac{I_{it}^I}{K_{it}^I}\frac{K_{it+1}^I}{A_{it+1}},$$

where $\tau_{c,t}$ is the corporate tax rate in country c. The regressors $\overline{IPA}_{jt}$ and $\overline{IIA}_{jt}$ capture the contribution of physical and intangible capital investment, respectively, to firm value at the portfolio level. Equation (12) then reduces to the linear regression

$$\overline{VR}_{jt}^M \;=\; \theta_c^P\,\overline{IPA}_{jt} \;+\; \theta_c^I\,\overline{IIA}_{jt} \;+\; \varepsilon_{jt}, \tag{14}$$

with no intercept, since the parameter-free terms were moved to the left-hand side. We estimate (14) separately for each country or region, which delivers the country-specific coefficient pair $(\hat{\theta}_c^P, \hat{\theta}_c^I)$ of the benchmark model.

To evaluate model fit, we report three measures for each country or region; because the valuation regression (14) has no intercept, the conventional R^2 is uninformative. Let $\overline{VR}_j = T^{-1}\sum_t \overline{VR}_{jt}$

[8] Expanding (11), the terms without a coefficient are $K_{it+1}^P/A_{it+1} + (1-\tau_{c,t})K_{it+1}^I/A_{it+1}$, the valuation ratio that would obtain with zero adjustment costs ($q^P = 1$, $q^I = 1-\tau$). Moving them to the left-hand side leaves a ratio that is linear in the two coefficients.

denote portfolio j's time-series mean valuation ratio, $\widehat{\overline{VR}}_j$ its model-implied counterpart, and $\overline{VR}_c$ the mean across all portfolios in country c. The cross-sectional R^2 (XS-R^2),

$$\text{XS-}R_c^2 \;=\; 1 - \frac{\sum_j \big(\overline{VR}_j - \widehat{\overline{VR}}_j\big)^2}{\sum_j \big(\overline{VR}_j - \overline{VR}_c\big)^2}, \tag{15}$$

measures how well the model explains the cross-sectional variation in average valuation ratios across portfolios within a country. The time-series R^2 (TS-R^2) uses the full portfolio-year panel,

$$\text{TS-}R_c^2 \;=\; 1 - \frac{\sum_{j,t} \big(\overline{VR}_{jt} - \widehat{\overline{VR}}_{jt}\big)^2}{\sum_{j,t} \big(\overline{VR}_{jt} - \overline{VR}_c\big)^2}, \tag{16}$$

and measures how well the model explains the variation in each portfolio's valuation ratio over time; by also targeting the time-series movement, it is the more demanding of the two. Finally, the mean absolute pricing error,

$$\text{MAPE}_c = \frac{1}{TJ} \sum_{j,t} \big|\overline{VR}_{jt} - \widehat{\overline{VR}}_{jt}\big| / \overline{VR}_c,$$

gives the average share of a portfolio's valuation ratio that the model-implied value does not capture. We compute all three measures at the portfolio level, even when the model is estimated at the firm level (Section 5.4), so that the fit statistics are directly comparable between the portfolio-level and firm-level estimates.

3.3 Portfolio Sorts

We form portfolios separately within each geographic unit—a standalone country or a regional group, as defined in Section 4.4.

Within each unit and year, we sort firms on the lagged physical- and intangible-capital terms that enter the valuation regression as $\overline{IPA}$ and $\overline{IIA}$. Sorting on the regressors themselves creates dispersion across portfolios, which helps identify θ^P and θ^I. We sort sequentially: we first split firms into terciles on the physical-capital term, and then, within each tercile, into terciles on the intangible-capital term, giving $3 \times 3 = 9$ portfolios per unit and year, re-balanced annually. Sequential sorting keeps the nine portfolios roughly balanced in the number of firms, even when the two sorting variables are correlated. Over the 2007–2023 sample (seventeen years) this yields 153 portfolio-year observations per unit and 7,191 across the 47 geographic units.

4 Data

We construct firm-level measures of market value, investment, and capital stocks from Compustat North America and Compustat Global, together with the macroeconomic series the model requires—corporate tax rates, GDP deflators, and exchange rates. Subsection 4.1 explains how we assign each firm to a country and express quantities in local currency, Subsection 4.2 describes the construction of the firm-level variables, Subsection 4.3 the sample selection, Subsection 4.4 the countries and geographic regions, and Subsection 4.5 presents summary statistics.

4.1 Country Assignment and Currency

We assign each firm to a single country: the location of its headquarters, taken from the Compustat headquarters location code (`loc`) rather than the country of legal incorporation (`fic`). This assignment defines the country $c(i)$ that indexes firm i throughout the paper, and it fixes the currency, tax rate, and country characteristics we attach to the firm. The two codes differ when a firm is incorporated offshore for tax or listing purposes—a firm headquartered in Beijing, say, may be incorporated in the Cayman Islands. Using `loc` assigns the firm to the economy in which it operates rather than to its legal domicile, and applies our offshore-financial-center exclusion (Section 4.3) to headquarters locations rather than legal domiciles.[9]

We measure all firm-level quantities in the local currency of the firm's headquarters country, expressed in each country's most recent ("last") local-currency units, so that capital stocks accumulated over long horizons are stated in comparable units. This avoids mechanically affecting accumulated capital stocks and investment rates through exchange-rate movements or changes in currency units over the sample period. We accumulate capital stocks over each firm's full available accounting history, subject to the availability of the Compustat Global exchange-rate series; because

[9] As a robustness check on our headquarters-based country assignment, we re-estimate the model on the subsample that excludes the ≈6.6% of firm-years whose country of incorporation differs from their country of location. The per-country benchmark estimates are unchanged except at the offshore-incorporation hubs. The most visible is Hong Kong, where over 90% of firm-years are incorporated offshore and whose intangible adjustment-cost parameter falls once those firms are removed. The country-characteristic estimates are essentially unchanged in sign, significance, and magnitude, in both currencies and at the portfolio and firm level.

that series begins in 1982, the perpetual-inventory accumulation begins no earlier than 1982.[10]

4.2 Capital Stocks and Other Firm-Level Variables

We construct firm-level measures of market value, investment, and capital stocks from the accounting and security data of publicly traded firms, obtained from Compustat through Wharton Research Data Services (WRDS). Among the international accounting databases available on WRDS, Compustat Global provides extensive coverage of publicly traded firms worldwide and one of the broadest sets of standardized accounting variables, making it well suited to a cross-country study of listed firms (Dai, 2012). For firms in the United States and Canada, accounting data come from *Compustat North America—Fundamentals Annual* and security data from *Compustat North America—Security Daily*; for firms in all other countries, we use the corresponding *Compustat Global* files.[11] We take nominal exchange rates from the Compustat Global Exchange Rates database, deflate nominal variables with the gross domestic product (GDP) deflator from the International Monetary Fund's *World Economic Outlook* (WEO) database, and obtain statutory corporate income tax rates from the Tax Foundation.[12]

4.2.1 Physical Capital

The physical capital stock, K_{it}^{P}, is measured as net property, plant, and equipment (Compustat data item PPENT). Total depreciation (Compustat data item DP) combines depreciation of tangible fixed assets (DFXA) and amortization of intangible assets (AM). DP therefore overstates the depreciation of physical capital, so we use a harmonized measure of DFXA instead. Reported DFXA is incomplete and inconsistently available across countries and years, so our measure uses reported values where reliable and imputes the rest. The Data Appendix describes the construction of the harmonized DFXA series.

[10] We report all results in local currency; converting every quantity to U.S. dollars leaves them nearly unchanged (Section 7.1).

[11] Compustat standardizes reported financial-statement items into uniform data fields across the heterogeneous accounting standards and reporting practices used across countries, so that items are comparable across firms, industries, and countries, and subjects them to automated validity and quality-control checks. An important benefit for researchers is that the data are collected and normalized according to each country's accounting principles, disclosure methods, and specific data-item definitions; although the detailed procedures are proprietary, Compustat's standardization is widely regarded as consistent with the regulations and standards of the SEC, U.S. GAAP, and IFRS. See S&P Global's Compustat documentation on data standardization and quality control.

[12] The Data Appendix (Section D) provides additional details on the construction of the variables.

The capital depreciation rate, δ^P_{it}, is measured as DFXA divided by the beginning-of-period capital stock. Following Belo et al. (2022), we construct an inflation-adjusted capital stock by repricing the beginning-of-period stock with the GDP deflator, so that the stock is expressed in current replacement cost—the same units as the market value in the valuation equation. Physical capital then evolves according to

$$K^P_{it+1} = K^P_{it}(1-\delta^P_{it})\frac{\Pi_{t+1}}{\Pi_t} + I^P_{it}, \tag{17}$$

where Π_t denotes the GDP deflator.[13] Because the physical capital stock is observed directly from PPENT, we use Equation (17) only to recover physical capital investment. Following Belo et al. (2022) and Gonçalves, Xue, and Zhang (2020), we obtain investment by inverting the law of motion of capital.[14,15]

4.2.2 Intangible Capital

We measure total intangible capital as the sum of two components: an *off-the-books* stock, built from internally generated intangible investment proxied by SG&A spending, and an *on-the-books* stock, built from the firm's reported balance-sheet intangible assets (Compustat data item INTAN):

$$K^I_{it} = K^{I,\text{off}}_{it} + K^{I,\text{on}}_{it}. \tag{18}$$

Off-the-books intangible capital. Following Eisfeldt and Papanikolaou (2013), we build the off-the-books stock from Selling, General, and Administrative (SG&A) expense (Compustat data item XSGA).[16] We set off-the-books intangible investment to 30% of SG&A expenditure, following

[13] Belo et al. (2022) use an investment-specific price index. Such indices are not available on a consistent basis across our cross-section of countries, so we deflate both physical and intangible capital with the widely available GDP deflator.

[14] Recovering investment from the law of motion, rather than from reported capital expenditures, keeps the investment series exactly consistent with the constructed capital stock and its depreciation, and sidesteps the gaps and inconsistencies in reported capital-expenditure data across countries.

[15] Occasionally, the inflation adjustment yields a negative capital stock in the local-currency data. These cases arise only for countries that experienced sustained deflation and have no economic interpretation. We therefore set the corresponding observations to missing and exclude the affected firm-years. The same safeguard is applied when constructing the on-the-books intangible capital stock that we describe next. The Data Appendix reports the affected countries and the number of observations removed.

[16] In the United States and Canada, firms report detailed R&D and advertising expenditures, which lets us distinguish knowledge capital from brand capital (Belo et al., 2022). Firms in other countries do not universally

Falato et al. (2022) (see also Peters and Taylor, 2017), and treat negative SG&A values as missing. We accumulate the off-the-books stock by the perpetual inventory method:

$$K_{it+1}^{I,\text{off}} = (1-\delta^I)\frac{\Pi_{t+1}}{\Pi_t}K_{it}^{I,\text{off}} + I_{it}^{I,\text{off}}, \tag{19}$$

where $I_{it}^{I,\text{off}}$ denotes off-the-books intangible investment, Π_t is the GDP deflator, and we calibrate the depreciation rate δ^I at 20%.[17] The initial stock is

$$K_{i0}^{I,\text{off}} = \frac{I_{i0}^{I,\text{off}}}{g_{c(i)}^I + \delta^I - \pi_{c(i)}(1-\delta^I)}, \tag{20}$$

where $I_{i0}^{I,\text{off}}$ is off-the-books intangible investment in the first usable year, $g_{c(i)}^I$ is the country-average SG&A growth rate, and $\pi_{c(i)}$ is the country-average GDP-deflator growth rate.[18]

On-the-books intangible capital. Belo et al. (2022) measure internally generated intangible capital using R&D and advertising expenditures and do not incorporate reported balance-sheet intangible assets. In our international setting, we include reported intangible assets (INTAN) because firms often record important productive assets on the balance sheet as intangibles rather than as property, plant, and equipment. A prominent example is concession infrastructure under IFRIC 12: firms operating toll roads, airports, and water networks may book them as concession rights inside INTAN.[19] For these firms, INTAN represents productive capital underlying market value. Omitting INTAN would therefore understate the capital base of firms that are economically important in sectors such as transportation and utilities.

report these details, and SG&A is the most internationally comparable measure of internally generated intangible investment available in Compustat Global.

[17] A depreciation rate of 20% corresponds to a geometric intangible-capital lifetime of about five years, in line with the amortization periods firms report for identifiable intangibles in their financial statements and with the rates used in the intangible-capital literature (Falato et al., 2022; Peters and Taylor, 2017).

[18] The country-average SG&A growth rate is computed from firm-level log SG&A growth where SG&A is strictly positive in both the current and lagged year, winsorized at the 2nd and 98th percentiles within country, and averaged across firms. The Data Appendix describes the construction of reporting regimes and the treatment of intermittent SG&A reporting.

[19] Examples include toll-road operators such as Transurban in Australia, Vinci and Eiffage in France, Ferrovial in Spain, and PINFRA, IDEAL, and Aleatica in Mexico; airport operators such as Aéroports de Paris, AENA in Spain, Fraport in Germany, Auckland International Airport, and the Mexican groups GAP, ASUR, and OMA; and water and environmental concessionaires such as Veolia, Suez, and Sabesp. These examples are more common outside the United States, where airports, highways, and water systems are largely government-owned, leaving relatively few listed pure-play concession operators.

We build the on-the-books stock from reported intangible assets using the same inflation-adjusted construction as physical capital, with INTAN in place of PP&E and amortization in place of tangible depreciation. Amortization is measured as $AM_{it} = DP_{it} - DFXA_{it}$, where $DFXA_{it}$ is the harmonized measure of depreciation of tangible fixed assets defined above. Because INTAN is observed directly, we use the corresponding law of motion only to recover on-the-books intangible investment. We apply the same negative-stock safeguard, and treat a missing INTAN as zero.[20]

Total intangible capital. Total intangible capital is the sum of the off-the-books and on-the-books stocks in Equation (18). Total intangible investment is likewise the sum of the corresponding investment flows, $I_{it}^{I} = I_{it}^{I,\text{off}} + I_{it}^{I,\text{on}}$. Firms with no reported INTAN retain only the SG&A-based component. The total intangible investment rate, which enters the model and the portfolio sorts, is I_{it}^{I}/K_{it}^{I}.

4.2.3 Additional Firm-Level Variables

Beyond capital stocks and investment, the model requires a measure of firm value. We construct firm value from equity market capitalization, gross book debt, and cash.

Market value. We measure the market value of equity, P_{it}, from security-level data: Compustat Global Security Daily for firms outside North America and Compustat North America Security Daily for firms in the United States and Canada. Security-level construction is necessary in the international data. In the single-country setting of Belo et al. (2022), equity value equals the fiscal-year closing price (`prcc_f`) times common shares outstanding (`csho`), both reported in the Compustat North America fundamentals file. That construction is not available in Compustat Global Fundamentals: the file contains no fiscal-year closing price field and reports only the shares of the primary security (`cshoi`), not the firm's total share count across all share classes and issues. We therefore build equity market value from the security-level files, adapting a procedure from an S&P Global query that aggregates each firm's securities into a single firm-year value. The Data Appendix provides implementation details.

[20]Missing INTAN does not reflect economically meaningful omissions; Appendix D reports the check.

Debt and cash. We measure debt, B_{it}, as gross book debt: long-term debt (`DLTT`) plus debt in current liabilities (`DLC`), and cash, $Cash_{it}$, as cash and short-term investments (`CHE`). The firm's market value in the model, $P_{it} + B_{it+1}$, is measured net of cash—market equity plus net debt, $P_{it} + \texttt{DLTT} + \texttt{DLC} - \texttt{CHE}$, as in Belo et al. (2022).

4.3 Sample Selection

We begin from the merged Compustat North America and Compustat Global sample and apply a sequence of firm, country, and firm-year screens to arrive at the estimation sample. We first exclude financial and utility firms: any firm ever classified as a utility (SIC 4900–4999 or NAICS 22) or in finance and insurance (SIC 6000–6999 or NAICS 52). We also exclude a small number of non-operating vehicles: real-estate investment trusts, funds and trusts, and unclassified firms (SIC 9995, 9997, and 9998).[21]

We then restrict the set of countries. Following the tax-haven literature (Hines, 2010; Zucman, 2014; Tørsløv, Wier, and Zucman, 2023), we exclude firms headquartered in well-known offshore financial centers: Bermuda, the Cayman Islands, the Bahamas, the British Virgin Islands, Luxembourg, and Jersey. We also exclude Russia, where the war that began in 2022 severely disrupted financial-market activity and data availability. Finally, we drop countries with too few firms: a country enters only if its firm count reaches ten in at least one sample year. The Data Appendix reports the full ordered sequence of sample-construction screens.

At the firm-year level, we keep observations with positive sales and non-missing market value, and require every model input to be observed.[22] A firm-year enters the estimation sample only if physical and intangible capital stocks, the corresponding investment rates, the lagged stocks and investment rates that form the portfolio sort variables, the local corporate tax rate, debt, and cash are all observed.[23]

[21] We first backfill missing SIC and NAICS codes with the firm's most recent reported code. We de-duplicate firms that appear in both Compustat North America and Compustat Global by keeping the North American record for firms headquartered in the United States or Canada and the Global record for all others.

[22] All ratios that enter the estimation are winsorized within each geographic unit at the 2nd and 98th percentiles to limit the influence of outliers: at both tails for those that admit negative values—the valuation ratio and the physical and intangible investment rates—and at the top only for the rest.

[23] Concretely, we drop firm-years with missing market value, missing or zero physical capital, missing physical or intangible investment rates, missing lagged physical or intangible stocks or investment rates, missing local corporate tax rates, or missing debt or cash.

The final sample covers 2007–2023. We begin in 2007 because Compustat Global's coverage expands sharply in the mid-2000s, following the European Union's mandatory adoption of IFRS for listed firms in 2005, with first reports in 2006, and a parallel expansion into Asian markets in the early 2000s. Observations before 2007 are a selected subsample of the largest and most internationally visible firms, whereas from 2007 onward coverage is more representative of the listed population across our markets. We end in 2023 because Compustat data for 2024 were not yet fully available when we conducted the analysis.

4.4 Countries and Geographic Regions

We link each firm to a country by the location of its headquarters (Section 4.1), and estimate the model on *geographic units*—a standalone country where coverage allows, a pooled regional group otherwise. Ideally every unit would be a single country, but the portfolio construction requires a minimum number of firms in each unit and year: within every unit-year we form nine portfolios (Section 3.3), and a unit needs enough firms to populate them. We therefore report a country on a standalone basis only when it has at least 45 firm-year observations in every sample year—roughly five firms per portfolio—and we pool the remaining, more thinly covered markets into regional "Rest-of" groups.[24] This yields 42 standalone markets and five regional groups (Rest of Latin America, Rest of Europe, Rest of Middle East and North Africa, Rest of Asia, and Rest of Sub-Saharan Africa)—47 geographic units in total, spanning 80 economies (77 countries and 3 territories: Hong Kong, Taiwan, and Macao). We separate Rest of Middle East and North Africa from Rest of Sub-Saharan Africa following standard international classifications (e.g., the World Bank and IMF), which treat the Middle East and North Africa and Sub-Saharan Africa as distinct regional aggregates.[25,26]

[24] The ten-firm screen of Section 4.3 determines whether a country enters the sample at all; this 45-firm-year threshold determines whether it is estimated standalone or pooled into a regional group.

[25] Standalone markets, by region. *North America*: Canada, United States. *Latin America*: Brazil, Chile, Mexico, Peru. *Europe*: Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Poland, Spain, Sweden, Switzerland, United Kingdom. *Middle East and North Africa*: Israel, Saudi Arabia, Turkey. *Asia*: China, Hong Kong, India, Indonesia, Japan, Malaysia, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand. *Sub-Saharan Africa*: Nigeria, South Africa. *Oceania*: Australia, New Zealand.

[26] Rest-of group membership. *Rest of Latin America*: Argentina, Colombia, Jamaica, Trinidad and Tobago. *Rest of Europe*: Austria, Bulgaria, Cyprus, Estonia, Hungary, Iceland, Latvia, Lithuania, Malta, Portugal, Romania, Serbia, Slovenia, Ukraine. *Rest of MENA*: Bahrain, Egypt, Jordan, Kuwait, Morocco, Oman, Qatar, Tunisia, United Arab Emirates. *Rest of Asia*: Bangladesh, Kazakhstan, Macao, Vietnam. *Rest of Sub-Saharan Africa*: Botswana, Côte d'Ivoire, Ghana, Kenya, Mauritius, Zambia, Zimbabwe.

4.5 Summary Statistics

Table 1 reports summary statistics for the main model variables by country and geographic unit. For each geographic unit, we compute the cross-firm median of each variable within each year and average these yearly medians over the 2007–2023 sample period. Bold rows report region-level medians—the median across the units in each region—and the final row reports the median across all 47 geographic units.

The valuation ratio Q (the VR_{it} of Section 3) varies substantially across countries and regions. The World row is 1.20, while China has by far the highest value (3.32). The lowest values are in the Rest-of-Europe group (0.73), Peru (0.80), Sri Lanka (0.82), and Japan (0.86).[27]

Columns (2) and (3) report physical and intangible investment rates. Intangible investment exceeds physical investment in the World row, 21% against 13%. Intangible investment rates are tightly clustered across countries, between 16% (Poland) and 27% (Rest of Asia), whereas physical rates vary far more widely, from 5% (Greece) to 31% (Sweden).

Column (5) reports the intangible share of installed capital, $K^I/(K^I + K^P)$—a book-quantity ratio, not the market-value share of Section 5.2. It is 42% in the World row, with wide cross-country variation, from 11% in Pakistan to 91% in Sweden. The share tracks economic development: it reaches 80% or more in Sweden (91%), the United Kingdom (83%), France (82%), the United States (80%), and Finland (80%), with a European regional median of 72%, and is markedly lower across Asia (regional median 31%), where Hong Kong (59%), Japan (55%), and Singapore (48%) stand out as exceptions. Column (6) reports the share of total intangible capital held on the balance sheet. This share is 2% in the World row, so the SG&A-based off-the-books component accounts for most intangible capital in the median firm.

Column (4) reports the within-unit correlation between physical and intangible investment rates. The correlation is positive throughout, with a world median of 0.30, ranging from 0.17 in Peru and Rest of Sub-Saharan Africa to 0.45 in Brazil, but everywhere well below one. This imperfect correlation is important, allowing us to separately identify θ^P and θ^I in the estimation.

[27] China's high Q is consistent with the high adjustment cost for intangible capital that we estimate for China below.

5 Estimation Results

This section presents the benchmark estimates, in which the adjustment costs are country-specific. Section 5.1 reports the parameter estimates and model fit. Section 5.2 decomposes firm value into its physical and intangible components. Section 5.3 quantifies the economic magnitude of the adjustment costs, and Section 5.4 re-estimates the model at the firm level. Section 5.5 then asks whether adjustment costs vary across industries rather than countries. We defer the economic and institutional drivers of the adjustment costs to Section 6.

5.1 Parameter Estimates and Model Fit

Table 2 reports the benchmark estimates of θ^P and θ^I by country and region, and model fit. θ^I exceeds θ^P in almost every country. The only exceptions are three continental European countries—Belgium, France, and the Netherlands—where physical capital adjustment costs are unusually high. The median $\hat{\theta}^I$ is 11.0, against 1.8 for $\hat{\theta}^P$, about six times as large. We translate these coefficients into their economic implications—the share of firm value attributable to intangible capital in Section 5.2, and the adjustment costs as a fraction of the capital stock and of sales in Section 5.3.

