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Institutional and structural determinants of investment worldwide

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ABSTRACT

This paper considers institutional and structural factors associated with investment activity in a panel of up to 129 developed and developing countries. We introduce these factors to a standard neoclassical investment function for open economies, and find that financial development and institutional quality are reasonably robust determinants of cross-country capital formation, with latter displaying more stability in the sign and significance of its coefficient. Indeed, when endogeneity concerns are addressed more explicitly using external instruments, and both interactions and subsamples are considered, institutional quality tends to survive as the causal determinant of investment.

1. Introduction

The cross-country variation in investment activity is truly remarkable. For the 30-year period between 1980 and 2010, the rate of gross fixed capital formation worldwide ranged from 1 to 90 percent of production, a variance more than two times that of economic growth. Much of this variability arises from developing countries, which also exhibit a far greater diversity in terms of political-economic structure and institutions. However, since most empirical studies of aggregate investment tend to focus on a relatively small set of (mostly) developed countries (Byrne and Davis, 2005; Davis, 2010; Oliner et al., 1995) and a well-defined set of theories (Chirinko, 1993; Ferderer, 1993; Kopcke and Brauman, 2001), they gloss over such structural and institutional detail, since the environments faced in those instances are reasonably similar. This is not the case when attempting to explain a broader cross-section of countries, which can differ along economic, legal, and political dimensions. Consequently, the failure to take into account structural differences that exist in the cross-country data risks missing an important part of the explanation for variations in international investment patterns.

Among the existing literature where a more general mix of economies is considered, the tendency has been a focus on purely economic factors of a more cyclical nature, such as the real exchange rate (Servén, 2003), fiscal and monetary policy (Greene and Villanueva, 1991), or capital inflows (Wai and Wong, 1982). The main shortcoming of such approaches is that they may fail to capture important discontinuities that may arise from longer-run changes in structural factors. A small number of papers do systematically examine the important role that institutional and structural factors play; however, most

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content themselves with the introduction of one or two such variables, such as the level of financial development (Benhabib and Spiegel, 2000; Levine, 2005; Love and Zicchino, 2006) and structure (Ndikumana, 2005), institutional quality (Campos and Nugent, 2003; Mauro, 1995; Morrissey and Udomkerdmongkol, 2012) and structure (Dawson, 1998), and the business environment (Bartelsman et al., 2010; Utrero-González, 2007). When addressed in isolation, however, it is difficult to place the importance of different structural variables in context.

Although there may be objection to the wholesale incorporation of such structural and institutional measures as atheoretical, this is only the case when such determinants are understood narrowly. Many structural determinants are in fact implied by pure investment theory. For example, the user cost of capital in a standard neoclassical model (Jorgenson, 1963) may differ by country due to differences in tax structure (Hall and Jorgenson, 1967). Alternatively, adjustment costs in either a Tobin's Q (Tobin, 1969; Hayashi, 1982) or (S,s)-type (Caballero and Engel, 1999) setting may diverge between countries due to differences in the transactions costs related to the respective institutional frameworks.

Modern theoretical models that incorporate frictions that arise from capital market imperfections (Holmström and Tirole, 1997) or uncertainty (Caballero and Pindyck, 1996; Lucas and Prescott, 1971) also implicitly point to the need to account for structural and institutional factors, since such frictions suggest that, *inter alia*, a country's financial structures and sophistication, or political-institutional risks, may in fact matter for investment. More generally, the (at least partial) irreversibility of investment means that price (interest rate) signals alone may be insufficient to generate observed levels of investment activity (Dixit and Pindyck, 1994), implying a need to pay greater attention to structural-institutional detail.

Recent work that has sought to explain differences in cross-country investment patterns (Caselli and Feyrer, 2007; Hsieh and Klenow, 2007; Kraay et al., 2005)—all of which stress the importance of uninsurable idiosyncratic investment risk—also support the notion that structural and institutional distinctions may be key frictions that prevent returns to capital—and hence investment—from normalizing across countries