The intangible capital estimates are also far more dispersed than the physical capital ones. $\hat{\theta}^I$ runs from 3.5 (Croatia, the lowest standalone country) and around 6 (Japan, Peru) at the low end to 25–45 in China (29.6), the Philippines (42.1), Saudi Arabia (43.1), and India (44.4). $\hat{\theta}^P$ is compressed by comparison, mostly between 1 and 5, and is statistically insignificant in many countries. In several—including Chile, Greece, Japan, Pakistan, South Korea, and Sri Lanka—the point estimate is even slightly negative, though only Sri Lanka's is statistically distinguishable from zero; these are markets where cross-portfolio variation in physical investment rates carries little identifying information.[28] The intangible capital estimate, by contrast, is positive and significant at the 1% level in every country.

The estimates display a clear geographic structure. The highest intangible capital adjustment costs cluster in emerging Asia and the Middle East—India, Saudi Arabia, the Philippines, and

[28]Identification of θ^P and θ^I relies on physical and intangible investment rates moving differently across portfolios (Section 3); where $\hat{\theta}^P$ is imprecise, the intangible investment rate carries most of the identifying variation.

China—and the highest physical capital adjustment costs in continental Europe—Belgium, France, the Netherlands, Switzerland, and Germany. China ranks near the top on both margins.

The model fits the data well. The median cross-sectional R^2 across countries is 0.82 and the median time-series R^2 is 0.38, with a median absolute valuation error of 0.29 (columns 3–5). The cross-sectional R^2 is higher than the time-series R^2 throughout, as expected: the time-series measure also targets each portfolio's variation over time and is the more demanding of the two (Section 3.2). The absolute pricing error has a direct reading: for the typical portfolio, the model misprices the valuation ratio by about 29% of its value. The fit is strongest in Australia, Indonesia, and Thailand, where the model explains almost all of the cross-sectional variation (cross-sectional R^2 above 0.96) and a large share of the time-series variation (time-series R^2 around 0.67 or above). It stays high in the major developed markets: the United States has the highest time-series R^2 (0.77) and the lowest pricing error (MAPE 0.16) of any country, and the United Kingdom is close behind.

5.2 The Market Value of Intangible Capital

The benchmark estimates let us decompose firm value into the market value of its physical and intangible capital. Substituting the estimated shadow prices into the value decomposition (9)–(10) gives the share of firm value attributable to each input, μ_{it}^P and μ_{it}^I, which sum to one. Table 3 reports the intangible capital share of firm value, μ^I, by country (column 1, in percent); the physical capital share is its complement.

Intangible capital accounts for the majority of firm value. The world median μ^I is 60.4%: on the typical firm, more than half of the market value of installed capital is intangible. The share is highest in the largest developed markets—Sweden (92.9%), the United Kingdom (85.8%), Finland (85.1%), and the United States (84.6%) all exceed 80%—and lowest in a few transition and emerging economies, around 27% in Croatia and Peru. The ranking broadly tracks economic development, as the world map in Figure 1 makes clear: the intangible capital share of value is highest—the darkest shading—in the United States, the United Kingdom, the Nordic countries, France, and Australia, and lowest across the emerging markets of Latin America, Africa, and developing Asia. The dispersion across countries is wide, reflecting differences in both the quantity of intangible capital firms hold (Table 1) and the shadow price the model assigns to it.

Intangible capital's share of firm value exceeds its share of book capital. Column 2 of Table 3 reports the intangible *book* share, $\bar{\mu}^I$: the share of installed capital that is intangible, valued at book rather than at the model's shadow prices.[29] At the world median, intangible capital is 34% of book capital (tax-adjusted, below the raw 42% ratio in Table 1) but 60% of firm value. The book-based measures common in the literature already make intangible capital large; valuing it at the market's shadow price makes it larger still. The gap is the adjustment-cost premium: because intangible capital is more costly to adjust, the market prices it above book, so it contributes more to firm value than its book quantity alone implies.

5.3 The Cost of Adjusting Intangible Capital

Intangible capital is substantially more costly to adjust than physical capital. The remaining columns of Table 3 translate the parameter estimates into adjustment-cost magnitudes, and both of the measures we report deliver this conclusion. The two measures differ in their denominator and in whether they hold the investment rate fixed. Our baseline expresses realized adjustment costs as a fraction of sales,

$$\frac{C^P_{it}}{Y_{it}} = \frac{\frac{\theta^P_{c(i)}}{2}\left(\frac{I^P_{it}}{K^P_{it}}\right)^2 K^P_{it}}{Y_{it}}, \tag{21}$$

$$\frac{C^I_{it}}{Y_{it}} = \frac{\frac{\theta^I_{c(i)}}{2}\left(\frac{I^I_{it}}{K^I_{it}}\right)^2 K^I_{it}}{Y_{it}}, \tag{22}$$

evaluated at each country's own investment rates (*Realized Adjustment Costs*, columns 3–4). At the world median, realized intangible capital adjustment costs are 6.9% of sales, against 0.8% for physical capital—a ratio of about nine to one. They are largest in Australia (34%), Sweden (22%), and the Philippines (20%), where high adjustment costs combine with large intangible capital stocks relative to sales. The realized adjustment costs depend on both the structural friction θ and each country's endogenous investment rate and scale, so they are not a clean measure of the friction

[29] The book share is the value decomposition evaluated at zero adjustment costs ($\theta^P = \theta^I = 0$), where the shadow prices collapse to $q^P = 1$ and $q^I = 1 - \tau_t$, so $\bar{\mu}^I_{it} = \dfrac{(1-\tau_t)K^I_{it+1}}{K^P_{it+1} + (1-\tau_t)K^I_{it+1}}$—the fraction of tax-adjusted book capital that is intangible.

itself: firms invest less where adjustment costs are higher, so a country's own rate already embeds its friction. Dividing by the installed capital stock instead of sales removes the scale, because the capital term cancels:

$$\frac{C^I_{it}}{K^I_{it}} = \frac{\theta^I_{c(i)}}{2}\left(\frac{I^I_{it}}{K^I_{it}}\right)^2, \qquad \frac{C^P_{it}}{K^P_{it}} = \frac{\theta^P_{c(i)}}{2}\left(\frac{I^P_{it}}{K^P_{it}}\right)^2. \tag{23}$$

We then evaluate both capital types at a common investment rate of 15%, rather than at each country's own rate (*Adjustment Costs at 15% Rate*, columns 5–6).[30] At a fixed rate the capital-scaled cost is $\frac{\theta}{2}\, i^2$, a function of the estimated parameter alone. Evaluating at a common rate makes each country's estimated adjustment-cost function comparable across countries and between the two capital inputs. On this basis intangible capital is about six times as costly to adjust as physical capital: the median cost is 12.4% of the intangible capital stock, against 2.0% of the physical capital stock, ranging from 3.8% (Rest of Europe) to 50.0% (India). This six-to-one gap equals the ratio of the coefficients θ^I and θ^P, since the common investment rate cancels—the same ratio reported in Section 5.1. The two measures need not rank countries the same way, precisely because investment rates and the capital-to-sales scale are endogenous and differ across countries: Australia tops the sales-based ranking—its firms hold large intangible capital stocks relative to sales—but sits in the middle once we divide by capital, whereas India, Saudi Arabia, and the Philippines, which have the highest $\hat{\theta}^I$, lead on the capital-based measure.

5.4 Firm-Level Estimates

The benchmark estimates pool firms into portfolios to reduce measurement error. We also estimate the model directly at the firm level. The firm-level estimates retain that measurement error and are therefore attenuated toward zero. They are not our preferred magnitudes, but they let us check whether the qualitative findings depend on the portfolio aggregation. Table 4 summarizes the firm-level estimates against the portfolio benchmark, by region; Tables E.1 and E.2 in the Online Appendix report the full country-level analogues of Tables 2 and 3.

The main findings hold at the firm level. θ^I still exceeds θ^P in almost every country; the cross-country ordering of both parameters is broadly preserved; and intangible capital still accounts for

[30] The 15% rate is a normalization: a round number between the world medians of the physical (13%) and intangible (21%) investment rates. Because the same rate enters both capital-scaled costs identically through the i^2 term, it scales the levels in columns 5–6 but leaves the intangible-to-physical ratio unchanged.

the majority of firm value, a median share of 56% against 60% in the benchmark. The firm-level coefficients are smaller, however: at the median, $\hat{\theta}^I$ falls from 11.0 to 7.9 and $\hat{\theta}^P$ from 1.8 to 1.3. This attenuation is consistent with classical measurement error: firm-level investment and capital carry idiosyncratic accounting and revaluation noise that portfolio averaging mitigates. The attenuation falls disproportionately on θ^I, which is expected: almost all intangible capital is off the books and constructed from an SG&A proxy, so it is measured with more error than physical capital, which firms report directly on the balance sheet. The intangible-to-physical ratio is stable: $\hat{\theta}^I$ is still about six times $\hat{\theta}^P$ at the firm level.

The same pattern appears in every region (Table 4, Panels A and B): under both methods intangible capital adjustment costs are highest in the Middle East and Asia and lowest in Sub-Saharan Africa. Model fit is mechanically lower at the firm level on every measure: the median cross-sectional R^2 falls from 0.82 to 0.52, and the time-series R^2 from 0.38 to 0.22.

5.5 Country versus Industry Variation

The benchmark model lets physical and intangible capital adjustment costs vary across countries but not across industries. Industry composition also varies across countries, so we now ask whether θ^P and θ^I vary across industries as well, and whether the country variation in the benchmark estimates is in part an industry effect.

We first ask whether industry alone can account for the variation in adjustment costs. We estimate an industry-only model, one (θ_h^P, θ_h^I) pair for each of the five Fama–French industries h, common to all countries, at the firm level and weighting each country equally so the estimates are not driven by the countries with the most listed firms. Table 5 reports the estimates. The intangible capital adjustment cost is similar across industries, between 6.2 and 9.5, while physical capital adjustment costs vary more, from around 1.3 in Consumer, Manufacturing, and Other to 4.3–4.7 in High-Tech and Health. The industry-only model attains a cross-sectional R^2 of 0.28, against 0.52 for the country benchmark at the same firm level (Section 5.4).[31] Country explains substantially more of the cross-sectional variation in valuation ratios than industry.

[31] Both firm-level specifications have low time-series R^2, 0.18 for the industry-only model and 0.22 for the country benchmark, because firm-level valuation ratios are noisier (Section 5.4). The cross-sectional comparison is therefore the more informative one.

To separate the country and industry contributions directly, we estimate a model with a separate $(\theta^P_{c,h}, \theta^I_{c,h})$ pair for each country×industry cell. Here the firm level is not merely convenient but necessary: many country×industry cells contain too few firms to form portfolios. Tables E.3 and E.4 report the cell estimates. Within a country, the intangible capital adjustment cost is relatively stable across industries, while the physical capital adjustment cost varies more—$\hat{\theta}^P$ is higher in High-Tech and Health than in Consumer or Manufacturing in most countries.

Table 6 makes this precise. We take the full set of country×industry cell estimates $\hat{\theta}_{c,h}$ and write each as a grand mean plus a country effect, an industry effect, and a country-specific industry term, $\hat{\theta}_{c,h} = \mu + u_c + v_h + w_{c,h}$. A two-way analysis of variance splits the total variance of $\hat{\theta}_{c,h}$ into these three components: the country and industry components are the variances of the country and industry marginal means of the cell-level estimates, and the cell component is the variance of the residual. We report the share each contributes.[32] For the intangible capital adjustment cost, countries account for 73% of the variation, industries for 1%, and the interaction for 26%. For the physical capital adjustment cost the split is more even—33% country, 26% industry, 41% interaction—consistent with physical capital adjustment depending on country-specific industrial conditions: the supply chains and used-equipment markets that make a given industry's machinery easy or hard to redeploy in a given country. For intangible capital, the variation is mostly a country attribute, not an artifact of countries specializing in intangible-intensive industries: if it were, the industry component would be large, and it is essentially zero. The benchmark model, which allows for country but not industry variation, therefore captures the dimension that matters for intangible capital. This result also motivates the country-characteristics model of the next section, which asks which country attributes account for the dominant country component.

6 Institutions and the Cost of Adjusting Capital

The benchmark estimates report the paper's two main findings: intangible capital is about six times as costly to adjust as physical capital, and it accounts for the majority of firm value, with a median

[32] As a robustness check we re-estimate the variance components by restricted maximum likelihood, a crossed random-effects model with random country and industry effects and the cell as residual. The qualitative pattern is unchanged; because that estimator corrects for the sampling variation in the cell-level coefficients, it attributes a somewhat larger share to the cell component and correspondingly smaller shares to country and industry.

market-value share of 60%. So far, these findings are mainly descriptive: they document where adjustment costs are high and low—and, for intangible capital, that the variation is a country attribute rather than an industry one (Section 5.5)—but not why. We now ask which country attributes account for that variation. We let the adjustment-cost coefficients depend linearly on observable country characteristics and re-estimate the model on the pooled portfolio-year panel, identifying which institutional and economic features raise or lower the cost of adjusting each type of capital. The characteristics model is a restricted version of the benchmark: the benchmark estimates a free pair (θ_c^P, θ_c^I) for each geographic unit, while the characteristics model constrains that pair to a linear function of a few interpretable variables.

6.1 The Country-Characteristics Model

We let each geographic unit's adjustment-cost coefficients depend on a vector $\mathbf{x}_c = (x_{1,c}, \ldots, x_{Z,c})$ of observed, standardized characteristics, with z indexing the individual characteristics:

$$\theta^P(\mathbf{x}_c) \;=\; \theta_g^P + \boldsymbol{\gamma}^P \cdot \mathbf{x}_c, \tag{24}$$

$$\theta^I(\mathbf{x}_c) \;=\; \theta_g^I + \boldsymbol{\gamma}^I \cdot \mathbf{x}_c, \tag{25}$$

so that $\theta^P(\mathbf{x}_c)$ and $\theta^I(\mathbf{x}_c)$ are geographic unit c's adjustment-cost coefficients under this specification. With each characteristic standardized to mean zero and unit standard deviation across geographic units, the global cost parameters θ_g^P and θ_g^I are the adjustment-cost coefficients of a geographic unit at the sample average of all characteristics. The incremental cost vectors $\boldsymbol{\gamma}^P = (\gamma_z^P)$ and $\boldsymbol{\gamma}^I = (\gamma_z^I)$ collect one coefficient per characteristic: γ_z^P and γ_z^I measure how a one-standard-deviation change in characteristic z shifts the physical and intangible adjustment cost, and $\boldsymbol{\gamma}^P \cdot \mathbf{x}_c = \sum_z \gamma_z^P \, x_{z,c}$.

This specification restricts the benchmark model. The benchmark of Section 3 estimates a free pair (θ_c^P, θ_c^I) for each country; equivalently, it is the saturated case in which $\mathbf{x}_c$ is a full set of country dummies. The characteristics model replaces those dummies with a small number of interpretable country variables.

Substituting (24)–(25) into the valuation ratio (11) gives the model-implied valuation ratio of firm i in country $c(i)$,

$$\widehat{VR}_{it} \;=\; \left[1+\theta^{P}(\mathbf{x}_{c(i)})(1-\tau_{c(i),t})\,\frac{I^{P}_{it}}{K^{P}_{it}}\right]\frac{K^{P}_{it+1}}{A_{it+1}}+(1-\tau_{c(i),t})\left[1+\theta^{I}(\mathbf{x}_{c(i)})\,\frac{I^{I}_{it}}{K^{I}_{it}}\right]\frac{K^{I}_{it+1}}{A_{it+1}}. \tag{26}$$

Substituting the linear specification into the benchmark portfolio regression (14) yields the pooled regression

$$\overline{VR}^{M}_{jct} \;=\; \theta^{P}_{g}\,\overline{IPA}_{jct}+\theta^{I}_{g}\,\overline{IIA}_{jct}+\sum_{z}\gamma^{P}_{z}\,(x_{z,c}\cdot\overline{IPA}_{jct})+\sum_{z}\gamma^{I}_{z}\,(x_{z,c}\cdot\overline{IIA}_{jct})+\varepsilon_{jct}, \tag{27}$$

where the regressors interact each standardized characteristic z with the physical and intangible investment regressors $\overline{IPA}_{jct}$ and $\overline{IIA}_{jct}$. A single OLS regression on the pooled panel of portfolio-year observations across all geographic units estimates $(\theta^{P}_{g},\theta^{I}_{g},\boldsymbol{\gamma}^{P},\boldsymbol{\gamma}^{I})$ jointly.

6.2 Country Characteristics

Rather than searching over a large set of country variables, we select on theory. We use fundamental institutional characteristics—the legal rules that protect property, investors, and creditors—rather than economic outcomes such as realized investment, patenting, or leverage. The institutions are prior to firms' investment decisions, whereas the outcomes are jointly determined with the adjustment costs we are trying to explain, so relating adjustment costs to outcomes would be circular.

The estimated adjustment costs need not be purely technological. In the spirit of business-cycle accounting (Chari, Kehoe, and McGrattan, 2007), the θ's are reduced-form objects that a detailed model can map to a concrete friction. Appendix C provides such a toy model: costly external finance generates an effective adjustment cost, with $\theta^{j}=\bar{\varphi}/\lambda^{j}$, where λ^{j} is the pledgeability of capital type j and $\bar{\varphi}$ is the premium on external equity. Since intangible capital is less pledgeable than physical capital, $\lambda^{I}<\lambda^{P}$, the model implies $\theta^{I}>\theta^{P}$.

This interpretation guides our choice of country characteristics. Creditor rights raise the collateral value of tangible assets and therefore the pledgeability of physical capital. Intellectual property protection makes intangible capital more verifiable, transferable, and pledgeable. Shareholder rights and director liability lower the premium on outside equity, a margin especially important for intangible investment. We focus on these four characteristics because each maps directly to one of these financing primitives; they are available for a broad cross-section of countries and generate clear predictions about which type of capital each should affect. Because these institutional variables are correlated with the overall level of economic development, we also include GDP per capita and a human capital index as controls.

Intellectual property protection. Enforceable intellectual property makes intangible capital a verifiable, transferable, and pledgeable claim: patents and trademarks can secure loans and be licensed or sold; when imitation is unchecked, the same knowledge secures little external finance. Stronger IP protection therefore raises the pledgeability of intangible capital and lowers θ_c^I (Acemoglu and Akcigit, 2012; Moser, 2005); because physical capital's pledgeability does not turn on it, we expect little effect on θ_c^P, consistent with Branstetter, Fisman, and Foley (2006). IP protection may also raise the appropriability of intangible returns, but that channel belongs naturally to the value side of the model, through the returns to intangible capital. The coefficient θ_c^I captures the investment-cost side. We measure IP protection using variable B6020 from the CEPII Institutional Profiles Database (IPD), which captures the strength of legal protection and enforcement of trade secrets and industrial patents on a 0–4 scale, with higher values indicating stronger protection.

Shareholder rights. Outside equity investors demand a premium for the risk that insiders expropriate them, and that premium is part of the cost of external finance. Stronger shareholder rights—greater power to approve major transactions, call meetings, and resist dilution—reduce that risk and lower the equity premium (Shleifer and Vishny, 1997; Porta et al., 1998; Gompers, Ishii, and Metrick, 2003), with a larger effect on the intangible capital adjustment cost: intangible investment, hard to collateralize, is financed at the equity margin, whereas physical investment is largely debt-financed. We measure shareholder rights using the World Bank's Extent of Shareholder Rights Index from the Doing Business project, the sum of six binary indicators of investors' ability to influence major corporate decisions, ranging from 0 to 6.

Director liability. Whereas shareholder rights give investors ex ante influence, director liability is an ex post enforcement mechanism that deters insider expropriation by raising the legal consequences of self-dealing (Djankov et al., 2008; Johnson et al., 2000). Like shareholder rights, it lowers the premium outside equity investors demand; because intangible investment is financed at the equity margin and intangible spending is the hardest to monitor, stronger director liability should reduce θ_c^I with little effect on θ_c^P. We measure it using the World Bank's Extent of Director Liability Index, which aggregates seven components of shareholders' ability to hold directors accountable for self-dealing, ranging from 0 to 10.

Creditor rights. The pledgeability of assets as collateral is a central determinant of access to external finance for physical investment. Stronger creditor rights raise the collateral value of tangible assets, lower financing costs for physical investment, and reduce θ_c^P (Hart and Moore, 1994; Almeida and Campello, 2007; Djankov, McLiesh, and Shleifer, 2007); most intangible capital is less pledgeable, with limited liquidation value, so creditor rights should have little effect on θ_c^I. We measure creditor rights using the World Bank's Strength of Legal Rights Index from the Getting Credit indicators, which evaluates twelve features of secured-transactions and bankruptcy law, ranging from 0 to 12.

Economic development controls. Because these institutional features are correlated with the overall level of economic development, we include two controls, so that the institutional coefficients do not simply proxy for development. GDP per capita is real GDP per capita from the Penn World Table, averaged over the sample period. The human capital index is the Penn World Table's index of human capital per person, based on average years of schooling and the estimated returns to education; it summarizes the education and skill level of a country's workforce. Because skilled labor is complementary to intangible capital—knowledge, brands, and organizational capital are costly to build and operate without it—a more educated workforce may lower the cost of accumulating intangible capital, and we include the index so that the institutional coefficients do not absorb this effect.

We construct each characteristic at the level of the 47 geographic units. A standalone country or territory takes its own value; each regional "Rest-of" group takes a firm-year-weighted average of its member countries' raw values, weighted by the number of firm-year observations each member contributes and excluding any member missing that characteristic. We use the time-series average of each characteristic over the sample period, since these institutions evolve slowly, and standardize across the 47 units to mean zero and unit standard deviation.

6.3 Estimation Results

Table 7 reports the country-characteristics estimates at the portfolio level, in local currency. Column (1) includes the four institutional variables; column (2) adds GDP per capita; column (3) adds a human capital index. The estimates are stable across the three specifications, so we read them off column (1). As in the benchmark, we estimate at the portfolio level so that units with many firms do not dominate: every geographic unit contributes the same number of portfolios, regardless of how many firms underlie it (Section 3.2); the firm-level specifications below instead weight observations so that each unit counts equally.

The global cost parameters confirm the benchmark result: $\theta_g^I = 13.0$ and $\theta_g^P = 2.8$, so the intangible capital adjustment cost remains several times larger than the physical one even after the unit dummies give way to a handful of observable characteristics.

The incremental coefficients, reported per one-standard-deviation change in each characteristic and separately for the physical and intangible channel, line up with the priors of Section 6.2. Intellectual property protection lowers θ^I and leaves θ^P unchanged: a one-standard-deviation increase reduces θ^I by 3.4, with no significant effect on θ^P—stronger protection makes intangible capital more pledgeable, and thus cheaper to adjust, with no corresponding effect on physical capital. Shareholder rights lower both, more strongly for intangible capital, with θ^I falling by 2.3 and θ^P by 0.5; stronger shareholder rights lower the premium on outside equity, with the larger effect on the intangible side, which is financed at the equity margin. Director liability lowers θ^I by 1.6 with no effect on θ^P, consistent with intangible investments being more exposed to managerial diversion. Creditor rights, by contrast, work on the physical side: a one-standard-deviation increase in the strength of legal rights lowers θ^P by 1.3 with no effect on θ^I, because stronger creditor protection raises the collateral value of tangible assets while intangible capital is less pledgeable.

The pattern is clean. Intellectual property protection, through the pledgeability of intangible capital, and shareholder rights and director liability, through the premium on outside equity, lower the intangible capital adjustment cost; creditor rights, through the collateral value of tangible assets, lower the physical. GDP per capita and the human capital index enter insignificantly and do not overturn the institutional coefficients. The model fits well: a cross-sectional R^2 of 0.54, against 0.82 for the full country-dummy benchmark (Table 4). Four institutional variables capture roughly two-thirds of the cross-sectional fit that a free coefficient per unit delivers, confirming that these institutions carry the economically important country variation.

To quantify the economic magnitude of these effects, Figures 2 and 3 translate the estimates into adjustment costs, investment rates, and value shares. For each characteristic we sort geographic units into terciles. We evaluate adjustment costs at a common 15% investment rate, so the comparison has a direct interpretation: it asks how costly it would be for firms in different institutional environments to invest at the same rate. In the figures we combine shareholder rights and director liability into a single equity-investor-protection index—both capture the protection of outside equity holders—though the estimation keeps them as separate coefficients.

The magnitudes are large. At a common 15% investment rate, firms in the low-IP tercile face an intangible adjustment cost equal to 19.3% of the installed intangible stock. Firms in the high-IP tercile face a cost of only 11.0%, with the middle tercile at 13.4% (Figure 2, top-left). Strong IP protection therefore lowers the cost of adjusting intangible capital by about 43%. The corresponding physical adjustment cost is small and does not fall with IP protection: it is 2.3%, 2.8%, and 3.8% across the three terciles (top-middle). IP protection lowers the intangible adjustment cost, not the physical adjustment cost.

Creditor protection works on the other input. The physical adjustment cost falls from 4.6% of the installed physical stock in the low-creditor-rights tercile to 1.5% in the high tercile, a decline of about two-thirds. The intangible adjustment cost is essentially flat across creditor-rights terciles: 13.9%, 12.4%, and 13.6%. Equity investor protection—the combined index—also lowers the intangible capital adjustment cost, from 17.0% in the low tercile to 11.3% in the high tercile. These comparisons show that the institutional variables shift the adjustment-cost friction on the capital input predicted by the model: intellectual property protection and equity-investor protection lower intangible adjustment costs, while creditor rights lower physical adjustment costs.

The share of firm value attributable to intangible capital (Figure 2, right panels) has a different interpretation. Unlike the common-rate adjustment-cost panels, the value shares are equilibrium outcomes: they depend on the shadow price of each input and on the capital stocks firms have accumulated. The shares therefore need not move monotonically with an institution. A stronger institution may lower the friction, which lowers the shadow price of an installed unit, while at the same time encouraging investment and raising the accumulated stock.

This equilibrium response is visible in the IP and creditor-rights panels. Strong IP protection lowers the intangible adjustment cost, but the intangible share of installed capital rises sharply, from 31.4% in the low-IP tercile to 71.6% in the high-IP tercile (Figure 3). The net effect is that the intangible share of market value is also higher, 75.6% against 55.2% in the low-IP tercile. Creditor protection shows a similar accumulation pattern. Stronger creditor rights lower the physical adjustment cost and are associated with a larger intangible share of installed capital, rising from 32.5% to 58.9%, and a larger intangible share of market value, rising from 50.8% to 75.0%. The figures therefore separate two margins: the common-rate panels show how institutions shift the adjustment-cost friction, while the share panels show the equilibrium allocation of firm value across physical and intangible capital.

The institutional pattern is robust. Re-estimating at the firm level attenuates the coefficients toward zero, as in the benchmark, but leaves the ranking of channels intact; letting the effects vary by industry changes little, consistent with the country, not industry, being the relevant margin (Section 5.5). We report both specifications in Section 7.2.

7 Robustness

To check the robustness of our main findings, we re-estimate the model under different sample-selection rules, currency conventions, and we re-estimate the country-characteristics model at the firm level and across industries. To save space, we report the full set of results in the online appendix, and we briefly summarize the main conclusions from these analyses here.

7.1 Sample Definition and Currency

In the benchmark, we assign each firm to the country of its headquarters and denominate all quantities in local currency. Multinational firms complicate the first choice: they operate capital in several countries but enter the sample under one, and the model does not separate the capital a firm holds across borders. We check two alternatives. First, we restrict the sample to domestic firms—those whose headquarters and country of incorporation coincide—so that the country assignment is unambiguous. Second, we assign each firm to its country of legal incorporation rather than its headquarters. Under both, the adjustment-cost estimates and their relation to institutions are close to the benchmark: weak institutions still go with a higher intangible capital adjustment cost.

We report all results in local currency; converting every quantity to U.S. dollars leaves them nearly unchanged (Appendix Tables E.7–E.18). The valuation ratio and the investment rates are ratios in which the common currency unit cancels, so the currency convention affects only a few constructed variables. The dollar sample additionally covers Palestine and Venezuela, which lack a usable local-currency exchange rate—82 economies, against 80 in local currency.

7.2 The Country-Characteristics Model: Firm-Level and Industry Estimates

The country-characteristics estimates in Section 6.3 are at the portfolio level and common across industries. We relax both.

We re-estimate the country-characteristics model at the firm level (Table E.5). As in the benchmark (Section 5.4), the coefficients attenuate toward zero: the global costs fall from $(2.8, 13.0)$ to about $(1.9, 8.8)$. The institutional pattern is preserved for the robust channels—intellectual property protection and shareholder rights still lower the intangible capital adjustment cost, and creditor rights still lower the physical capital adjustment cost—while director liability, the channel most sensitive to firm-level measurement error, weakens to insignificance.

We also let the characteristic effects differ across the five Fama–French industries (Table E.6). Consistent with the variance decomposition of Section 5.5, the institutional effects are broadly uniform across industries: intellectual property protection and shareholder rights lower the intangible capital adjustment cost in most industries, with no systematic industry pattern.

8 Conclusion

We incorporate intangible capital into a neoclassical investment model with two heterogeneous capital inputs, and estimate the value of intangible capital and the cost of adjusting it for publicly listed firms across 80 economies from 2007 to 2023. The model fits the data well: the median cross-sectional R^2 across countries is 0.82, and the median time-series R^2 is 0.38.

First, intangible capital is the dominant component of firm value: it accounts for a median of 60% of the market value of installed capital, and for more than 80% in the largest developed markets. Second, intangible capital is substantially more costly to adjust than physical capital. The intangible capital adjustment cost exceeds the physical one in almost every country, by a factor of roughly six: at a common 15% investment rate, adjusting intangible capital costs about 12% of the installed intangible stock, against 2% for physical capital. The same pattern holds at the firm level, where measurement error attenuates the parameters but leaves their relative magnitude intact. Third, the variation in intangible capital adjustment costs is primarily cross-country, not cross-industry. A variance decomposition attributes nearly three-quarters of that variation to differences across countries, and almost none to differences across industries. The benchmark model, which lets adjustment costs vary across countries but not industries, therefore captures the dimension that matters for intangible capital.

We then ask which country attributes explain the dominant country variation. Stronger intellectual property protection, shareholder rights, and director liability each lower the cost of adjusting intangible capital, while stronger creditor rights lower the cost of adjusting physical capital. The magnitudes are economically large: at a common 15% investment rate, adjustment costs consume about 19% of the intangible capital stock in countries with weak IP protection, against 11% where protection is strong. Stronger institutions are also associated with more accumulated intangible capital and a higher intangible share of firm value.

Taken together, these results show that intangible capital is a central component of firm value around the world, and that the institutional environment in which firms operate affects both its accumulation and its value. The strong country component of intangible capital adjustment costs is difficult to reconcile with purely technological frictions alone. It is consistent with a financing-frictions reading: a toy model in Appendix C maps the estimated θ's to the pledgeability of each capital type and the premium on external equity. The institutional gradient supports this interpretation: intellectual property protection and governance lower the intangible capital adjustment cost, while creditor rights lower the physical capital adjustment cost. The decomposition between technological and institutional components carries different normative implications, since only an institutional friction can be reduced by reform, and we leave that distinction, together with the higher-order dynamics of occasionally binding constraints, for future research.

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A Tables and Figures

Table 1: Descriptive Firm Statistics

This table reports descriptive statistics for the firm-level sample, 2007–2023, with all quantities in each firm's local currency. The 47 units are the 42 standalone markets and five regional "Rest-of" groups defined in Section 4.4; each cell is the median across firms within the unit in each year, averaged over the sample years. Bold rows are medians across the units in each region, and the World row is the median across all 47 units. Column (1) is the valuation ratio Q (market value of equity plus net debt over the book value of installed capital); columns (2) and (3) are the physical and intangible investment rates; column (4) their within-unit correlation; column (5) the intangible share of installed capital, $K^I/(K^I + K^P)$; and column (6) reported balance-sheet intangibles ($K^{I,\text{on}}$) as a share of intangible capital.

Country/Region	Q	$\frac{I^P}{K^P}$	$\frac{I^I}{K^I}$	$\rho\left(\frac{I^P}{K^P}, \frac{I^I}{K^I}\right)$	$\frac{K^I}{K^I+K^P}$	$\frac{K^{I,\text{on}}}{K^I}$
	(1)	(2)	(3)	(4)	(5)	(6)
Canada	1.02	0.16	0.20	0.35	0.42	0.02
United States	1.31	0.19	0.18	0.38	0.80	0.15
Brazil	1.05	0.12	0.20	0.45	0.44	0.06
Chile	0.93	0.08	0.18	0.30	0.29	0.04
Mexico	0.93	0.08	0.17	0.34	0.37	0.05
Peru	0.80	0.10	0.21	0.17	0.22	0.00
Rest of Latin America	0.93	0.11	0.23	0.38	0.35	0.00
Americas	**0.93**	**0.11**	**0.20**	**0.35**	**0.37**	**0.04**
Belgium	1.16	0.16	0.17	0.38	0.63	0.15
Croatia	0.90	0.06	0.22	0.23	0.21	0.01
Denmark	1.28	0.15	0.20	0.29	0.74	0.15
Finland	1.31	0.20	0.16	0.36	0.80	0.21
France	1.07	0.23	0.18	0.32	0.82	0.22
Germany	1.22	0.19	0.19	0.27	0.74	0.14
Greece	0.91	0.05	0.20	0.34	0.33	0.01
Ireland	1.41	0.19	0.17	0.37	0.77	0.30
Italy	1.30	0.17	0.18	0.34	0.72	0.27
Netherlands	1.22	0.21	0.17	0.40	0.75	0.28
Norway	1.11	0.23	0.18	0.36	0.62	0.12
Poland	0.95	0.14	0.16	0.26	0.68	0.03
Spain	1.26	0.13	0.17	0.42	0.65	0.15
Sweden	1.74	0.31	0.23	0.27	0.91	0.23
Switzerland	1.53	0.14	0.19	0.33	0.69	0.11
United Kingdom	1.05	0.21	0.18	0.31	0.83	0.23
Rest of Europe	0.73	0.07	0.20	0.20	0.33	0.01
Europe	**1.22**	**0.17**	**0.18**	**0.33**	**0.72**	**0.15**
Israel	1.30	0.22	0.17	0.30	0.73	0.04
Saudi Arabia	2.09	0.08	0.23	0.20	0.17	0.00
Turkey	1.71	0.27	0.25	0.34	0.31	0.01
Rest of MENA	1.47	0.11	0.21	0.28	0.25	0.00
MENA	**1.59**	**0.16**	**0.22**	**0.29**	**0.28**	**0.00**
Nigeria	0.94	0.12	0.21	0.25	0.32	0.00
South Africa	0.95	0.15	0.18	0.34	0.56	0.09
Rest of Sub-Saharan Africa	0.96	0.13	0.21	0.17	0.34	0.00
Sub-Saharan Africa	**0.95**	**0.13**	**0.21**	**0.25**	**0.34**	**0.00**
China	3.32	0.15	0.24	0.28	0.37	0.08
Hong Kong	1.24	0.17	0.21	0.20	0.59	0.02
India	1.54	0.06	0.21	0.29	0.28	0.00
Indonesia	1.20	0.08	0.22	0.41	0.20	0.00
Japan	0.86	0.14	0.22	0.31	0.55	0.02
Malaysia	1.12	0.08	0.21	0.24	0.31	0.01
Pakistan	0.88	0.07	0.24	0.21	0.11	0.00
Philippines	1.39	0.12	0.20	0.30	0.27	0.01
Singapore	1.10	0.13	0.21	0.24	0.48	0.01
South Korea	1.20	0.11	0.23	0.31	0.36	0.03
Sri Lanka	0.82	0.09	0.23	0.20	0.22	0.00
Taiwan	1.87	0.12	0.23	0.27	0.35	0.01
Thailand	1.56	0.11	0.22	0.26	0.32	0.01
Rest of Asia	1.64	0.11	0.27	0.33	0.25	0.00
Asia	**1.22**	**0.11**	**0.22**	**0.28**	**0.31**	**0.01**
Australia	1.22	0.19	0.22	0.26	0.60	0.01
New Zealand	1.39	0.15	0.22	0.29	0.59	0.11
Oceania	**1.31**	**0.17**	**0.22**	**0.27**	**0.59**	**0.06**
World	**1.20**	**0.13**	**0.21**	**0.30**	**0.42**	**0.02**

Table 2: Parameter Estimates and Model Fit

This table reports the benchmark-model estimates by country (or territory/region). Columns (1) and (2) report the physical and intangible adjustment-cost coefficients, $\hat{\theta}_P$ and $\hat{\theta}_I$, with Driscoll–Kraay standard errors (one lag) in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels. Column (3) is the cross-sectional R^2, column (4) the time-series R^2, and column (5) the mean absolute percentage valuation error (MAPE).

Country/Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE
	(1)	(2)	(3)	(4)	(5)
Canada	0.974*	8.431***	0.935	0.660	0.217
	(0.470)	(0.730)			
USA	2.656***	11.830***	0.931	0.767	0.156
	(0.403)	(0.752)			
Brazil	1.795*	9.054***	0.898	0.525	0.284
	(0.793)	(1.306)			
Chile	-0.788	12.113***	0.755	0.221	0.373
	(0.974)	(1.861)			
Mexico	1.714	6.458***	0.661	0.362	0.269
	(1.028)	(0.951)			
Peru	1.029	6.165***	0.511	0.220	0.538
	(0.620)	(1.370)			
RestLatAm	1.557	11.123***	0.840	0.380	0.425
	(0.938)	(1.831)			
Americas	**1.56**	**9.05**	**0.84**	**0.38**	**0.28**
Belgium	9.951***	8.646***	0.737	0.304	0.436
	(2.041)	(1.345)			
Croatia	0.796	3.489***	0.631	0.222	0.320
	(0.518)	(0.819)			
Denmark	5.052*	12.167***	0.709	0.298	0.477
	(2.069)	(1.924)			
Finland	1.161	9.529***	0.755	0.372	0.314
	(0.771)	(1.461)			
France	8.295*	8.005***	0.774	0.468	0.264
	(3.312)	(1.708)			
Germany	7.098***	12.171***	0.734	0.314	0.298
	(1.434)	(2.260)			
Greece	-0.235	6.592***	0.848	0.453	0.218
	(0.396)	(1.118)			
Ireland	1.373*	6.836***	0.678	0.081	0.415
	(0.539)	(1.433)			
Italy	3.175***	8.556***	0.884	0.510	0.274
	(0.711)	(0.637)			
Netherlands	8.214***	6.709***	0.792	0.181	0.433
	(2.070)	(1.815)			
Norway	0.654	10.907***	0.827	0.508	0.379
	(0.567)	(1.275)			
Poland	0.591	8.457***	0.888	0.429	0.265
	(0.717)	(1.340)			
Spain	0.235	11.787***	0.809	0.409	0.322
	(1.646)	(1.258)			
Sweden	3.698***	13.021***	0.917	0.607	0.288
	(0.676)	(1.265)			
Switzerland	7.715***	9.970***	0.830	0.298	0.293
	(1.709)	(1.485)			
UK	1.793***	7.081***	0.917	0.636	0.204
	(0.425)	(0.644)			
RestEurope	0.467	3.375***	0.703	0.374	0.201
	(0.554)	(0.620)			
Europe	**1.79**	**8.56**	**0.79**	**0.37**	**0.30**
Israel	2.379	10.522***	0.763	0.168	0.275
	(1.356)	(1.511)			
SaudiArabia	2.330	43.147***	0.665	0.373	0.297
	(1.240)	(4.313)			
Turkey	3.089***	15.238***	0.920	0.279	0.376
	(0.749)	(2.990)			
RestMENA	2.328***	23.200***	0.935	0.610	0.196
	(0.644)	(1.367)			
MENA	**2.35**	**19.22**	**0.84**	**0.33**	**0.29**
Nigeria	1.257***	11.258***	0.663	0.242	0.439
	(0.238)	(3.079)			
SouthAfrica	2.054**	5.149***	0.741	0.420	0.211
	(0.650)	(0.472)			
Rest of Sub-Saharan Africa	0.808*	7.062***	0.503	0.143	0.306
	(0.332)	(1.287)			
Sub-Saharan Africa	**1.26**	**7.06**	**0.66**	**0.24**	**0.31**
China	9.452*	29.559***	0.849	0.381	0.271
	(3.743)	(5.008)			
HongKong	1.887*	13.333***	0.898	0.299	0.297
	(0.885)	(3.010)			
India	2.123	44.417***	0.813	0.196	0.434
	(3.720)	(7.760)			
Indonesia	2.367**	20.361***	0.965	0.671	0.236
	(0.857)	(1.542)			
Japan	-0.586	6.180***	0.625	0.475	0.249
	(0.540)	(1.074)			
Malaysia	3.556***	12.113***	0.962	0.610	0.189
	(0.771)	(1.066)			
Pakistan	-1.130	25.354***	0.894	0.644	0.375
	(1.260)	(3.211)			
Philippines	3.057	42.064***	0.829	0.364	0.485
	(1.784)	(5.135)			
Singapore	0.948*	10.224***	0.878	0.588	0.190
	(0.472)	(0.821)			
SouthKorea	-1.250	11.003***	0.823	0.506	0.177
	(0.996)	(1.121)			
SriLanka	-2.133***	12.414***	0.819	0.485	0.333
	(0.632)	(1.452)			
Taiwan	4.970***	19.764***	0.945	0.565	0.193
	(0.901)	(1.626)			
Thailand	3.110***	16.325***	0.974	0.669	0.180
	(0.633)	(1.555)			
RestAsia	1.814***	13.589***	0.491	0.075	0.283
	(0.530)	(2.020)			
Asia	**2.00**	**14.96**	**0.86**	**0.50**	**0.26**
Australia	1.602**	13.605***	0.969	0.742	0.203
	(0.619)	(1.204)			
NewZealand	6.970***	9.592***	0.790	0.255	0.474
	(1.133)	(1.613)			
Oceania	**4.29**	**11.60**	**0.88**	**0.50**	**0.34**
World	1.81	11.00	0.82	0.38	0.29

Table 3: Shares and Adjustment Costs by Country

This table reports, by country (or territory/region), the market and book share of intangible capital μ_I and $\bar{\mu}_I$ (columns (1) and (2)) and two adjustment-cost measures, all in percent. Columns (3)–(4), C^I/Y and C^P/Y, are the realized intangible and physical adjustment costs as a share of sales, computed from each country's own investment rates and capital stocks, so they reflect both the adjustment-cost coefficients and cross-country differences in investment. Columns (5)–(6), C^I/K^I and C^P/K^P, are the adjustment costs as a share of installed capital evaluated at a common cross-country investment rate (at 15% for both inputs), so differences across units isolate the coefficients θ^I and θ^P. Columns (7)–(12) repeat these statistics for the remaining units; μ_I and the sales-based costs are time-series averages of within-unit cross-sectional medians.

	Share		Realized Adjustment Costs		Adjustment Costs at 15% Rate			Share		Realized Adjustment Costs		Adjustment Costs at 15% Rate	
Country/Region	μ_I	$\bar{\mu}_I$	C^I/Y	C^P/Y	C^I/K^I	C^P/K^P	Country/Region	μ_I	$\bar{\mu}_I$	C^I/Y	C^P/Y	C^I/K^I	C^P/K^P
	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Canada	53.04	34.56	5.92	0.96	9.48	1.10	Saudi Arabia	57.40	14.09	16.69	0.82	48.54	2.62
United States	84.63	72.43	9.68	1.06	13.31	2.99	Turkey	49.37	26.50	6.90	5.19	17.14	3.47
Brazil	55.56	33.98	6.07	0.78	10.19	2.02	Rest of MENA	53.73	21.30	8.42	1.17	26.10	2.62
Chile	52.36	24.22	5.72	-0.31	13.63	-0.89	**MENA**	**55.56**	**23.90**	**7.66**	**1.31**	**21.62**	**2.65**
Mexico	44.96	29.48	3.45	0.43	7.26	1.93	Nigeria	47.88	24.51	7.30	0.69	12.66	1.41
Peru	28.21	16.79	2.91	0.79	6.94	1.16	South Africa	55.42	46.56	2.41	0.65	5.79	2.31
Rest of Latin America	52.42	27.19	7.12	0.56	12.51	1.75	Rest of Sub-Saharan Africa	45.40	26.97	3.83	0.41	7.94	0.91
Americas	**52.42**	**29.48**	**5.92**	**0.78**	**10.19**	**1.75**	**Sub-Saharan Africa**	**47.88**	**26.97**	**3.83**	**0.65**	**7.94**	**1.41**
Belgium	56.25	53.87	4.54	4.22	9.73	11.19	China	60.68	30.41	18.61	5.18	33.25	10.63
Croatia	27.01	17.39	1.38	0.22	3.92	0.90	Hong Kong	76.42	54.81	8.47	1.01	15.00	2.12
Denmark	81.18	69.08	14.39	1.75	13.69	5.68	India	67.93	20.51	14.75	0.35	49.97	2.39
Finland	85.15	75.16	5.47	0.38	10.72	1.31	Indonesia	45.35	16.16	8.05	0.69	22.91	2.66
France	74.67	75.48	7.42	3.48	9.01	9.33	Japan	67.02	44.93	3.84	-0.12	6.95	-0.66
Germany	75.55	65.83	8.56	2.35	13.69	7.98	Malaysia	46.95	25.17	4.83	0.83	13.63	4.00
Greece	45.70	27.34	3.47	-0.04	7.42	-0.26	Pakistan	38.83	7.42	5.45	-0.19	28.52	-1.27
Ireland	82.72	74.86	5.33	0.80	7.69	1.54	Philippines	63.63	20.34	20.31	1.81	47.32	3.44
Italy	74.63	64.43	6.51	1.32	9.63	3.57	Singapore	66.27	42.95	5.15	0.39	11.50	1.07
Netherlands	68.15	68.87	4.65	4.83	7.55	9.24	South Korea	63.56	29.74	5.57	-0.38	12.38	-1.41
Norway	74.61	54.84	8.68	0.71	12.27	0.74	Sri Lanka	48.66	16.48	7.62	-0.74	13.97	-2.40
Poland	78.07	63.46	4.35	0.18	9.51	0.66	Taiwan	60.38	30.30	8.29	1.45	22.23	5.59
Spain	80.17	57.99	7.98	0.07	13.26	0.26	Thailand	54.57	26.44	7.45	0.84	18.37	3.50
Sweden	92.90	89.01	21.72	2.16	14.65	4.16	Rest of Asia	47.76	20.67	4.93	0.53	15.29	2.04
Switzerland	71.77	63.51	7.94	2.32	11.22	8.68	**Asia**	**60.53**	**25.80**	**7.53**	**0.61**	**16.83**	**2.26**
United Kingdom	85.76	79.53	7.26	0.79	7.97	2.02	Australia	75.51	51.58	33.96	3.02	15.31	1.80
Rest of Europe	40.41	29.11	1.98	0.12	3.80	0.53	New Zealand	60.23	50.46	7.92	3.82	10.79	7.84
Europe	**74.67**	**64.43**	**6.51**	**0.80**	**9.63**	**2.02**	**Oceania**	**67.87**	**51.02**	**20.94**	**3.42**	**13.05**	**4.82**
Israel	79.53	66.96	6.07	1.44	11.84	2.68		.	.	.	.	.	.
World	**60.38**	**33.98**	**6.90**	**0.79**	**12.38**	**2.04**							

Table 4: Firm vs Portfolio Level Estimates: Summary Statistics

This table reports regional medians of the benchmark estimates, model fit, and implied adjustment costs. Panel A reports medians of the portfolio-level estimates (Table 2) and Panel B medians of the firm-level estimates (Table E.1), each estimated separately by geographic unit. Each region is the median across its constituent units, and the World row the median across all units. Columns (1)–(2) are the physical and intangible adjustment-cost coefficients, $\hat{\theta}_P$ and $\hat{\theta}_I$; columns (3)–(5) the cross-sectional R^2, the time-series R^2, and the mean absolute percentage valuation error (MAPE); and column (6) the share of intangible capital, μ_I. Columns (7)–(8), C^I/Y and C^P/Y, are the realized adjustment costs as a share of sales, computed at each unit's own investment rates and capital; columns (9)–(10), C^I/K^I and C^P/K^P, are the adjustment costs as a share of installed capital evaluated at a common (15%) cross-country investment rate, isolating the coefficients θ^I and θ^P. All shares and costs are in percent.

	Point Estimates		Model Fit			Share	Adjustment Costs			
Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE	μ_I	C^I/Y	C^P/Y	C^I/K^I	C^P/K^P
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A. Portfolio Level										
Americas	1.56	9.05	0.84	0.38	0.28	52.42	5.92	0.78	10.19	1.75
Europe	1.79	8.56	0.79	0.37	0.30	74.67	6.51	0.80	9.63	2.02
MENA	2.35	19.22	0.84	0.33	0.29	55.56	7.66	1.31	21.62	2.65
Sub-Saharan Africa	1.26	7.06	0.66	0.24	0.31	47.88	3.83	0.65	7.94	1.41
Asia	2.00	14.96	0.86	0.50	0.26	60.53	7.53	0.61	16.83	2.26
Oceania	4.29	11.60	0.88	0.50	0.34	67.87	20.94	3.42	13.05	4.82
World	**1.81**	**11.00**	**0.82**	**0.38**	**0.29**	**60.38**	**6.90**	**0.79**	**12.38**	**2.04**
Panel B. Firm-Level										
Americas	1.73	5.18	0.59	0.35	0.29	45.02	3.63	0.65	5.82	1.94
Europe	1.33	5.24	0.31	0.19	0.31	74.44	3.58	1.02	5.90	1.49
MENA	1.78	14.66	0.54	0.28	0.30	53.72	5.84	0.81	16.49	2.00
Sub-Saharan Africa	0.54	5.07	0.10	0.21	0.31	48.73	2.75	0.27	5.71	0.61
Asia	1.72	11.69	0.67	0.44	0.30	51.75	5.72	0.48	13.15	1.93
Oceania	2.02	7.10	0.08	0.14	0.39	64.98	12.28	1.58	7.99	2.28
World	**1.33**	**7.88**	**0.52**	**0.22**	**0.31**	**56.15**	**4.40**	**0.71**	**8.87**	**1.49**

Table 5: Adjustment Costs by Fama–French 5 Industry

This table reports country-weighted firm-level estimates—each geographic unit is weighted equally—in which the adjustment-cost coefficients are allowed to vary by Fama–French 5 industry. Columns (1) and (2) report the physical and intangible coefficients, $\hat{\theta}_P$ and $\hat{\theta}_I$, with standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels. The lower rows report the number of firm-year observations and the model fit—the cross-sectional R^2, the time-series R^2, and the mean absolute percentage valuation error (MAPE).

Industry	$\hat{\theta}_P$	$\hat{\theta}_I$
FF5 = Consumer	1.319***	7.147***
	(0.224)	(0.869)
FF5 = Manufacturing	1.418***	6.150***
	(0.236)	(0.735)
FF5 = HiTech	4.265***	7.527***
	(0.850)	(0.616)
FF5 = Health	4.665***	9.469***
	(0.768)	(1.404)
FF5 = Other	1.201***	7.153***
	(0.214)	(0.714)
N		433105
XS-R^2		0.276
TS-R^2		0.181
MAPE		0.350

Table 6: Variance Decomposition of Physical and Intangible Adjustment Costs

This table decomposes the variance of the estimated adjustment-cost coefficients θ_P and θ_I into country, Fama–French 5 industry, and country×industry-cell components. The coefficients are first estimated at the country×industry-cell level; their variance is then decomposed by a two-way analysis of variance, in which the country and industry components are the variances of the country and industry marginal means of the cell-level coefficients, and the cell component is the variance of the residual. For each coefficient, σ^2 is the variance component and "Share" its percentage of the total.

	θ_P		θ_I	
Component	σ^2	Share (%)	σ^2	Share (%)
Country	3.87	32.83	68.06	72.93
FF5 Industry	3.02	25.66	1.15	1.24
Country × FF5 Industry Cell	4.89	41.51	24.10	25.83
Total	11.79	100.00	93.32	100.00

Table 7: Parameter Estimates of the Country-Characteristics Model

This table reports the portfolio-level country-characteristics model estimates. Panel A reports the global adjustment-cost coefficients θ_P and θ_I; Panel B the incremental coefficients γ on the standardized country characteristics (intellectual property protection, shareholder rights, director liability, strength of legal rights, human capital, and GDP per capita); and Panel C the fit statistics (N, XS-R^2, TS-R^2, MAPE). Standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels. Columns (1)–(3) are progressively richer specifications: (1) the four institutional characteristics, (2) adds GDP per capita, and (3) further adds human capital.

	(1)		(2)		(3)	
	θ_P	θ_I	θ_P	θ_I	θ_P	θ_I
Panel A. Global Cost Coefficients						
Global Cost	2.767***	12.983***	2.669***	12.977***	2.521***	13.140***
	(0.429)	(1.071)	(0.474)	(1.069)	(0.431)	(1.081)
Panel B. Country Characteristics						
(a) Intellectual Property Protection						
Trade Secrets and Patents	0.607	-3.377**	-0.068	-3.389**	0.181	-2.941*
	(0.461)	(1.327)	(0.967)	(1.623)	(1.126)	(1.605)
(b) Equity Investor Protection						
Shareholder Rights	-0.529*	-2.271**	-0.679*	-2.242**	-0.699**	-2.220**
	(0.295)	(1.077)	(0.340)	(1.065)	(0.318)	(1.041)
Director Liability	0.107	-1.622**	0.050	-1.595**	-0.002	-1.683**
	(0.369)	(0.765)	(0.416)	(0.750)	(0.398)	(0.733)
(c) Credit Protection						
Strength of Legal Rights	-1.326***	1.077	-1.360***	1.079	-1.268**	1.270
	(0.432)	(0.869)	(0.465)	(0.871)	(0.517)	(0.873)
(d) Human Capital						
Human Capital Index					-0.473	-1.107
					(0.719)	(1.391)
(e) Economic Development						
GDP per Capita			0.789	0.043	1.026	0.240
			(0.967)	(0.964)	(0.922)	(1.202)
Panel C. Statistics						
N	7191		7191		7191	
XS-R^2	0.544		0.554		0.515	
TS-R^2	0.175		0.201		0.179	
MAPE	0.373		0.364		0.374	

Figure 1: Market Share of Intangible Capital Around the World

This figure reports the median share of intangible capital in firms' market value, computed from the benchmark per-country estimates in Table 2 (each unit's own adjustment-cost coefficients).

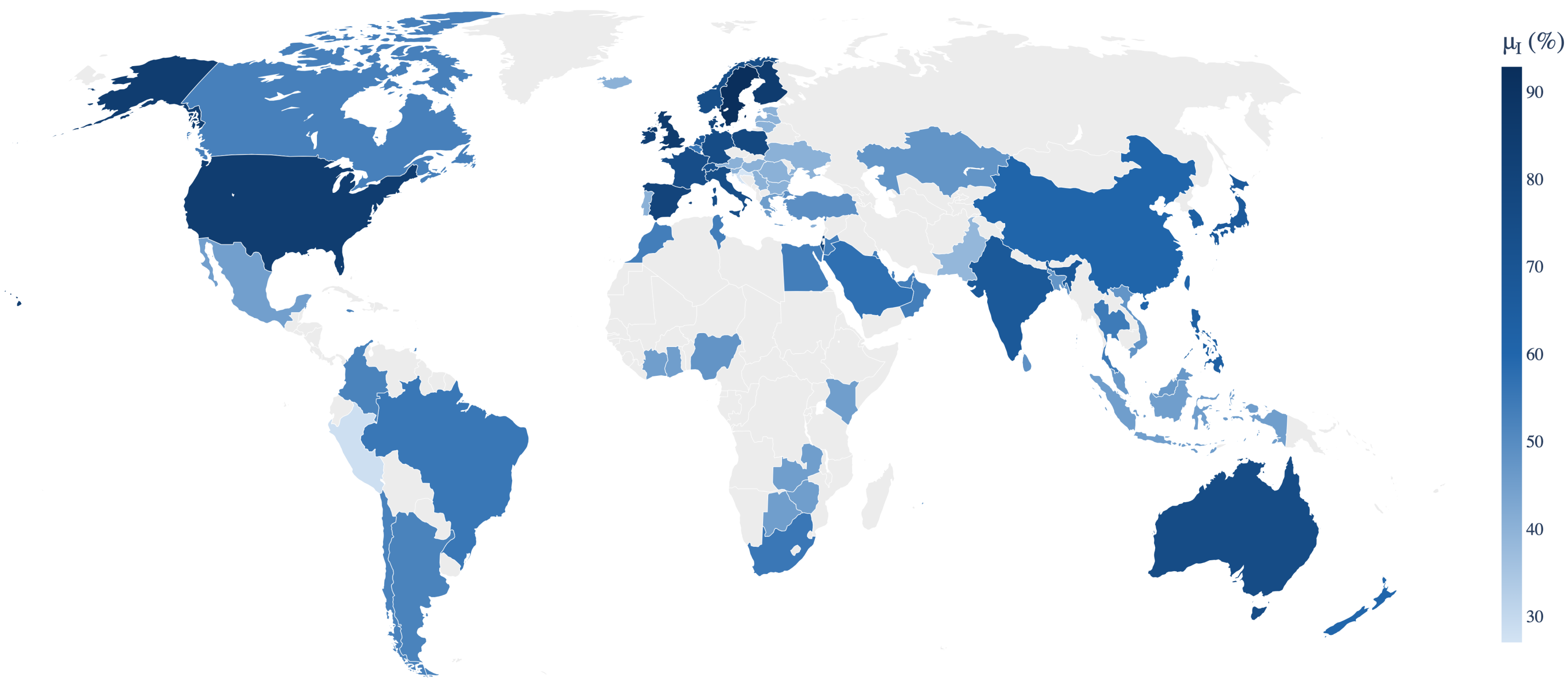


Figure 2: Adjustment Costs and Intangible Capital Shares by Country Characteristics.

This figure displays the median adjustment cost as a share of capital (in percent) and the share of firms' value attributable to intangible capital for countries in the low, middle, and high terciles of each institutional characteristic. Adjustment costs are evaluated at a common reference investment rate of 15%, the same for physical and intangible capital. The left panel reports the adjustment cost of intangible capital, while the middle panel reports the adjustment cost of physical capital. The right panel reports the share of firms' value attributable to intangible capital (market-based), evaluated at realized investment levels, and the share of intangible capital in book assets, computed under the assumption of zero adjustment costs. These quantities use the country-characteristics model (portfolio-level Specification (1) in Table 7), in which the adjustment costs depend on country characteristics; they therefore differ from the benchmark per-country estimates that underlie the map in Figure 1. Equity investor protection is the sum of the two equity-investor indices, shareholder rights and director liability.

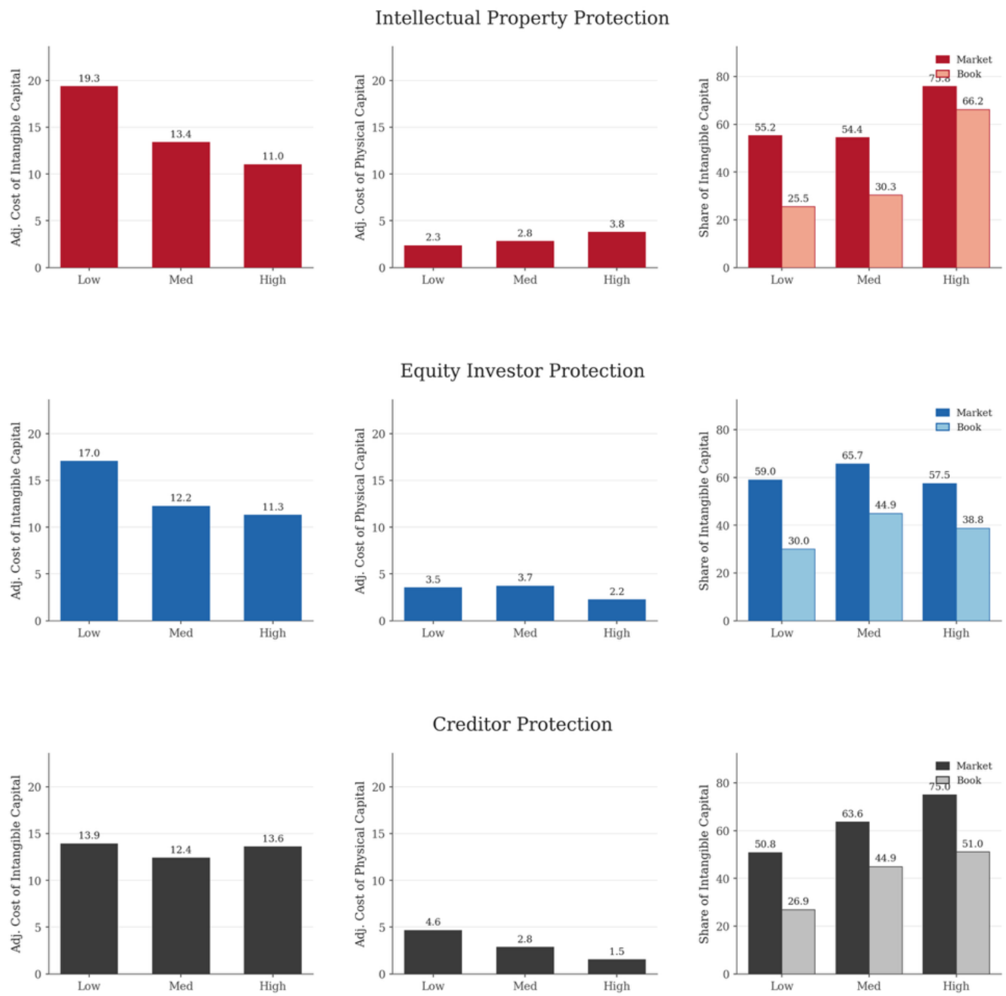
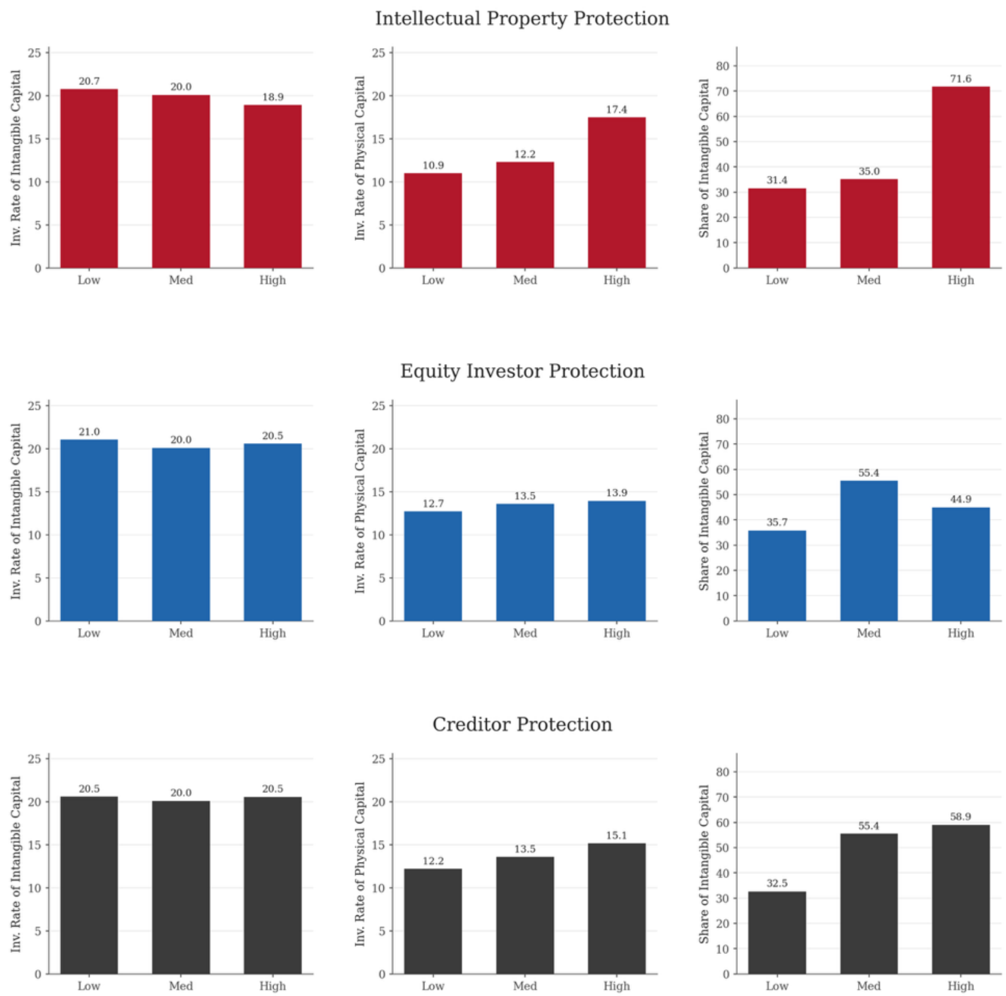


Figure 3: Investment Rates and Stock of Intangible Capital by Country Characteristics.

This figure displays the median investment rates in intangible and physical capital and the share of intangible capital over total capital (all in percent) for countries in the low, middle, and high terciles of each institutional characteristic. Investment rates and capital shares are evaluated at realized investment levels and realized capital stocks. Equity investor protection is the sum of the two equity-investor indices, shareholder rights and director liability.



B Math Appendix

B.1 Theorem of Firm Valuation Decomposition

This appendix section provides the proof for the valuation equation 6. The proof is direct extension of (Hayashi, 1982) with consideration of multiple types of capital inputs and debt.

Theorem [Hayashi,1982]: Denote $P_{it} \equiv V_{it} - D_{it}$ be the ex-dividend equity value. If profit function $\Pi(.)$ and cost function $C(.)$ are Constant Return to Scale, firm's value maximization implies that

$$P_{it} + B_{it+1} = q_{it}^P K_{it+1}^P + q_{it}^I K_{it+1}^I, \tag{28}$$

in which

$$\begin{aligned} q_{it}^P &= 1 + (1-\tau_t) \cdot \frac{\partial C_{it}}{\partial I_{it}^P}, \\ q_{it}^I &= (1-\tau_t) \cdot (1 + \frac{\partial C_{it}}{\partial I_{it}^I}). \end{aligned} \tag{29}$$

Proof:

The Bellman equation of firm equity valuation is

$$V(X_{it}, K_{it}^P, K_{it}^I) \equiv \max_{\{L_{it+s}, \mathbf{I}_{it+s}, \mathbf{K}_{it+s+1}, B_{it+s+1}\}_{s=0}^{\infty}} D_{it} + E_t\left[M_{t+1} \cdot V(X_{it+1}, K_{it+1}^P, K_{it+1}^I)\right], \tag{30}$$

$$s.t.\ \ D_{it} \equiv (1-\tau_t)[\Pi_{it} - C_{it} - I_{it}^I] \quad -I_{it}^P + B_{it+1} - r_{it}^B B_{it} + \tau_t \delta_{it}^P K_{it}^P + \tau_t (r_{it}^B - 1) B_{it} \tag{31}$$

$$K_{it+1}^P = I_{it}^P + (1-\delta_{it}^P) K_{it}^P, \tag{32}$$

$$K_{it+1}^I = I_{it}^I + (1-\delta_{it}^I) K_{it}^I \tag{33}$$

The X_{it} is vector of state variables of aggregate productivity and firm productivity. Optimal physical capital investment reflects the marginal value of physical capital (K_{it+1}^P):

$$\underbrace{1 + (1-\tau_t)\frac{\partial C_{it}}{\partial I_{it}^P}}_{q_{it}^P\text{: Physical Capital Marginal q}} = E_t\left[M_{t+1} \cdot \frac{\partial V}{\partial K^P}(X_{it+1}, K_{it+1}^P, K_{it+1}^I)\right] \tag{34}$$

Optimal intangible capital investment reflects the marginal value of intangible capital (K^I_{it+1}):

$$\underbrace{(1-\tau_t)\left[1+\frac{\partial C_{it}}{\partial I^I_{it}}\right]}_{q^I_{it}\text{: Intangible Capital Marginal q}} \quad = E_t\left[M_{t+1}\cdot\frac{\partial V}{\partial K^I}(X_{it+1},K^P_{it+1},K^I_{it+1})\right] \tag{35}$$

We assume the Modigliani-Miller environment, total firm valuation is irrelevant of capital structure. Equity value maximization implies the total firm valuation maximization, $r^B_{it}B_{it} + V(X_t,\mathbf{K}_{it}) = \overline{V}(X_t,\mathbf{K}_{it})$. If profit function $\Pi(.)$ and cost function $C(.)$ are Constant Return to Scale w.r.t $\mathbf{K}_{it} = (K^P_{it},K^I_{it})$, firm's value maximization implies that

$$\overline{V}(X_t, a\cdot K^P_{it}, a\cdot K^I_{it}) = a\cdot\overline{V}(X_t,K^P_{it},K^I_{it}), \tag{36}$$

Homogeneity of Degree One implies the equation below,

$$\frac{\partial\overline{V}}{\partial K^P}(X_t,a\cdot K^P_{it},a\cdot K^I_{it})\cdot K^P_{it} + \frac{\partial\overline{V}}{\partial K^I}(X_t,a\cdot K^P_{it},a\cdot K^I_{it})\cdot K^I_{it} = a\cdot\overline{V}(X_t,K^P_{it},K^I_{it}), \tag{37}$$

At $a=1$, the total firm valuation is quantity of capital(s) multiplied by the marginal valuation of capital(s). In the Modigliani-Miller environment, total firm valuation is irrelevant of debt. Marginal value of physical capital for the equity valuation is identical with the first-order partial derivative of total firm valuation,

$$\frac{\partial V}{\partial K^P}(X_t,\mathbf{K}_{it}) = \frac{\partial\overline{V}}{\partial K^P}(X_t,\mathbf{K}_{it}), \tag{38}$$

The similar equation holds for the new amount of intangible capital. Previously, we denote the $q^P_{it}(X_t) = E_t\left[M_{t+1}\cdot\frac{\partial V}{\partial K^P}(X_{it+1},\mathbf{K}_{it+1})\right]$, substituting the equation (38) yields $q^P_{it} = E_t\left[M_{t+1}\cdot\frac{\partial\overline{V}}{\partial K^P}(X_{it+1},\mathbf{K}_{it+1})\right]$, shadow price of physical capital is the expected marginal value for total firm valuation. Replacing the expected marginal value of capital, The expected total firm valuation is written as

$$
\begin{aligned}
E_t\left[M_{t+1}\cdot\overline{V}(X_{it+1},\mathbf{K}_{it+1})\right] &= E_t\left[M_{t+1}\cdot(\tfrac{\partial\overline{V}}{\partial K^P}(X_{it+1},\mathbf{K}_{it+1})\cdot K^P_{it+1}+\tfrac{\partial\overline{V}}{\partial K^I}(X_{it+1},\mathbf{K}_{it+1})\cdot K^I_{it+1})\right] \\
&= q^P_{it}(X_t)\cdot K^P_{it+1}+q^I_{it}(X_t)\cdot K^I_{it+1}
\end{aligned},
$$

Recall the total firm valuation is equity plus the debt, we arrive to the expected equity value $E_t\left[M_{t+1}\cdot(V(X_{it+1},\mathbf{K}_{it+1})\right]$ prior to dividend payout,

$$
\begin{aligned}
E_t\left[M_{t+1}\cdot\overline{V}(X_{it+1},\mathbf{K}_{it+1})\right] &= E_t\left[M_{t+1}\cdot(V(X_{it+1},\mathbf{K}_{it+1})+r^B_{it+1}B_{i,t+1})\right] \\
&= E_t\left[M_{t+1}\cdot(V(X_{it+1},\mathbf{K}_{it+1})\right]+E_t\left[M_{t+1}\cdot r^B_{it+1}B_{i,t+1}\right]
\end{aligned},
$$

The model considers the one-period debt. The new amount of debt equals the expected repayment in next period, $B_{i,t+1}=E_t\left[M_{t+1}\cdot r^B_{it+1}B_{i,t+1}\right]$. Equity value of current period is the payout and the expected equity value of next period, $V_{it}=D_{it}+E_t\left[M_{t+1}\cdot V(X_{it+1},\mathbf{K}_{it+1})\right]$. Combining these equations, we conclude, if profit function $\Pi(.)$ and cost function $C(.)$ are Constant Return to Scale w.r.t $\mathbf{K}_{it}$, firm's value maximization implies that

$$
V_{it}+B_{it+1}=D_{it}+q^P_{it}(X_{it})\cdot K^P_{it+1}+q^I_{it}(X_{it})\cdot K^I_{it+1}, \tag{39}
$$

Let $P_{it}\equiv V_{it}-D_{it}$ be the ex-dividend equity value, the equation is further simplified as

$$
P_{it}+B_{it+1}=q^P_{it}(X_{it})\cdot K^P_{it+1}+q^I_{it}(X_{it})\cdot K^I_{it+1}, \tag{40}
$$

Q.E.D.

C A Financing-Frictions Interpretation of the Adjustment-Cost Coefficients

This appendix presents a simple model in which the adjustment-cost coefficients θ^P and θ^I of equation (3) arise from the cost of external finance rather than from technology. The exercise is in the spirit of business-cycle accounting (Chari, Kehoe, and McGrattan, 2007): a reduced-form object—there a wedge, here the estimated adjustment-cost coefficient—can be rationalized by several detailed models, and a prototype model establishes the mapping to one particular friction rather than proving it is the only one. The parallel is close in substance. Chari, Kehoe, and McGrattan (2007) show that an economy with credit-market frictions, as in Bernanke, Gertler, and Gilchrist (1999), is observationally equivalent to a growth model with an investment wedge—the same investment margin a capital adjustment cost distorts. The model below is thus an interpretation of θ^j consistent with our estimates, not a structural proof.

Setup and assumptions. The model rests on five assumptions, stated here in simple terms.

1. *The argument is local and static.* It characterizes the cost of financing the marginal unit of investment, taking the paper's dynamic model as given; it interprets θ^j and does not re-derive the estimator.

2. *External finance is costly, and increasingly so.* Raising outside funds costs more per dollar the more the firm raises: the cost function is convex. This is the key assumption; without it, $\theta^j = 0$.

3. *The firm has internal funds, but they run out at the margin.* Internal funds are the cheapest source and are used first, so the marginal unit of investment is financed externally. The model describes firms, or margins, at which financing constraints bind.

4. *Each capital type is financed on its own.* Physical and intangible investment each face their own financing cost, which is what permits $\theta^P \neq \theta^I$.

5. *External finance comes in two steps: debt first, then equity.* The firm borrows cheaply against collateral up to the pledgeable value $\lambda^j K_{it}^j$ of each capital stock (Almeida and Campello,

2007; Rampini and Viswanathan, 2013), and finances the remainder with external equity at a premium $\bar{\varphi} > 0$, the extra return outside investors demand for agency risk (Hennessy, Levy, and Whited, 2007). Both capital types are pledgeable, with $0 < \lambda^I < \lambda^P$: intangible capital is *less* pledgeable, not unpledgeable (Falato et al., 2022).

Institutions enter only through the two primitives λ^j and $\bar{\varphi}$: the model isolates the financing channel by holding the marginal product of intangible capital fixed.

From financing cost to adjustment cost. Let $\Lambda^j(I^j_{it})$ denote the cost of the external funds raised to finance investment I^j_{it} in capital type $j \in \{P, I\}$, net of the purchase price of capital, so $\Lambda^j(0) = \Lambda^{j\prime}(0) = 0$ and $\Lambda^{j\prime\prime} > 0$: the marginal unit of outside finance is more expensive than the last (Cooper and Ejarque, 2003; Bolton, Chen, and Wang, 2011). A second-order expansion gives

$$\Lambda^j(I^j_{it}) \approx \tfrac{1}{2}\left[\Lambda^{j\prime\prime}(0)K^j_{it}\right]\left(\frac{I^j_{it}}{K^j_{it}}\right)^2 K^j_{it}, \tag{C.1}$$

exactly the quadratic adjustment cost of equation (3) with $\theta^j = \Lambda^{j\prime\prime}(0)K^j_{it}$: the coefficient is the curvature of the financing cost, the "requiem in q" of Cooper and Ejarque (2003). A reduced-form external financing premium schedule that smooths the transition between the two margins (equity and debt), $\varphi^j = \bar{\varphi}/(1 + \lambda^j/\iota^j)$ with $\iota^j \equiv I^j_{it}/K^j_{it}$, has curvature $\Lambda^{j\prime\prime}(0) = \bar{\varphi}/(\lambda^j K^j_{it})$, so

$$\boxed{\theta^j = \frac{\bar{\varphi}}{\lambda^j}} \tag{C.2}$$

(the constant is a normalization). The equity premium $\bar{\varphi}$ enters the numerator, pledgeability λ^j the denominator. Because $\lambda^I < \lambda^P$, the model implies $\theta^I > \theta^P$, with $\theta^I/\theta^P = \lambda^P/\lambda^I$; the benchmark median estimates ($\theta^I \approx 11.0$, $\theta^P \approx 1.8$) imply physical capital is roughly six times as pledgeable as intangible capital. Moreover $\partial\theta^j/\partial\bar{\varphi} = 1/\lambda^j > 0$ for both capital types, and the effect of changes in equity premium is much stronger for the intangible coefficient: physical capital, largely debt-financed against high λ^P, seldom operates on the equity margin.

Mapping the country characteristics. Institutions shift the two primitives, and each loads mainly on one coefficient.

- *Creditor rights* raise the collateral value of tangible assets: $\lambda^P \uparrow \Rightarrow \theta^P \downarrow$. Intangibles have little liquidation value, so the effect on θ^I is small.

- *IP protection* makes intangible capital a verifiable, transferable, pledgeable claim: $\lambda^I \uparrow \Rightarrow \theta^I \downarrow$, with little effect on θ^P. Its distinct effect on the *return* to intangibles—appropriability—belongs to the value side of the model, whereas θ^I captures the investment-cost side.

- *Shareholder rights* (ex ante control) and *director liability* (ex post enforcement) reduce the expropriation risk borne by outside equity investors: $\bar{\varphi} \downarrow$ lowers both coefficients, but θ^I much more strongly, since intangible investment is financed mainly at the equity margin.

Writing λ_c^j and $\bar{\varphi}_c$ as linear in the standardized characteristics and expanding (C.2) to first order yields the linear specifications $\theta_c^j \approx \theta_g^j + \boldsymbol{\gamma}^j \cdot \mathbf{x}_c$ estimated in Section 6, with both coefficients falling in institutional quality and the decline steeper for intangibles. Because a purely technological adjustment cost has no reason to co-vary with legal institutions—let alone differentially by capital type—this pattern is evidence that the estimated θ's reflect, in substantial part, financing frictions.

Two limits of the equivalence are worth stating. It is a first-order result: financing frictions and adjustment costs can differ at higher orders—financing constraints bind occasionally and asymmetrically, while quadratic costs are smooth—and these non-linearities may matter for the distribution of firm values under heterogeneity. And it is a positive result: the two structural origins carry different normative implications, since a technological cost is a real resource cost while a financing friction is a distortion that institutional reform can reduce. Both are left for future research.

D Data Appendix

Data sources and Compustat North America/Global harmonization. We obtain firm-level accounting and security data from Compustat through Wharton Research Data Services (WRDS). For firms headquartered in the United States or Canada, accounting variables are drawn from *Compustat North America—Fundamentals Annual* and security-level variables from *Compustat North America—Security Daily*. For all other firms, we use the corresponding *Compustat Global—Fundamentals Annual* and *Compustat Global—Security Daily* databases.

Compustat standardizes financial-statement items into common fields across heterogeneous accounting standards and reporting practices. This standardization is important in our setting because the analysis combines firms from many countries and accounting regimes. We use the Compustat headquarters location code (`loc`) to assign firms to countries, rather than the country of legal incorporation (`fic`), and de-duplicate firms that appear in both Compustat North America and Compustat Global. For firms headquartered in the United States or Canada, we keep the North American record; for all other firms, we keep the Global record. Missing industry codes are backfilled with the firm's most recent reported SIC or NAICS code before applying industry exclusions.

Several field differences between the North America and Global databases matter for the construction of the variables. In particular, the North America fundamentals file reports both the fiscal-year closing price (`prcc_f`) and common shares outstanding (`csho`), whereas the Global fundamentals file does not report an analogous fiscal-year price field and reports only the shares of the primary security (`cshoi`). These differences motivate the security-level market-value construction described below.

Currency conversion and local-currency units. All firm-level quantities are measured in the local currency of the firm's headquarters country, expressed in that country's most recent local-currency units. The conversion proceeds in two steps. First, each reported nominal amount is converted from its reported local-currency units into U.S. dollars using the Compustat Global Exchange Rates database. Second, the U.S.-dollar value is converted into the country's most recent local-currency units using the most recent exchange rate for that country. The U.S. dollar is used as the pivot currency because Compustat quotes exchange rates against the U.S. dollar.

This procedure places historical firm-level quantities in a consistent set of country-level currency units. It is particularly important for accumulated capital stocks, because the perpetual-inventory method combines observations over long horizons. Without this conversion, changes in currency units or exchange-rate quoting conventions could mechanically affect constructed capital stocks and investment rates. The Compustat Global exchange-rate series begins in 1982, so capital-stock accumulation starts no earlier than 1982 even when earlier accounting observations are available.

Construction of capital stocks. We construct each firm's physical and intangible capital stocks. Physical capital is measured from net property, plant, and equipment. As in the main text, total intangible capital is the sum of two components: an off-the-books stock, built from internally generated intangible investment proxied by SG&A spending, and an on-the-books stock, built from reported intangible assets. Physical and on-the-books intangible capital are recovered from directly observed stocks, so the inflation-adjusted law of motion serves only to back out investment, while the off-the-books stock is accumulated by perpetual inventory. A negative-stock safeguard, described at the end of the section, applies to the physical and on-the-books stocks.

Physical capital. Physical capital is measured as net property, plant, and equipment (`PPENT`). Because `PPENT` is directly observed, the inflation-adjusted law of motion is used only to recover physical investment, not to construct the physical capital stock itself.

The relevant depreciation measure for physical capital is depreciation of tangible fixed assets (`DFXA`), not total depreciation and amortization (`DP`). Total depreciation and amortization combines tangible depreciation and amortization of intangible assets. Using `DP` would therefore overstate the depreciation of physical capital and understate the amortization component used to construct on-the-books intangible investment.

We construct a harmonized `DFXA` series. Reported `DFXA` is used when it is available and reliable, where reliability is assessed using country- and period-specific reporting regimes, with the availability of amortization as a completeness check. For the United States (under ASC 350) and for Canada after its 2011 IFRS adoption (IAS 38), intangible amortization is treated as reliably reported, so a trusted `DFXA` is the reported value or, when it is missing, `DP` minus amortization. All other countries are handled through an empirical threshold year, the first year from which a sustained majority of a country's firms separately report DFXA—at least half of them, in country-years with at least five firms, for three consecutive years—which aligns closely with national IFRS-adoption dates. For these countries an observation is trusted when DFXA is reported (positive and no greater than DP) with amortization also present: automatically at or after the threshold year, and as a voluntary reporter before it (or throughout, for the few small markets that never reach the threshold).

For observations without reliable reported DFXA, we impute the ratio of DFXA to DP. The imputation follows a hierarchy. We first use the firm's own median DFXA/DP ratio when the firm has at least five trusted observations. If that is unavailable, we use the corresponding SIC1-by-country median ratio. If that is also unavailable, we use the SIC1 global median ratio. The harmonized DFXA measure is then the product of the imputed ratio and DP. Amortization is defined residually as $AM_{it} = DP_{it} - DFXA_{it}$.

Off-the-books intangible capital. The off-the-books intangible capital stock is constructed from SG&A expenditure (XSGA). We define off-the-books intangible investment as 30 percent of reported SG&A, following Falato et al. (2014). Negative SG&A values, which can arise when SG&A is reported net of credits or accounting reversals, are treated as missing when constructing the investment proxy.

To address intermittent SG&A reporting, we identify internal runs of missing SG&A that are bracketed by non-missing observations. Short internal gaps of up to three consecutive years are imputed as zero SG&A investment. Longer missing runs are treated as structural breaks in the investment series. The perpetual-inventory stock is initialized when SG&A investment first becomes positive and is reinitialized when positive SG&A investment resumes after a structural break.

We retain only reporting regimes with at least three consecutive usable years, where usable years include both observed SG&A investment and imputed-zero years from short internal gaps. Regimes that do not meet this minimum-length requirement are discarded and do not generate SG&A-based stock values. The initial stock in each usable regime is computed using the perpetual-inventory initialization formula in the main text, with the country-average SG&A growth rate and the country-average GDP-deflator growth rate.

On-the-books intangible capital. The on-the-books intangible capital stock is constructed from reported intangible assets (INTAN). We use the same inflation-adjusted logic as for physical capital, replacing PPENT with INTAN and tangible depreciation with amortization. Because INTAN is directly observed, the law of motion is used only to recover on-the-books intangible investment.

Amortization is measured as the residual between total depreciation and amortization and the harmonized tangible-depreciation measure, $AM_{it} = DP_{it} - DFXA_{it}$. Missing INTAN values are treated as zero. We verify that this treatment does not reflect economically meaningful omissions: in over 97 percent of observations where INTAN is missing, the reconstructed asset total matches reported total assets within one percent, indicating that missing INTAN does not correspond to large unreported intangible assets.

Negative-stock safeguard. The inflation adjustment can occasionally imply a negative capital stock in the local-currency data. These cases arise in countries with sustained deflation and have no economic interpretation: a firm cannot have a negative stock of physical capital or on-the-books intangible capital. We therefore set these observations to missing and exclude the affected firm-years. The same safeguard is applied to physical capital and to the on-the-books intangible capital stock.

In the current construction, this safeguard removes 911 local-currency firm-years. The affected observations are concentrated in Taiwan, Hong Kong, and Japan, which together account for 804 of the 911 firm-years. The country-level breakdown is as follows: Taiwan 405, Hong Kong 234, Japan 165, Australia 33, Singapore 18, Cyprus 9, Philippines 9, Kuwait 8, Malaysia 5, Switzerland 4, Saudi Arabia 4, Norway 3, China 3, Israel 2, Canada 2, and one observation each for Greece, Mauritius, Ireland, the United Arab Emirates, Zimbabwe, Oman, and Côte d'Ivoire.

Market value: security-level aggregation. In the U.S. data used by Belo et al. (2022), equity market value can be measured from the fundamentals file as fiscal-year closing price (`prcc_f`) times common shares outstanding (`csho`). This construction is not feasible in Compustat Global Fundamentals, which contains no fiscal-year closing-price field and reports shares only for the primary security (`cshoi`), not the firm's total across all share classes and issues; it would also leave cross-listed firms and firms with depositary receipts exposed to double-counting that the fundamentals row cannot police. We therefore build equity value from the underlying security-level price, share, and security-history files, following the logic of S&P Global's Marketplace query #828,[1] S&P's reference routine for assembling a firm's market capitalization from its constituent securities.

It is written to run one company at a time and at daily frequency—infeasible for a panel of this size and unnecessary here, since the estimation requires a single market-value observation per firm-fiscal-year. We port its security-selection and aggregation logic to a firm-by-fiscal-year panel. Security prices are first reduced to one observation per security per month, and isolated single-month observations with no adjacent month are discarded. For each firm and fiscal-year-end—identified by the month and year of the fundamentals report, so that a change in fiscal-year-end that produces two reports in one calendar year is kept as two observations—we take the closing price in the fiscal-year-end month for each of the firm's securities, dropping any security on or after its delisting date.

Equity market value is the sum, across the securities that carry the relevant market-value-inclusion flag, of price times shares outstanding, with prices and share counts placed on a consistent split-adjusted basis using the cumulative price-adjustment factor rather than the raw split field. Following the S&P query, the inclusion flag is `MKVALINCL` for North-American issues and the Earnings Participation Flag (`EPF`) for non-North-American ("World") issues; together these retain common and other earnings-participating equity while excluding warrants, non-participating preferred, and similar claims. Shares are measured at the issue level in millions; North-American issues are divided by the ADR ratio, and World prices by their quotation unit. A security is treated as non-traded only if it never appears in the price files—a missing or zero price alone does not make it non-traded—and included non-traded issues are valued at their region's primary-issue price and at fundamentals-reported shares. When issue-level shares must be drawn from the fundamentals file, we use them only if the fundamentals split factor matches the price-file adjustment factor, so that prices and shares stay on the same basis.

Each security is converted to U.S. dollars at the average monthly exchange rate for its trading currency before the securities are summed, so that a firm whose share classes trade in different currencies is valued coherently, and the firm-year market value is taken in U.S. dollars throughout. To avoid double-counting equity that is cross-listed or held through depositary receipts, the securities

[1] `https://www.marketplace.spglobal.com/en/support/query-library/query-(828)`

summed for a given firm-year are always drawn from a single region. We value each firm-year from the highest-priority region for which usable price and share data exist, in the order: U.S. primary (non-ADR) issues, Canadian issues, the non-North-American home market, U.S. depositary receipts, and, as a last resort, any remaining region. Two safeguards protect the share count: if an included depositary receipt lacks the ADR ratio needed to translate it into underlying shares, the affected North-American issue shares are discarded in favor of the firm's company-level share total; and when the primary issue's shares are missing, the company-level total is likewise used rather than an incomplete issue-level sum.

We depart from the S&P query in two respects. First, whereas it fixes a firm's valuation region once, we make that choice separately for each firm-year—so that a firm may be valued from its home market in some years and from a depositary listing in others as data availability changes. Second, we convert each security directly to U.S. dollars rather than to the primary issue's currency. Firm-years with no usable security data are left missing rather than set to zero. Finally, a small number of firm-specific corrections handle companies whose Compustat security structure does not map cleanly to a single market-capitalization concept—for example, dropping a duplicate listing of the same share class for a cross-listed firm, or retaining a depositary receipt that represents genuinely separate share capital.

Sample-construction screens. The estimation sample is obtained from the merged Compustat North America and Compustat Global data by applying firm, country, and firm-year screens in sequence.

Firm and industry screens. We exclude firms that are ever classified as utilities (SIC 4900–4999 or NAICS 22) or as finance and insurance firms (SIC 6000–6999 or NAICS 52), and non-operating vehicles—real-estate investment trusts, funds and trusts, and unclassified firms (SIC 9995, 9997, and 9998). Firms appearing in both Compustat North America and Compustat Global are de-duplicated as described above.

Country screens. We exclude firms headquartered in offshore financial centers and Russia, and drop countries with insufficient firm coverage, as described in the main text.

Firm-level screens. Because the capital stocks are accumulated over each firm's time series, we drop firms that never report a market value, firms that never report strictly positive SG&A, and firms that never report strictly positive property, plant, and equipment, none of which can support a meaningful stock series.

Firm-year screens. Finally, at the firm-year level the estimation requires positive sales; a non-missing market value; non-missing and nonzero physical capital; the physical and intangible capital stocks and their investment rates; the lagged stocks and investment rates used in the portfolio sorts; and the local corporate tax rate, debt, and cash. Only firm-years for which every model input is defined enter the estimation sample.

Country characteristics. Section 6.2 defines the four institutional variables—intellectual property protection, shareholder rights, director liability, and creditor rights—with their sources, scales, and construction at the level of the 47 geographic units. Here we detail the components of each index and the treatment of missing data.

The intellectual-property measure (CEPII Institutional Profiles Database variable B6020) is an expert assessment of the protection and enforcement of trade secrets and industrial patents. The IPD also reports related measures for industrial counterfeiting, copyrights and intangible goods, and a summary index; we use B6020 as the most direct measure of the protection relevant for intangible-capital investment.

The Extent of Shareholder Rights Index sums six binary indicators of investors' ability to influence major corporate decisions: shareholder approval for major asset sales and new share issuances, minority shareholders' ability to call extraordinary meetings, automatic preemption rights, shareholder election of the external auditor, and shareholder approval for changes to share-class rights.

The Extent of Director Liability Index aggregates seven components of shareholders' ability to hold directors and executives personally accountable for self-dealing: direct and derivative suits, the standard of liability for approving directors and other board members, and remedies such as damages, disgorgement of profits, director disqualification, and transaction rescission.

The Strength of Legal Rights Index (Getting Credit) evaluates twelve features of the legal framework governing secured transactions and debt enforcement: the ability to pledge movable assets as collateral, the scope of security interests, the existence of a modern collateral registry, and creditor priority and enforcement rights in insolvency and bankruptcy.

All four characteristics are available for every standalone unit; the only gaps are among countries pooled into the regional “Rest-of” groups. The CEPII intellectual-property measure is unavailable for Botswana, Zambia, Trinidad and Tobago, and Macao, and the three World Bank indices are unavailable for Macao and Romania (in the dollar sample, Palestine additionally lacks all four). A country missing a characteristic is excluded from its group’s firm-year-weighted average for that characteristic.

E Additional Tables

Table E.1: Parameter Estimates and Model Fit (Firm-Level Estimation)

This table reports the firm-level benchmark estimates by country (or territory/region)—the firm-level counterpart of Table 2, with the benchmark model estimated separately by geographic unit. Columns (1) and (2) report the physical and intangible adjustment-cost coefficients, $\hat{\theta}_P$ and $\hat{\theta}_I$; *, **, and *** denote significance at the 10%, 5%, and 1% levels, based on Driscoll–Kraay standard errors (one lag). Column (3) is the cross-sectional R^2, column (4) the time-series R^2, and column (5) the mean absolute percentage valuation error (MAPE). Columns (6)–(10) repeat these statistics for the remaining units.

	Point Estimates		Model Fit				Point Estimates		Model Fit		
Country/Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE	Country/Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE
	(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)
Canada	0.771***	5.177***	0.590	0.433	0.241	Israel	1.417***	7.883***	-0.019	-0.017	0.292
USA	2.273***	7.185***	0.391	0.372	0.221	SaudiArabia	2.144**	40.458***	0.633	0.365	0.299
Brazil	3.099***	4.849***	0.556	0.362	0.291	Turkey	2.357***	11.642***	0.475	0.201	0.358
Chile	0.499	9.321***	0.643	0.197	0.361	RestMENA	1.307***	17.679***	0.607	0.414	0.232
Mexico	1.728**	5.091***	0.599	0.334	0.264	China	8.787***	13.698***	-0.862	-0.413	0.408
Peru	0.373	4.727***	0.448	0.184	0.509	HongKong	0.861***	8.590***	-0.201	-0.062	0.354
RestLatAm	1.814***	8.712***	0.767	0.354	0.413	India	5.165***	34.278***	0.659	0.155	0.435
Belgium	7.853***	7.006***	0.550	0.252	0.411	Indonesia	2.605***	17.038***	0.924	0.642	0.247
Croatia	0.754**	2.372***	0.522	0.195	0.309	Japan	0.707***	6.247***	0.570	0.455	0.270
Denmark	3.094***	10.355***	0.533	0.250	0.440	Malaysia	2.128***	8.653***	0.560	0.369	0.208
Finland	1.211***	6.244***	0.306	0.202	0.305	Pakistan	-0.386	24.424***	0.882	0.642	0.392
France	4.767***	6.711***	0.439	0.298	0.270	Philippines	2.563***	26.396***	0.396	0.212	0.461
Germany	3.891***	9.124***	0.059	0.054	0.313	Singapore	0.493***	8.544***	0.681	0.477	0.210
Greece	0.119	4.749***	0.714	0.388	0.220	SouthKorea	0.879**	7.934***	0.844	0.426	0.192
Ireland	1.230***	4.228***	-0.045	-0.042	0.415	SriLanka	-0.570**	10.268***	0.720	0.456	0.356
Italy	3.472***	4.354***	-0.027	0.132	0.313	Taiwan	2.453***	21.779***	0.899	0.538	0.202
Netherlands	4.588**	4.846***	0.030	0.042	0.403	Thailand	2.277***	13.109***	0.778	0.547	0.192
Norway	1.326***	4.597***	0.148	0.180	0.356	RestAsia	1.308***	9.491***	-0.643	-0.082	0.330
Poland	0.740***	6.626***	0.719	0.361	0.268	Nigeria	0.301	10.402***	0.634	0.205	0.426
Spain	3.313***	5.243***	-0.114	0.093	0.349	SouthAfrica	1.051***	3.515***	0.098	0.219	0.236
Sweden	1.295***	7.936***	0.078	0.173	0.350	RestAfrica	0.540**	5.074***	-0.181	0.050	0.314
Switzerland	3.404***	8.089***	0.049	0.085	0.311	Australia	0.709***	7.683***	0.160	0.223	0.317
UK	1.122***	4.084***	0.315	0.251	0.252	NewZealand	3.338***	6.524***	-0.001	0.059	0.470
RestEurope	0.359**	3.010***	0.688	0.363	0.197						
Summary Statistics Across Countries											
World	1.33	7.88	0.52	0.22	0.31	.	.	.	.	.	

Table E.2: Shares and Adjustment Costs by Country (Firm-Level Estimation)

This table reports, by country (or territory/region), the share of intangible capital μ_I (column 1) and the realized adjustment costs C^I/Y and C^P/Y as a share of sales (columns 2–3), all in percent, computed from the firm-level benchmark estimates (Table E.1) at each unit's own investment rates and capital stocks. Columns (4)–(6) repeat these statistics for the remaining units. This is the firm-level counterpart of Table 3; the capital-based "eval" cost columns are omitted.

		Adjustment Costs				Adjustment Costs	
Country/Region	μ_I	C^I/Y	C^P/Y	Country/Region	μ_I	C^I/Y	C^P/Y
	(1)	(2)	(3)		(4)	(5)	(6)
Canada	46.77	3.63	0.76	Israel	78.68	4.55	0.86
United States of America	80.60	5.88	0.90	Saudi Arabia	56.59	15.65	0.76
Brazil	44.82	3.25	1.34	Turkey	46.60	5.27	3.96
Chile	45.02	4.40	0.20	Rest of MENA	50.86	6.42	0.66
Mexico	42.01	2.72	0.44	China	46.43	8.62	4.82
Peru	27.11	2.23	0.29	Hong Kong	73.23	5.46	0.46
Rest of Latin America	47.67	5.57	0.65	India	59.71	11.38	0.84
Belgium	56.15	3.68	3.33	Indonesia	41.49	6.73	0.76
Croatia	24.23	0.94	0.21	Japan	64.12	3.89	0.15
Denmark	81.98	12.25	1.07	Malaysia	43.06	3.45	0.49
Finland	82.17	3.58	0.40	Pakistan	35.86	5.25	-0.07
France	77.76	6.22	2.00	Philippines	54.94	12.74	1.52
Germany	75.80	6.42	1.29	Singapore	65.04	4.30	0.20
Greece	41.27	2.50	0.02	South Korea	51.58	4.02	0.27
Ireland	79.76	3.29	0.72	Sri Lanka	40.99	6.30	-0.20
Italy	67.67	3.31	1.44	Taiwan	66.18	9.14	0.71
Netherlands	70.53	3.36	2.70	Thailand	51.91	5.98	0.61
Norway	61.73	3.66	1.44	Rest of Asia	42.82	3.45	0.38
Poland	75.29	3.41	0.22	Nigeria	48.73	6.75	0.16
Spain	64.44	3.55	1.03	South Africa	54.64	1.64	0.33
Sweden	93.10	13.24	0.76	Rest of Africa	41.98	2.75	0.27
Switzerland	74.44	6.44	1.02	Australia	69.53	19.18	1.34
United Kingdom	83.56	4.19	0.49	New Zealand	60.42	5.39	1.83
Rest of Europe	39.66	1.76	0.09		.	.	.
Summary Statistics Across Countries							
World	80.60	12.25	2.00	.	.	.	

Table E.3: Industry and Country Estimates of Adjustment Costs (Part A)

This table reports firm-level adjustment-cost coefficients estimated jointly for each Fama–French 5 industry within each geographic unit, with units weighted equally. For each unit, the columns report the physical ($\hat{\theta}_P$) and intangible ($\hat{\theta}_I$) coefficients for the five industries (Consumer, Manufacturing, HiTech, Health, and Other), with standard errors in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels. Part A reports the first set of units; Part B (Table E.4) reports the remaining units and the model fit.

	θ_P					θ_I				
Country	Cnsmr	Manuf	HiTec	Hlth	Other	Cnsmr	Manuf	HiTec	Hlth	Other
Canada	1.665***	0.344*	2.897***	2.049***	0.783***	4.151***	5.577***	5.391***	4.258***	5.060***
	(0.46)	(0.18)	(0.87)	(0.32)	(0.17)	(0.50)	(0.75)	(0.29)	(0.57)	(0.63)
United States of America	2.229***	1.031***	6.116***	5.811***	1.847***	5.505***	5.684***	7.433***	7.650***	6.197***
	(0.70)	(0.12)	(1.07)	(0.73)	(0.25)	(0.41)	(0.45)	(0.58)	(0.42)	(0.43)
Brazil	1.551*	4.112***	13.874***	2.380**	3.334***	4.190***	2.685**	3.469***	3.440**	6.881***
	(0.80)	(1.18)	(2.90)	(0.94)	(0.87)	(0.63)	(1.00)	(0.91)	(1.27)	(1.16)
Chile	1.573*	1.294	13.035**	3.465***	-1.377	3.941***	8.710***	2.439*	3.642***	18.006***
	(0.76)	(0.77)	(4.61)	(1.17)	(1.27)	(1.18)	(1.30)	(1.22)	(1.05)	(4.06)
Mexico	0.893	0.878***	0.000	1.260	2.743**	2.919***	2.043**	0.000	9.745***	9.465***
	(0.54)	(0.28)	(.)	(2.83)	(1.17)	(0.53)	(0.71)	(.)	(1.27)	(2.06)
Peru	-0.915***	-0.368**	-0.364	4.207**	1.974**	7.322***	0.496	11.713*	12.200***	3.175***
	(0.24)	(0.17)	(0.36)	(1.53)	(0.71)	(0.93)	(2.42)	(6.66)	(0.98)	(1.02)
Rest of Latin America	0.961	0.516*	6.059*	0.519	6.553***	12.761***	2.481***	7.738**	6.008***	7.912***
	(0.78)	(0.29)	(3.26)	(0.49)	(1.22)	(1.70)	(0.65)	(3.36)	(1.53)	(1.81)
Belgium	1.858**	1.642*	22.235***	17.354***	0.756	3.022***	1.904*	3.162*	8.836***	6.207***
	(0.70)	(0.94)	(6.72)	(3.28)	(0.77)	(0.47)	(0.93)	(1.55)	(1.02)	(1.07)
Croatia	0.237	1.237*	14.370***	-1.511	0.300	2.012***	0.300	4.931**	1.460	2.755
	(0.42)	(0.63)	(2.01)	(4.43)	(0.40)	(0.65)	(0.44)	(1.93)	(3.30)	(1.74)
Denmark	2.676***	1.590*	6.806***	6.968***	0.915*	2.508**	8.692***	7.930***	18.300***	4.654***
	(0.92)	(0.79)	(1.19)	(2.38)	(0.50)	(0.92)	(2.77)	(1.82)	(3.84)	(1.44)
Finland	1.493**	0.650	2.621**	1.068	-0.167	4.104***	4.870***	7.059***	7.730***	5.549***
	(0.60)	(0.43)	(1.18)	(2.13)	(0.33)	(0.84)	(0.96)	(1.20)	(1.77)	(0.66)
France	2.589***	3.972***	7.446***	6.580***	1.483***	3.108***	7.389***	5.133***	13.927***	4.639***
	(0.74)	(0.73)	(1.67)	(0.95)	(0.34)	(0.59)	(1.04)	(0.85)	(1.00)	(0.68)
Germany	2.835**	2.544***	6.983***	4.287**	2.615***	9.568***	6.036***	6.954***	14.262***	12.924***
	(0.99)	(0.57)	(1.29)	(1.48)	(0.83)	(1.00)	(0.77)	(1.07)	(2.43)	(2.60)
Greece	1.640***	0.186	0.048	-0.982	-0.223	1.967**	3.055***	6.739***	1.982	5.307***
	(0.41)	(0.28)	(1.40)	(1.06)	(0.13)	(0.73)	(0.86)	(1.07)	(1.69)	(1.66)
Ireland	-2.078**	0.817*	5.775*	4.251***	0.493	7.844***	2.070***	4.065***	3.135***	7.048*
	(0.76)	(0.42)	(3.07)	(0.98)	(0.71)	(1.85)	(0.46)	(1.20)	(1.07)	(3.78)
Italy	2.013**	3.847***	4.235***	4.732**	3.596***	5.036***	3.701***	4.111***	7.206***	4.057***
	(0.82)	(0.62)	(1.18)	(1.83)	(0.69)	(0.76)	(0.79)	(0.51)	(1.75)	(0.74)
Netherlands	0.414	7.521***	9.759***	5.794	0.429*	3.246***	4.858	4.047***	11.081***	1.590***
	(1.00)	(2.23)	(2.01)	(5.30)	(0.24)	(0.40)	(2.98)	(1.12)	(2.74)	(0.50)
Norway	0.965***	0.576**	4.051**	10.886***	0.185	1.888**	2.709**	5.340***	6.668***	2.553***
	(0.16)	(0.22)	(1.60)	(1.50)	(0.14)	(0.70)	(0.95)	(0.90)	(1.61)	(0.84)
Poland	0.231*	0.312	2.848***	2.322***	0.741**	2.978***	4.071***	8.380***	6.970***	6.913***
	(0.12)	(0.19)	(0.86)	(0.54)	(0.30)	(0.33)	(0.65)	(1.25)	(1.12)	(1.14)
Spain	1.889**	5.318***	1.795	5.261*	2.824*	4.942***	3.658***	5.935***	7.016***	4.819***
	(0.80)	(1.21)	(2.72)	(2.97)	(1.39)	(1.08)	(0.91)	(1.51)	(1.65)	(1.14)
Sweden	1.272**	0.841***	1.650**	3.496***	0.528**	5.284***	6.888***	7.046***	12.800***	5.338***
	(0.53)	(0.27)	(0.61)	(0.75)	(0.19)	(0.70)	(1.30)	(0.67)	(1.57)	(0.48)
Switzerland	4.063**	2.204**	7.675**	6.251**	-0.484**	5.399***	5.670***	8.451***	10.828***	7.781***
	(1.55)	(0.85)	(2.78)	(2.85)	(0.19)	(1.03)	(0.88)	(1.27)	(1.29)	(1.44)
United Kingdom	0.695*	0.424***	4.314***	4.426***	0.608***	4.074***	3.691***	3.880***	5.861***	3.074***
	(0.33)	(0.13)	(0.67)	(1.00)	(0.14)	(0.69)	(0.41)	(0.37)	(0.78)	(0.52)
Rest of Europe	0.277	0.041	3.868**	2.441**	0.232	3.009***	2.202***	3.354***	4.377***	2.007***
	(0.20)	(0.17)	(1.47)	(0.90)	(0.18)	(0.45)	(0.63)	(0.71)	(1.30)	(0.57)

Table E.4: Industry and Country Estimates of Adjustment Costs (Part B)

Continuation of Table E.3, reporting the remaining geographic units; see that table for the column definitions and standard-error conventions. The final rows report the number of firm-year observations and the model fit—the cross-sectional R^2, the time-series R^2, and the mean absolute percentage valuation error (MAPE).

	θ_P					θ_I				
Country	Cnsmr	Manuf	HiTec	Hlth	Other	Cnsmr	Manuf	HiTec	Hlth	Other
Israel	0.409	1.596***	1.483***	4.303**	1.347	6.371***	6.850***	7.135***	8.448***	11.215***
	(0.35)	(0.53)	(0.41)	(1.75)	(0.80)	(1.26)	(1.43)	(1.41)	(1.15)	(1.88)
Saudi Arabia	3.407**	-0.123	6.547	3.126**	3.736**	34.849***	59.405***	62.522***	34.990***	24.045***
	(1.29)	(0.85)	(4.76)	(1.36)	(1.67)	(3.90)	(6.88)	(3.68)	(11.33)	(5.21)
Turkey	1.987***	1.749***	7.706***	3.172**	3.396***	9.968***	13.725***	11.532***	8.539**	11.908***
	(0.40)	(0.23)	(0.66)	(1.17)	(1.06)	(1.98)	(4.18)	(2.19)	(3.57)	(2.17)
Rest of MENA	1.213**	1.205***	11.886***	1.805	0.654**	19.617***	14.629***	10.815***	12.266***	22.617***
	(0.48)	(0.32)	(2.43)	(1.09)	(0.23)	(1.03)	(1.24)	(1.88)	(2.25)	(1.57)
China	5.806***	7.447***	13.384***	13.275***	6.317***	12.841***	12.263***	16.075***	13.117***	10.949***
	(0.71)	(1.23)	(1.83)	(1.57)	(0.43)	(1.19)	(1.53)	(1.82)	(1.92)	(0.92)
Hong Kong	0.814***	0.501**	0.982***	0.962***	1.008***	7.794***	7.490***	7.000***	6.785***	11.223***
	(0.19)	(0.21)	(0.25)	(0.30)	(0.23)	(1.10)	(1.52)	(1.08)	(1.10)	(3.05)
India	3.832**	3.102**	9.678***	4.759***	7.966***	56.897***	24.414***	19.081***	25.624***	29.118***
	(1.78)	(1.27)	(2.85)	(1.30)	(1.20)	(4.99)	(5.09)	(3.83)	(4.49)	(4.54)
Indonesia	1.395***	2.762***	5.745***	1.379	2.737***	15.324***	20.890***	14.259***	25.794***	18.199***
	(0.24)	(0.57)	(1.12)	(1.29)	(0.48)	(1.80)	(1.92)	(1.68)	(4.81)	(2.36)
Japan	0.455***	1.822***	1.021***	4.532***	0.584***	1.990***	3.084***	10.429***	10.767***	6.915***
	(0.10)	(0.25)	(0.24)	(1.40)	(0.20)	(0.48)	(0.60)	(1.12)	(1.50)	(0.95)
Malaysia	1.131***	1.742***	3.490***	3.605***	2.505***	7.637***	9.395***	7.721***	8.118***	10.488***
	(0.35)	(0.45)	(0.60)	(0.82)	(0.38)	(0.92)	(1.34)	(0.93)	(2.25)	(1.21)
Pakistan	-0.702**	-0.335	2.742	0.418	2.526	22.651***	24.694***	15.223***	19.297***	45.057***
	(0.29)	(0.29)	(1.61)	(1.93)	(1.81)	(2.57)	(2.53)	(4.40)	(4.89)	(8.84)
Philippines	2.805*	0.594	8.089***	-0.758	2.899**	13.564***	19.059***	42.625***	55.412*	21.276***
	(1.34)	(1.10)	(2.00)	(1.00)	(1.15)	(3.49)	(5.53)	(6.97)	(28.86)	(6.23)
Singapore	0.235**	0.295	0.185	2.494***	0.629***	7.042***	5.901***	9.796***	9.306***	10.959***
	(0.09)	(0.17)	(0.51)	(0.63)	(0.15)	(0.44)	(0.69)	(0.79)	(1.18)	(0.87)
South Korea	-0.429***	0.967**	1.180***	2.611***	0.837***	5.873***	7.237***	8.092***	14.360***	6.711***
	(0.10)	(0.35)	(0.35)	(0.63)	(0.27)	(0.56)	(0.56)	(0.67)	(1.79)	(0.66)
Sri Lanka	-0.828***	-0.072	0.316	0.078	-0.391	9.552***	13.459***	16.409***	2.032	6.190***
	(0.23)	(0.46)	(3.25)	(0.86)	(0.29)	(1.56)	(2.18)	(2.46)	(2.85)	(1.96)
Taiwan	1.469***	2.327***	2.469***	5.269***	-0.118	15.618***	17.586***	22.929***	27.332***	26.607***
	(0.39)	(0.19)	(0.34)	(0.59)	(0.31)	(1.68)	(1.64)	(2.59)	(1.51)	(2.12)
Thailand	2.058***	1.671***	3.044***	3.324***	2.983***	12.801***	9.860***	15.311***	15.550***	14.425***
	(0.30)	(0.43)	(0.63)	(1.07)	(0.47)	(1.29)	(1.12)	(2.38)	(2.42)	(1.57)
Rest of Asia	1.358***	1.194***	1.524**	1.634***	1.083***	7.387***	10.303***	6.460***	9.022***	13.327***
	(0.13)	(0.17)	(0.58)	(0.51)	(0.29)	(0.48)	(0.96)	(1.91)	(2.05)	(1.41)
Nigeria	0.151	0.344	2.151	-0.386	0.612	12.116***	16.213***	7.081*	3.779	-2.518*
	(0.21)	(0.44)	(1.49)	(0.30)	(0.66)	(3.20)	(2.84)	(3.47)	(4.18)	(1.35)
South Africa	1.230***	1.443**	1.883***	0.685	0.707**	5.168***	2.085***	2.783***	2.354***	3.383***
	(0.32)	(0.54)	(0.60)	(0.52)	(0.30)	(0.56)	(0.63)	(0.52)	(0.58)	(0.44)
Rest of Africa	0.452	0.510*	2.279***	-2.610	0.422	7.593***	4.170***	-1.746***	4.442*	3.920**
	(0.29)	(0.29)	(0.38)	(4.32)	(0.33)	(1.11)	(1.23)	(0.43)	(2.18)	(1.65)
Australia	0.644***	0.695***	1.573***	1.098**	0.644***	4.534***	6.303***	6.338***	12.411***	8.752***
	(0.21)	(0.13)	(0.47)	(0.46)	(0.10)	(0.77)	(0.39)	(0.77)	(1.87)	(0.74)
New Zealand	2.675	1.610	11.553**	3.389	4.193***	3.636***	3.182***	7.610***	14.549**	3.596
	(1.82)	(1.14)	(4.39)	(2.71)	(0.84)	(1.17)	(0.73)	(1.14)	(6.39)	(2.88)
XSR^2					0.541					
TSR^2					0.294					
MAPE					0.311					

Table E.5: Parameter Estimates of the Country-Characteristics Model (Firm-Level)

This table reports the firm-level country-characteristics model estimates—the firm-level counterpart of Table 7, with each geographic unit weighted equally. Panel A reports the global adjustment-cost coefficients θ_P and θ_I; Panel B the incremental coefficients γ on the standardized country characteristics (intellectual property protection, shareholder rights, director liability, strength of legal rights, human capital, and GDP per capita); and Panel C the fit statistics (N, XS-R^2, TS-R^2, MAPE). Standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels. Columns (1)–(3) are progressively richer specifications: (1) the four institutional characteristics, (2) adds GDP per capita, and (3) further adds human capital.

	(1)		(2)		(3)	
	θ_P	θ_I	θ_P	θ_I	θ_P	θ_I
Panel A. Global Cost Coefficients						
Global Cost	1.945***	8.680***	1.903***	8.780***	1.891***	8.849***
	(0.218)	(0.661)	(0.207)	(0.675)	(0.211)	(0.697)
Panel B. Country Characteristics						
(a) Intellectual Property Protection						
Trade Secrets and Patents	-0.124	-2.117**	-0.319	-1.608	-0.332	-0.941
	(0.322)	(0.810)	(0.632)	(1.015)	(0.747)	(1.016)
(b) Equity Investor Protection						
Shareholder Rights	-0.106	-1.747**	-0.138	-1.703**	-0.141	-1.685**
	(0.147)	(0.827)	(0.168)	(0.766)	(0.166)	(0.729)
Director Liability	-0.152	-0.472	-0.175	-0.471	-0.173	-0.605
	(0.178)	(0.450)	(0.223)	(0.456)	(0.213)	(0.423)
(c) Credit Protection						
Strength of Legal Rights	-0.616***	0.248	-0.619***	0.216	-0.627**	0.502
	(0.192)	(0.656)	(0.215)	(0.658)	(0.242)	(0.643)
(d) Human Capital						
Human Capital Index					0.048	-1.623
					(0.365)	(1.227)
(e) Economic Development						
GDP per Capita			0.221	-0.608	0.217	-0.164
			(0.486)	(0.688)	(0.446)	(0.884)
Panel C. Statistics						
N	433105		433105		433105	
XS-R^2	0.172		0.168		0.236	
TS-R^2	0.110		0.137		0.131	
MAPE	0.355		0.359		0.364	

Table E.6: Industry Heterogeneity in Country Characteristics and Adjustment Costs

This table reports firm-level estimates of how the adjustment-cost coefficients vary with country characteristics within each Fama–French 5 industry, with each geographic unit weighted equally. The columns report the physical ($\hat{\theta}_P$) and intangible ($\hat{\theta}_I$) coefficients for the five industries (Consumer, Manufacturing, HiTech, Health, and Other). Panel A reports the baseline (global) coefficients; Panels B–E the incremental coefficients on intellectual property protection (patents), shareholder rights and director liability, strength of legal rights, and GDP per capita; and Panel F the fit statistics (N, XS-R^2, TS-R^2, MAPE). Standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels.

	θ_P					θ_I				
	Cnsmr	Manuf	HiTec	Hlth	Other	Cnsmr	Manuf	HiTec	Hlth	Other
Panel A. Baseline Adjustment Costs										
Baseline Cost	1.243***	1.413***	4.414***	4.493***	1.519***	7.962***	7.569***	9.128***	10.674***	8.215***
	(0.172)	(0.203)	(0.587)	(0.788)	(0.218)	(0.911)	(0.667)	(0.839)	(0.790)	(0.591)
Panel B. Intellectual Property Protection										
Patents (IP)	-0.188	-0.599	-1.170	0.830	-0.290	-3.856**	-1.356	-0.751	1.798*	-3.630***
	(0.462)	(0.532)	(1.131)	(1.740)	(0.428)	(1.675)	(0.925)	(1.225)	(0.939)	(0.962)
Panel C. Equity Investor Protection										
Shareholder Rights	-0.225	0.033	-0.572	-0.261	-0.049	-0.663	-1.433***	-2.683*	-0.491	-2.087***
	(0.148)	(0.196)	(0.415)	(0.774)	(0.179)	(0.931)	(0.514)	(1.380)	(0.688)	(0.753)
Director Liability	-0.102	-0.251	-0.625	-0.032	0.063	0.963	-0.216	-0.514	-2.470***	0.378
	(0.189)	(0.204)	(0.469)	(0.534)	(0.159)	(0.777)	(0.619)	(0.568)	(0.743)	(0.446)
Panel D. Credit Protection										
Strength of Legal Rights	-0.375	-0.469**	-1.358**	-1.685**	-0.119	-0.646	-0.591	0.150	1.366	0.739
	(0.289)	(0.202)	(0.611)	(0.688)	(0.184)	(1.046)	(0.808)	(0.866)	(0.853)	(0.539)
Panel E. Economic Development										
GDP per Capita	0.124	0.350	0.223	0.841	-0.316	0.636	-0.974	-1.546	-3.007**	0.833
	(0.372)	(0.430)	(0.884)	(1.050)	(0.341)	(0.740)	(0.713)	(1.179)	(1.127)	(0.798)
Panel F. Statistics										
N						433105				
XS-R^2						0.259				
TS-R^2						0.153				
MAPE						0.349				

Table E.7: Descriptive Firm Statistics (USD)

This table reports descriptive statistics for the firm-level sample, 2007—2023, with all quantities converted to U.S. dollars; it is the U.S.-dollar counterpart of Table 1. See that table for the column definitions and the construction of the regional and World rows.

Country/Region	Q	$\frac{I^P}{K^P}$	$\frac{I^I}{K^I}$	$\rho\left(\frac{I^P}{K^P}, \frac{I^I}{K^I}\right)$	$\frac{K^I}{K^I+K^P}$	$\frac{K^{I,\text{on}}}{K^I}$
	(1)	(2)	(3)	(4)	(5)	(6)
Canada	1.02	0.15	0.20	0.36	0.42	0.02
United States	1.31	0.19	0.18	0.38	0.80	0.15
Brazil	1.28	0.14	0.20	0.44	0.52	0.07
Chile	1.09	0.09	0.19	0.30	0.32	0.04
Mexico	1.12	0.09	0.18	0.34	0.43	0.07
Peru	0.86	0.11	0.20	0.23	0.24	0.01
Rest of Latin America	1.16	0.09	0.20	0.29	0.41	0.01
Americas	**1.12**	**0.11**	**0.20**	**0.34**	**0.42**	**0.04**
Belgium	1.14	0.15	0.16	0.40	0.63	0.14
Croatia	0.87	0.05	0.17	0.26	0.24	0.01
Denmark	1.25	0.14	0.20	0.29	0.75	0.14
Finland	1.28	0.18	0.15	0.36	0.79	0.20
France	1.02	0.21	0.17	0.34	0.82	0.21
Germany	1.19	0.17	0.18	0.29	0.73	0.13
Greece	0.87	0.03	0.19	0.37	0.33	0.01
Ireland	1.35	0.19	0.16	0.37	0.78	0.29
Italy	1.27	0.16	0.17	0.34	0.72	0.26
Netherlands	1.19	0.20	0.16	0.41	0.75	0.28
Norway	1.16	0.21	0.18	0.35	0.63	0.13
Poland	1.11	0.12	0.22	0.34	0.62	0.04
Spain	1.22	0.12	0.16	0.44	0.66	0.14
Sweden	1.69	0.28	0.21	0.27	0.91	0.22
Switzerland	1.46	0.15	0.20	0.34	0.67	0.11
United Kingdom	1.04	0.19	0.17	0.31	0.84	0.22
Rest of Europe	0.76	0.07	0.18	0.26	0.37	0.01
Europe	**1.19**	**0.16**	**0.17**	**0.34**	**0.72**	**0.14**
Israel	1.44	0.22	0.21	0.33	0.70	0.05
Saudi Arabia	2.33	0.10	0.24	0.21	0.18	0.00
Turkey	2.11	0.15	0.19	0.33	0.37	0.01
Rest of MENA	1.59	0.11	0.21	0.30	0.28	0.00
MENA	**1.85**	**0.13**	**0.21**	**0.31**	**0.32**	**0.00**
Nigeria	1.06	0.06	0.19	0.34	0.38	0.00
South Africa	1.08	0.14	0.17	0.36	0.59	0.10
Rest of Sub-Saharan Africa	0.98	0.12	0.20	0.56	0.40	0.00
Sub-Saharan Africa	**1.06**	**0.12**	**0.19**	**0.36**	**0.40**	**0.00**
China	3.46	0.16	0.25	0.29	0.38	0.08
Hong Kong	1.23	0.16	0.20	0.21	0.59	0.02
India	1.82	0.05	0.20	0.27	0.33	0.00
Indonesia	1.49	0.10	0.23	0.37	0.26	0.00
Japan	0.73	0.09	0.19	0.35	0.53	0.02
Malaysia	1.16	0.07	0.20	0.24	0.32	0.01
Pakistan	1.12	0.02	0.22	0.24	0.14	0.00
Philippines	1.53	0.13	0.20	0.30	0.30	0.01
Singapore	1.10	0.14	0.22	0.25	0.46	0.01
South Korea	1.17	0.09	0.22	0.31	0.37	0.03
Sri Lanka	0.97	0.06	0.22	0.24	0.26	0.00
Taiwan	1.72	0.10	0.22	0.30	0.34	0.01
Thailand	1.59	0.11	0.23	0.27	0.32	0.01
Rest of Asia	1.75	0.12	0.24	0.28	0.30	0.00
Asia	**1.36**	**0.10**	**0.22**	**0.28**	**0.33**	**0.01**
Australia	1.26	0.21	0.24	0.27	0.61	0.01
New Zealand	1.43	0.16	0.23	0.30	0.59	0.12
Oceania	**1.35**	**0.19**	**0.23**	**0.28**	**0.60**	**0.06**
World	**1.19**	**0.13**	**0.20**	**0.31**	**0.43**	**0.02**

Table E.8: Parameter Estimates and Model Fit (USD)

This table reports the benchmark-model estimates by country (or territory/region) in U.S. dollars—the U.S.-dollar counterpart of Table 2. Columns (1) and (2) report $\hat{\theta}_P$ and $\hat{\theta}_I$, with Driscoll–Kraay standard errors (one lag) in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels. Column (3) is the cross-sectional R^2, column (4) the time-series R^2, and column (5) the mean absolute percentage valuation error (MAPE).

Country/Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE
	(1)	(2)	(3)	(4)	(5)
Canada	1.299**	8.227***	0.948	0.728	0.190
	(0.404)	(0.746)			
USA	2.656***	11.830***	0.931	0.767	0.156
	(0.403)	(0.752)			
Brazil	1.660*	11.047***	0.726	0.284	0.308
	(0.734)	(1.507)			
Chile	1.697	11.592***	0.670	0.156	0.325
	(0.870)	(1.772)			
Mexico	2.189*	8.109***	0.582	0.133	0.241
	(1.080)	(0.987)			
Peru	1.456**	6.867***	0.566	0.297	0.451
	(0.490)	(1.159)			
RestLatAm	1.648	15.857***	0.822	0.368	0.335
	(0.910)	(1.779)			
Americas	**1.66**	**11.05**	**0.73**	**0.30**	**0.31**
Belgium	8.101***	10.054***	0.750	0.308	0.426
	(1.606)	(1.387)			
Croatia	1.708*	3.116***	0.560	0.253	0.314
	(0.779)	(0.785)			
Denmark	4.676	12.638***	0.686	0.310	0.468
	(2.454)	(2.249)			
Finland	1.676*	9.134***	0.779	0.360	0.313
	(0.747)	(1.359)			
France	8.327**	7.997***	0.781	0.474	0.273
	(2.914)	(1.658)			
Germany	7.901***	11.696***	0.743	0.339	0.292
	(1.511)	(2.363)			
Greece	0.665	5.467***	0.813	0.516	0.219
	(0.629)	(0.981)			
Ireland	1.883*	7.948***	0.808	0.219	0.398
	(0.812)	(1.589)			
Italy	3.533***	8.654***	0.928	0.523	0.279
	(0.878)	(0.731)			
Netherlands	9.034***	6.836**	0.849	0.280	0.431
	(1.859)	(2.101)			
Norway	1.902**	10.200***	0.791	0.465	0.386
	(0.655)	(1.384)			
Poland	0.778	8.937***	0.905	0.477	0.271
	(0.777)	(1.748)			
Spain	0.366	11.581***	0.824	0.370	0.334
	(1.430)	(1.106)			
Sweden	3.871***	13.341***	0.906	0.615	0.299
	(0.928)	(1.487)			
Switzerland	6.152***	9.295***	0.839	0.232	0.304
	(1.536)	(1.404)			
UK	2.043***	7.371***	0.923	0.723	0.184
	(0.394)	(0.698)			
RestEurope	0.685	4.373***	0.754	0.466	0.192
	(0.478)	(0.528)			
Europe	**2.04**	**8.94**	**0.81**	**0.37**	**0.30**

Country/Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE
	(1)	(2)	(3)	(4)	(5)
Israel	2.687	10.814***	0.880	0.332	0.271
	(1.666)	(1.535)			
SaudiArabia	2.678*	45.485***	0.565	0.319	0.308
	(1.339)	(3.775)			
Turkey	3.323	18.988***	0.361	-0.157	0.436
	(1.775)	(5.458)			
RestMENA	2.744**	27.026***	0.860	0.525	0.207
	(0.984)	(1.703)			
MENA	**2.72**	**23.01**	**0.71**	**0.33**	**0.29**
Nigeria	2.157***	15.910***	0.436	0.368	0.399
	(0.387)	(3.722)			
SouthAfrica	2.237*	6.401***	0.005	0.188	0.237
	(0.952)	(0.634)			
Rest of Sub-Saharan Africa	-0.025	8.217***	0.299	0.024	0.360
	(0.126)	(1.193)			
Sub-Saharan Africa	**2.16**	**8.22**	**0.30**	**0.19**	**0.36**
China	7.499*	30.985***	0.799	0.237	0.290
	(3.772)	(5.582)			
HongKong	1.588	14.275***	0.872	0.343	0.300
	(0.861)	(2.798)			
India	3.075	46.405***	0.757	0.065	0.426
	(3.703)	(8.484)			
Indonesia	3.452***	20.263***	0.907	0.487	0.226
	(0.633)	(1.765)			
Japan	-1.425	5.505***	0.488	0.389	0.308
	(0.944)	(1.065)			
Malaysia	2.658**	13.265***	0.951	0.527	0.189
	(1.026)	(1.360)			
Pakistan	2.497*	25.979***	0.935	0.724	0.266
	(1.058)	(2.994)			
Philippines	4.925***	39.471***	0.739	0.361	0.471
	(1.488)	(5.707)			
Singapore	1.271*	9.597***	0.916	0.621	0.183
	(0.566)	(0.949)			
SouthKorea	-0.150	10.129***	0.883	0.507	0.182
	(0.929)	(1.287)			
SriLanka	-0.226	12.907***	0.798	0.449	0.310
	(1.034)	(1.132)			
Taiwan	4.475***	20.159***	0.955	0.615	0.190
	(0.761)	(2.051)			
Thailand	2.491**	16.467***	0.966	0.614	0.188
	(0.924)	(1.866)			
RestAsia	3.937***	13.319***	0.471	0.081	0.248
	(0.733)	(1.312)			
Asia	**2.58**	**15.37**	**0.88**	**0.47**	**0.26**
Australia	1.524*	13.196***	0.984	0.735	0.189
	(0.621)	(1.390)			
NewZealand	8.123***	7.994***	0.723	0.132	0.443
	(0.926)	(1.464)			
Oceania	**4.82**	**10.59**	**0.85**	**0.43**	**0.32**
World	2.24	11.05	0.80	0.37	0.30

Table E.9: Share and Adjustment Costs by Country (USD)

This table reports, by country (or territory/region), the share of intangible capital μ_I and the adjustment-cost measures in U.S. dollars—the U.S.-dollar counterpart of Table 3. See that table for the column definitions.

	Share		Realized Adjustment Costs		Adjustment Costs at 15% Rate			Share		Realized Adjustment Costs		Adjustment Costs at 15% Rate	
Country/Region	μ_I	$\bar{\mu}_I$	C^I/Y	C^P/Y	C^I/K^I	C^P/K^P	Country/Region	μ_I	$\bar{\mu}_I$	C^I/Y	C^P/Y	C^I/K^I	C^P/K^P
	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Canada	51.91	34.92	5.74	1.35	9.26	1.46	Saudi Arabia	59.36	14.87	18.43	1.24	51.17	3.01
United States	84.63	72.43	9.68	1.06	13.31	2.99	Turkey	61.57	31.56	6.83	3.96	21.36	3.74
Brazil	63.80	41.87	7.63	1.63	12.43	1.87	Rest of MENA	59.38	23.95	9.72	1.75	30.40	3.09
Chile	48.99	27.13	5.41	0.86	13.04	1.91	**MENA**	**60.47**	**27.75**	**8.60**	**1.81**	**25.88**	**3.05**
Mexico	51.69	34.68	4.64	0.97	9.12	2.46	Nigeria	60.56	30.18	9.26	2.52	17.90	2.43
Peru	30.43	18.13	3.07	1.56	7.73	1.64	South Africa	61.50	50.36	2.91	0.90	7.20	2.52
Rest of Latin America	63.43	33.07	8.31	0.58	17.84	1.85	Rest of Sub-Saharan Africa	56.73	33.02	4.01	-0.02	9.24	-0.03
Americas	**51.91**	**34.68**	**5.74**	**1.06**	**12.43**	**1.87**	**Sub-Saharan Africa**	**60.56**	**33.02**	**4.01**	**0.90**	**9.24**	**2.43**
Belgium	62.54	54.06	5.13	3.54	11.31	9.11	China	64.74	31.15	20.78	5.00	34.86	8.44
Croatia	26.96	20.29	0.95	0.85	3.51	1.92	Hong Kong	77.98	54.58	9.03	0.80	16.06	1.79
Denmark	82.40	69.52	14.86	1.69	14.22	5.26	India	73.29	25.28	15.32	0.78	52.21	3.46
Finland	83.96	75.03	5.13	0.55	10.28	1.89	Indonesia	51.23	20.99	8.10	1.33	22.80	3.88
France	75.19	75.77	6.97	3.33	9.00	9.37	Japan	63.42	42.91	3.01	-0.28	6.19	-1.60
Germany	74.77	65.70	7.83	2.65	13.16	8.89	Malaysia	51.30	26.61	5.13	0.83	14.92	2.99
Greece	40.95	26.92	2.83	0.20	6.15	0.75	Pakistan	40.30	10.20	4.88	0.75	29.23	2.81
Ireland	82.79	75.16	5.66	0.93	8.94	2.12	Philippines	62.63	23.45	19.66	3.97	44.41	5.54
Italy	74.19	64.83	6.48	1.42	9.74	3.97	Singapore	64.02	41.78	5.06	0.55	10.80	1.43
Netherlands	68.73	69.18	4.64	4.90	7.69	10.16	South Korea	57.77	30.21	4.79	-0.05	11.40	-0.17
Norway	70.00	56.49	7.84	1.84	11.47	2.14	Sri Lanka	48.63	19.68	7.21	-0.10	14.52	-0.25
Poland	77.14	57.53	6.65	0.31	10.05	0.88	Taiwan	60.49	29.14	8.09	1.24	22.68	5.03
Spain	78.89	58.35	7.58	0.13	13.03	0.41	Thailand	56.20	26.65	7.87	0.89	18.53	2.80
Sweden	92.94	89.24	19.91	2.04	15.01	4.36	Rest of Asia	46.12	24.73	4.15	1.34	14.98	4.43
Switzerland	71.79	62.00	7.86	2.08	10.46	6.92	**Asia**	**59.13**	**26.63**	**7.54**	**0.81**	**17.29**	**2.90**
United Kingdom	85.59	79.99	6.90	0.89	8.29	2.30	Australia	76.47	52.96	35.83	3.51	14.85	1.71
Rest of Europe	44.96	32.89	2.31	0.32	4.92	0.77	New Zealand	56.46	51.28	7.68	5.88	8.99	9.14
Europe	**74.77**	**64.83**	**6.65**	**1.42**	**10.05**	**2.30**	**Oceania**	**66.47**	**52.12**	**21.75**	**4.70**	**11.92**	**5.43**
Israel	78.72	64.02	7.49	1.86	12.17	3.02		.	.	.	.	.	.
World	**62.63**	**34.92**	**6.97**	**1.24**	**12.43**	**2.52**							

Table E.10: Industry Adjustment Costs by FF5 Industry (Firm USD)

This table reports country-weighted firm-level estimates in U.S. dollars in which the adjustment-cost coefficients vary by Fama–French 5 industry—the U.S.-dollar counterpart of Table 5. Columns (1) and (2) report $\hat{\theta}_P$ and $\hat{\theta}_I$, with standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels. The lower rows report the number of firm-year observations and the model fit (cross-sectional R^2, time-series R^2, and MAPE).

Industry	$\hat{\theta}_P$	$\hat{\theta}_I$
FF5 = Consumer	0.988***	7.626***
	(0.321)	(1.003)
FF5 = Manufacturing	1.323***	6.514***
	(0.251)	(0.778)
FF5 = HiTech	4.122***	7.639***
	(0.821)	(0.619)
FF5 = Health	4.756***	9.662***
	(0.763)	(1.228)
FF5 = Other	1.118***	7.382***
	(0.221)	(0.728)
N		434818
XS-R^2		0.080
TS-R^2		0.112
MAPE		0.333

Table E.11: Variance Decomposition of Physical and Intangible Adjustment Costs (Firm USD)

This table decomposes the variance of the estimated adjustment-cost coefficients θ_P and θ_I into country, Fama–French 5 industry, and country×industry-cell components, in U.S. dollars—the U.S.-dollar counterpart of Table 6. Coefficients are first estimated at the country×industry-cell level and then decomposed by a two-way analysis of variance, in which the country and industry components are the variances of the country and industry marginal means of the cell-level coefficients, and the cell component is the variance of the residual. For each coefficient, σ^2 is the estimated variance component and "Share" its percentage of the total.

	θ_P		θ_I	
Component	σ^2	Share (%)	σ^2	Share (%)
Country	3.94	33.38	75.36	72.75
FF5 Industry	2.94	24.89	1.18	1.14
Country × FF5 Industry Cell	4.93	41.73	27.05	26.11
Total	11.81	100.00	103.59	100.00

Table E.12: Country Characteristics USD

This table reports the portfolio-level country-characteristics model estimates in U.S. dollars—the U.S.-dollar counterpart of Table 7. Standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels.

	(1)		(2)		(3)	
	θ_P	θ_I	θ_P	θ_I	θ_P	θ_I
Panel A. Global Cost Coefficients						
Global Cost	2.765***	13.863***	2.706***	13.813***	2.510***	14.153***
	(0.473)	(1.074)	(0.504)	(1.059)	(0.434)	(1.078)
Panel B. Country Characteristics						
(a) Intellectual Property Protection						
Trade Secrets and Patents	1.123**	-4.359***	0.224	-4.317**	0.437	-3.242*
	(0.486)	(1.438)	(0.912)	(1.759)	(1.068)	(1.697)
(b) Equity Investor Protection						
Shareholder Rights	-0.721**	-2.236**	-0.915**	-2.199**	-0.911***	-2.221**
	(0.343)	(1.051)	(0.360)	(1.043)	(0.325)	(0.997)
Director Liability	0.326	-1.233	0.273	-1.223	0.193	-1.403*
	(0.411)	(0.873)	(0.455)	(0.843)	(0.441)	(0.756)
(c) Credit Protection						
Strength of Legal Rights	-1.559***	0.693	-1.610***	0.706	-1.503**	1.160
	(0.507)	(0.923)	(0.539)	(0.921)	(0.564)	(0.868)
(d) Human Capital						
Human Capital Index					-0.438	-2.686*
					(0.642)	(1.519)
(e) Economic Development						
GDP per Capita			1.008	0.039	1.274	0.660
			(0.945)	(0.907)	(0.929)	(1.261)
Panel C. Statistics						
N	7191		7191		7191	
XS-R^2	0.578		0.571		0.487	
TS-R^2	0.198		0.210		0.251	
MAPE	0.365		0.365		0.372	

Table E.13: Parameter Estimates and Model Fit (Firm USD)

This table reports the firm-level benchmark estimates by country (or territory/region) in U.S. dollars—the U.S.-dollar counterpart of Table E.1.

	Point Estimates		Model Fit				Point Estimates		Model Fit		
Country/Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE	Country/Region	$\hat{\theta}_P$	$\hat{\theta}_I$	XS-R^2	TS-R^2	MAPE
	(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)
Canada	0.894***	5.141***	0.595	0.484	0.223	Israel	1.510***	8.353***	0.310	0.159	0.299
USA	2.273***	7.185***	0.391	0.372	0.221	SaudiArabia	2.186***	41.658***	0.497	0.300	0.312
Brazil	2.582***	4.951***	-0.591	-0.071	0.348	Turkey	2.449***	14.616***	-0.868	-0.230	0.438
Chile	1.243**	10.056***	0.518	0.133	0.311	RestMENA	1.212***	20.492***	0.404	0.289	0.258
Mexico	1.781**	5.761***	-0.140	0.003	0.252	China	8.234***	13.539***	-1.311	-0.660	0.426
Peru	0.589*	5.516***	0.515	0.246	0.432	HongKong	0.860***	8.584***	-0.225	-0.061	0.353
RestLatAm	1.738**	12.986***	0.712	0.327	0.330	India	4.759***	35.598***	0.404	-0.009	0.428
Belgium	7.799***	6.906***	0.528	0.245	0.407	Indonesia	2.176***	18.513***	0.726	0.412	0.242
Croatia	0.986**	2.620***	0.514	0.227	0.301	Japan	0.584	5.493***	0.439	0.354	0.337
Denmark	3.113***	10.279***	0.504	0.257	0.434	Malaysia	1.898***	8.707***	0.364	0.209	0.223
Finland	1.213***	6.219***	0.294	0.198	0.303	Pakistan	0.499**	27.635***	0.947	0.711	0.257
France	4.899***	6.591***	0.449	0.312	0.271	Philippines	2.484***	27.105***	0.307	0.199	0.430
Germany	4.123***	8.937***	0.035	0.086	0.302	Singapore	0.531***	8.260***	0.709	0.503	0.210
Greece	0.365	4.052***	0.741	0.449	0.212	SouthKorea	0.907***	8.003***	0.843	0.459	0.187
Ireland	1.420***	4.554***	0.082	0.054	0.384	SriLanka	-0.197	12.206***	0.803	0.446	0.304
Italy	3.504***	4.394***	0.008	0.163	0.318	Taiwan	2.517***	21.492***	0.927	0.600	0.193
Netherlands	5.031***	4.309***	0.061	0.097	0.410	Thailand	1.990***	12.946***	0.715	0.479	0.200
Norway	1.140***	4.843***	0.032	0.138	0.354	RestAsia	1.151***	12.602***	-1.089	-0.208	0.313
Poland	1.034***	6.232***	0.519	0.329	0.282	Nigeria	0.529*	13.661***	0.359	0.283	0.388
Spain	3.657***	5.099***	-0.075	0.072	0.357	SouthAfrica	1.102***	4.157***	-2.408	-0.122	0.266
Sweden	1.315***	8.173***	0.109	0.193	0.351	RestAfrica	-0.007	4.205***	-1.039	-0.194	0.402
Switzerland	3.250***	7.515***	0.257	0.073	0.308	Australia	0.714***	7.354***	-0.021	0.176	0.329
UK	1.165***	4.179***	0.298	0.294	0.234	NewZealand	3.582***	6.182***	-0.281	-0.064	0.472
RestEurope	0.352**	4.142***	0.763	0.451	0.186						
Summary Statistics Across Countries											
World	1.42	7.51	0.36	0.21	0.31	.	.	.	.	.	

Table E.14: Share and Adjustment Costs by Country (Firm USD)

This table reports, by country (or territory/region), the share of intangible capital μ_I (column 1) and the realized adjustment costs C^I/Y and C^P/Y as a share of sales (columns 2–3), all in percent, computed from the firm-level benchmark estimates (Table E.13) at each unit's own investment rates and capital. This is the U.S.-dollar counterpart of Table E.2.

		Adjustment Costs				Adjustment Costs	
Country/Region	μ_I	C^I/Y	C^P/Y	Country/Region	μ_I	C^I/Y	C^P/Y
	(1)	(2)	(3)		(4)	(5)	(6)
Canada	46.28	3.59	0.93	Israel	78.61	5.78	1.05
United States of America	80.60	5.88	0.90	Saudi Arabia	58.28	16.88	1.01
Brazil	52.39	3.42	2.53	Turkey	57.21	5.26	2.92
Chile	47.79	4.69	0.63	Rest of MENA	57.06	7.37	0.77
Mexico	48.11	3.30	0.79	China	47.82	9.08	5.49
Peru	29.43	2.46	0.63	Hong Kong	73.16	5.43	0.43
Rest of Latin America	59.68	6.81	0.62	India	67.20	11.75	1.21
Belgium	57.48	3.52	3.41	Indonesia	51.28	7.40	0.84
Croatia	26.39	0.79	0.49	Japan	59.62	3.01	0.12
Denmark	81.81	12.09	1.12	Malaysia	44.90	3.37	0.59
Finland	81.66	3.49	0.40	Pakistan	43.02	5.19	0.15
France	77.77	5.75	1.96	Philippines	58.82	13.50	2.00
Germany	75.72	5.98	1.38	Singapore	63.92	4.35	0.23
Greece	38.27	2.10	0.11	South Korea	51.65	3.79	0.30
Ireland	79.51	3.24	0.70	Sri Lanka	47.55	6.82	-0.09
Italy	68.12	3.29	1.41	Taiwan	64.44	8.63	0.70
Netherlands	69.65	2.92	2.73	Thailand	52.78	6.19	0.71
Norway	63.58	3.72	1.10	Rest of Asia	51.22	3.93	0.39
Poland	71.94	4.63	0.41	Nigeria	59.44	7.95	0.62
Spain	64.49	3.34	1.29	South Africa	58.97	1.89	0.44
Sweden	92.92	12.20	0.69	Rest of Africa	47.71	2.05	-0.00
Switzerland	73.12	6.36	1.10	Australia	70.08	19.97	1.64
United Kingdom	83.48	3.91	0.51	New Zealand	60.10	5.94	2.59
Rest of Europe	45.03	2.19	0.16		.	.	.
Summary Statistics Across Countries							
World	80.60	12.09	2.59	.	.	.	

Table E.15: Industry and Country Estimates of Adjustment Costs USD (Part A)

This table reports firm-level adjustment-cost coefficients estimated jointly for each Fama–French 5 industry within each geographic unit, with units weighted equally; it is the U.S.-dollar counterpart of Table E.3. Standard errors in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels.

	θ_P					θ_I				
Country	Cnsmr	Manuf	HiTec	Hlth	Other	Cnsmr	Manuf	HiTec	Hlth	Other
Canada	1.702***	0.453**	3.301***	2.087***	0.937***	4.153***	5.523***	5.341***	4.218***	4.989***
	(0.44)	(0.19)	(0.77)	(0.31)	(0.18)	(0.47)	(0.73)	(0.27)	(0.53)	(0.60)
United States of America	2.229***	1.031***	6.116***	5.811***	1.847***	5.505***	5.684***	7.433***	7.650***	6.197***
	(0.70)	(0.12)	(1.07)	(0.73)	(0.25)	(0.41)	(0.45)	(0.58)	(0.42)	(0.43)
Brazil	1.252**	2.792***	11.648***	2.365***	3.357***	4.751***	3.598***	3.482***	2.894**	6.579***
	(0.54)	(0.90)	(2.72)	(0.81)	(0.70)	(0.73)	(0.90)	(0.82)	(1.02)	(1.28)
Chile	1.633**	2.858***	13.287***	2.964***	-0.494	5.385***	10.134***	2.439***	4.466***	18.625***
	(0.73)	(0.89)	(3.49)	(0.92)	(1.16)	(1.24)	(1.37)	(0.81)	(1.29)	(4.00)
Mexico	0.469	1.384***	0.000	2.222	2.776**	4.126***	3.412***	0.000	9.710***	9.010***
	(0.60)	(0.33)	(.)	(2.64)	(1.28)	(0.60)	(0.98)	(.)	(1.49)	(1.73)
Peru	-0.668***	-0.223	-0.360	3.503**	2.298***	8.545***	1.351	13.567*	12.492***	3.713***
	(0.21)	(0.22)	(0.32)	(1.46)	(0.67)	(1.03)	(2.38)	(7.32)	(0.89)	(1.20)
Rest of Latin America	0.909	0.236	9.957***	0.657	6.309***	17.918***	6.566***	7.074**	11.932***	11.230***
	(0.79)	(0.16)	(3.28)	(0.46)	(1.28)	(1.62)	(0.90)	(2.88)	(2.53)	(1.87)
Belgium	1.571***	1.747*	21.964***	18.135***	0.715	3.042***	1.851*	2.857*	8.571***	6.088***
	(0.51)	(0.94)	(6.28)	(2.97)	(0.80)	(0.48)	(0.94)	(1.59)	(1.03)	(1.14)
Croatia	0.799	1.357**	14.045***	0.447	0.464	1.678**	0.374	5.796**	0.102	3.391*
	(0.66)	(0.51)	(1.94)	(2.84)	(0.48)	(0.71)	(0.59)	(2.13)	(3.52)	(1.93)
Denmark	2.485**	1.583*	7.141***	6.828***	1.069	2.345**	8.600***	8.023***	17.971***	4.859***
	(0.86)	(0.79)	(1.38)	(2.31)	(0.62)	(0.82)	(2.77)	(1.97)	(3.95)	(1.52)
Finland	1.514**	0.605	2.648**	1.253	-0.136	3.895***	4.718***	7.067***	7.718***	5.706***
	(0.57)	(0.44)	(1.22)	(2.02)	(0.35)	(0.77)	(0.92)	(1.18)	(1.86)	(0.69)
France	2.729***	4.135***	7.783***	6.820***	1.467***	2.944***	7.310***	5.035***	13.885***	4.549***
	(0.78)	(0.80)	(1.67)	(0.92)	(0.33)	(0.56)	(1.06)	(0.84)	(0.98)	(0.66)
Germany	3.005***	2.800***	7.116***	5.326***	2.706***	9.528***	5.927***	6.854***	13.560***	12.563***
	(1.02)	(0.58)	(1.29)	(1.57)	(0.86)	(0.99)	(0.75)	(1.07)	(2.47)	(2.54)
Greece	1.899***	0.665	-0.022	0.026	-0.101	1.567**	2.527**	5.996***	1.605	4.386***
	(0.43)	(0.50)	(1.28)	(0.82)	(0.17)	(0.62)	(0.89)	(1.00)	(1.68)	(1.48)
Ireland	-2.644**	1.039*	5.629*	4.673***	0.578	8.472***	2.104***	4.338***	3.514***	7.489*
	(0.97)	(0.55)	(2.88)	(1.06)	(0.75)	(1.90)	(0.50)	(1.31)	(1.16)	(3.81)
Italy	2.026**	3.787***	4.300***	5.314**	3.667***	5.157***	3.717***	4.148***	7.128***	4.083***
	(0.78)	(0.63)	(1.21)	(2.00)	(0.70)	(0.72)	(0.80)	(0.50)	(1.75)	(0.75)
Netherlands	0.541	8.161***	10.368***	7.040	0.929	2.930***	4.160	3.613***	10.145***	1.343**
	(1.12)	(2.45)	(2.04)	(6.03)	(0.64)	(0.41)	(2.72)	(1.12)	(2.53)	(0.47)
Norway	0.918***	0.557**	3.518**	9.964***	0.183**	2.018***	3.034***	5.562***	7.119***	2.608***
	(0.18)	(0.23)	(1.50)	(1.52)	(0.09)	(0.69)	(0.99)	(1.01)	(1.75)	(0.83)
Poland	0.340**	0.593*	3.038***	2.776***	1.116**	3.389***	3.530***	7.738***	6.875***	6.190***
	(0.14)	(0.30)	(0.85)	(0.66)	(0.43)	(0.35)	(0.61)	(1.32)	(1.51)	(0.97)
Spain	1.952**	6.109***	2.621	5.569	2.954*	4.817***	3.487***	5.675***	6.294***	4.975***
	(0.78)	(1.42)	(3.20)	(3.25)	(1.55)	(0.96)	(0.95)	(1.50)	(1.54)	(1.32)
Sweden	1.486**	0.853***	1.628**	3.581***	0.540***	5.529***	7.170***	7.259***	13.325***	5.240***
	(0.63)	(0.28)	(0.60)	(0.80)	(0.17)	(0.69)	(1.34)	(0.63)	(1.57)	(0.50)
Switzerland	3.902***	2.104**	7.436**	6.415**	-0.605**	4.999***	5.233***	7.832***	9.991***	7.058***
	(1.32)	(0.83)	(2.89)	(2.89)	(0.22)	(1.03)	(0.80)	(1.24)	(1.22)	(1.38)
United Kingdom	0.758*	0.476***	4.372***	4.448***	0.630***	4.111***	3.806***	3.993***	5.897***	3.155***
	(0.36)	(0.13)	(0.62)	(1.01)	(0.15)	(0.71)	(0.35)	(0.37)	(0.75)	(0.50)
Rest of Europe	0.157	0.179	3.613**	2.241**	0.225	4.555***	2.584***	4.439***	6.734***	3.095***
	(0.17)	(0.19)	(1.53)	(0.88)	(0.17)	(0.63)	(0.62)	(0.86)	(1.41)	(0.82)

Table E.16: Industry and Country Estimates of Adjustment Costs USD (Part B)

This table reports firm-level adjustment-cost coefficients estimated jointly for each Fama–French 5 industry within each geographic unit, with units weighted equally; it is the U.S.-dollar counterpart of Table E.4 and continues Table E.15. Standard errors in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels.

	θ_P					θ_I				
Country	Cnsmr	Manuf	HiTec	Hlth	Other	Cnsmr	Manuf	HiTec	Hlth	Other
Israel	0.555	1.572***	1.666***	4.455**	1.471	6.739***	7.035***	7.458***	9.335***	11.949***
	(0.43)	(0.49)	(0.45)	(1.83)	(0.87)	(1.24)	(1.36)	(1.45)	(1.03)	(2.02)
Saudi Arabia	3.173**	0.375	5.544	3.088*	3.705**	36.850***	59.475***	61.882***	34.164***	24.857***
	(1.15)	(0.90)	(3.87)	(1.71)	(1.59)	(3.80)	(7.48)	(3.68)	(10.45)	(6.06)
Turkey	2.054***	1.745***	8.995***	3.504***	3.468**	11.958***	17.045***	14.007***	13.761**	15.852***
	(0.68)	(0.59)	(0.82)	(0.79)	(1.42)	(2.61)	(4.60)	(3.90)	(5.13)	(2.69)
Rest of MENA	1.237**	1.182***	11.413***	1.383	0.464	22.328***	16.546***	12.410***	13.440***	27.342***
	(0.44)	(0.34)	(2.36)	(0.82)	(0.28)	(1.23)	(1.40)	(2.25)	(2.02)	(2.29)
China	5.445***	6.917***	12.647***	12.828***	6.125***	12.891***	12.168***	15.815***	13.149***	10.673***
	(0.70)	(1.25)	(1.95)	(1.60)	(0.41)	(1.18)	(1.49)	(1.76)	(1.86)	(0.94)
Hong Kong	0.807***	0.396**	1.073***	0.854**	1.055***	7.889***	7.561***	7.147***	6.971***	10.945***
	(0.22)	(0.17)	(0.30)	(0.37)	(0.23)	(1.11)	(1.39)	(1.07)	(1.08)	(2.99)
India	3.456**	2.810**	8.664***	4.588***	7.581***	58.626***	26.555***	19.724***	26.746***	30.882***
	(1.57)	(1.05)	(2.50)	(1.25)	(1.05)	(5.37)	(5.04)	(3.76)	(4.48)	(4.34)
Indonesia	0.973***	2.288***	5.602***	1.193	2.462***	17.581***	23.104***	14.677***	24.225***	17.944***
	(0.23)	(0.52)	(1.12)	(1.12)	(0.42)	(1.75)	(1.94)	(1.79)	(4.79)	(2.50)
Japan	0.492	1.727***	0.700*	3.689**	0.229	1.013*	1.945***	9.944***	10.704***	6.210***
	(0.36)	(0.43)	(0.39)	(1.47)	(0.28)	(0.49)	(0.61)	(1.33)	(1.50)	(1.12)
Malaysia	0.964***	1.547***	3.179***	3.419***	2.286***	7.753***	9.594***	7.629***	7.964***	10.551***
	(0.32)	(0.41)	(0.53)	(0.82)	(0.37)	(0.87)	(1.35)	(0.99)	(2.29)	(1.09)
Pakistan	0.107	0.616***	3.162	1.591	3.656*	25.867***	27.360***	17.469***	24.330***	49.600***
	(0.27)	(0.16)	(1.94)	(2.39)	(1.75)	(2.75)	(2.43)	(4.67)	(5.18)	(8.74)
Philippines	2.424*	0.687	7.123***	-0.275	2.892**	13.016***	20.142***	45.127***	62.757	22.153***
	(1.21)	(1.08)	(1.70)	(1.68)	(1.11)	(3.24)	(5.62)	(6.84)	(38.47)	(6.47)
Singapore	0.249**	0.324*	0.184	2.658***	0.692***	6.806***	5.833***	9.500***	8.883***	10.626***
	(0.09)	(0.16)	(0.54)	(0.63)	(0.16)	(0.47)	(0.69)	(0.85)	(1.24)	(0.84)
South Korea	-0.428***	0.988***	1.234***	2.650***	0.876***	5.892***	7.278***	8.175***	14.794***	6.731***
	(0.10)	(0.30)	(0.38)	(0.65)	(0.23)	(0.58)	(0.59)	(0.68)	(1.72)	(0.68)
Sri Lanka	-0.472	0.359	1.299	0.394	-0.089	11.304***	16.234***	20.511***	3.858*	6.981***
	(0.34)	(0.51)	(2.70)	(0.71)	(0.33)	(1.67)	(2.20)	(2.10)	(2.20)	(1.86)
Taiwan	1.391***	2.389***	2.620***	5.290***	-0.364	15.026***	16.569***	22.631***	27.181***	27.475***
	(0.39)	(0.19)	(0.37)	(0.66)	(0.36)	(1.75)	(1.69)	(2.56)	(1.65)	(1.85)
Thailand	1.778***	1.501***	2.413***	2.949***	2.638***	12.546***	10.308***	14.707***	15.620***	14.238***
	(0.32)	(0.36)	(0.52)	(1.00)	(0.46)	(1.24)	(1.21)	(2.26)	(2.62)	(1.54)
Rest of Asia	1.154***	1.120***	1.430**	0.989	0.866***	9.547***	13.809***	8.133***	13.274***	18.013***
	(0.19)	(0.14)	(0.59)	(0.60)	(0.25)	(0.62)	(1.08)	(1.77)	(2.41)	(1.38)
Nigeria	0.172	0.691	1.948	-0.130	1.141	16.049***	20.946***	5.007	7.284	-0.955
	(0.22)	(0.58)	(1.35)	(0.41)	(0.87)	(3.52)	(3.51)	(3.34)	(5.24)	(1.61)
South Africa	1.141***	1.745**	1.707***	0.627	0.780**	6.186***	2.600***	3.230***	2.741***	3.941***
	(0.31)	(0.67)	(0.46)	(0.50)	(0.28)	(0.57)	(0.65)	(0.56)	(0.61)	(0.49)
Rest of Africa	-0.083	-0.004	-0.223	-7.700	-0.036	6.850***	2.819**	3.673**	5.144**	2.172
	(0.18)	(0.18)	(0.22)	(8.80)	(0.08)	(1.69)	(1.32)	(1.61)	(2.02)	(1.34)
Australia	0.613**	0.702***	1.557***	1.011**	0.655***	4.379***	6.179***	5.915***	12.026***	8.404***
	(0.22)	(0.14)	(0.46)	(0.44)	(0.11)	(0.76)	(0.35)	(0.70)	(1.84)	(0.61)
New Zealand	2.810	1.788	12.142**	4.117	4.333***	3.324***	2.960***	7.588***	13.733*	3.046
	(1.72)	(1.18)	(4.65)	(2.92)	(0.94)	(1.02)	(0.65)	(1.08)	(6.64)	(2.41)
XSR^2						0.425				
TSR^2						0.241				
MAPE						0.307				

Table E.17: Country Characteristics (Firm USD)

This table reports the firm-level country-characteristics model estimates in U.S. dollars—the U.S.-dollar counterpart of Table E.5. Standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels.

	(1)		(2)		(3)	
	θ_P	θ_I	θ_P	θ_I	θ_P	θ_I
Panel A. Global Cost Coefficients						
Global Cost	1.738***	9.020***	1.698***	9.109***	1.694***	9.248***
	(0.242)	(0.703)	(0.234)	(0.729)	(0.231)	(0.769)
Panel B. Country Characteristics						
(a) Intellectual Property Protection						
Trade Secrets and Patents	0.273	-2.445***	0.036	-1.932*	-0.043	-1.014
	(0.370)	(0.877)	(0.649)	(1.112)	(0.768)	(1.086)
(b) Equity Investor Protection						
Shareholder Rights	-0.115	-1.826**	-0.158	-1.778**	-0.158	-1.771**
	(0.159)	(0.892)	(0.178)	(0.828)	(0.176)	(0.776)
Director Liability	-0.057	-0.199	-0.082	-0.189	-0.073	-0.378
	(0.187)	(0.466)	(0.234)	(0.481)	(0.222)	(0.425)
(c) Credit Protection						
Strength of Legal Rights	-0.713***	0.038	-0.719***	-0.000	-0.744**	0.410
	(0.217)	(0.668)	(0.247)	(0.681)	(0.286)	(0.656)
(d) Human Capital						
Human Capital Index					0.175	-2.325*
					(0.408)	(1.347)
(e) Economic Development						
GDP per Capita			0.263	-0.610	0.218	0.057
			(0.546)	(0.741)	(0.484)	(0.961)
Panel C. Statistics						
N	434818		434818		434818	
XS-R^2	0.100		0.074		0.099	
TS-R^2	0.101		0.068		0.080	
MAPE	0.330		0.331		0.329	

Table E.18: Industry Heterogeneity in Country Characteristics and Adjustment Costs (USD)

This table reports firm-level estimates of how the adjustment-cost coefficients vary with country characteristics within each Fama–French 5 industry, with each geographic unit weighted equally; it is the U.S.-dollar counterpart of Table E.6. Standard errors clustered by geographic unit in parentheses; *, **, and *** denote significance at the 10%, 5%, and 1% levels.

	θ_P					θ_I				
	Cnsmr	Manuf	HiTec	Hlth	Other	Cnsmr	Manuf	HiTec	Hlth	Other
Panel A. Baseline Adjustment Costs										
Baseline Cost	1.024***	1.282***	3.942***	4.717***	1.339***	8.550***	8.075***	9.168***	10.716***	8.462***
	(0.193)	(0.212)	(0.637)	(0.777)	(0.239)	(0.978)	(0.763)	(0.867)	(0.889)	(0.667)
Panel B. Intellectual Property Protection										
Patents (IP)	0.129	-0.410	-0.809	0.798	0.163	-4.277**	-1.702	-0.504	1.472	-3.855***
	(0.466)	(0.540)	(1.259)	(1.736)	(0.467)	(1.771)	(1.049)	(1.411)	(0.960)	(1.138)
Panel C. Equity Investor Protection										
Shareholder Rights	-0.153	0.023	-0.556	-0.045	-0.155	-0.568	-1.498**	-2.905*	-0.525	-2.234**
	(0.172)	(0.181)	(0.436)	(0.694)	(0.180)	(0.957)	(0.591)	(1.535)	(0.702)	(0.845)
Director Liability	0.081	-0.185	-0.492	0.007	0.181	1.208	0.160	-0.329	-2.061***	0.503
	(0.175)	(0.210)	(0.465)	(0.528)	(0.164)	(0.819)	(0.685)	(0.570)	(0.754)	(0.443)
Panel D. Credit Protection										
Strength of Legal Rights	-0.631**	-0.547**	-1.671***	-1.651**	-0.191	-0.848	-0.872	-0.062	1.150	0.577
	(0.284)	(0.222)	(0.601)	(0.677)	(0.189)	(1.091)	(0.860)	(0.915)	(0.800)	(0.589)
Panel E. Economic Development										
GDP per Capita	0.185	0.428	0.622	0.752	-0.333	0.351	-1.051	-1.743	-2.682**	0.839
	(0.416)	(0.474)	(1.002)	(1.041)	(0.334)	(0.831)	(0.761)	(1.338)	(1.144)	(0.841)
Panel F. Statistics										
N	434818									
XS-R^2	0.151									
TS-R^2	0.168									
MAPE	0.324									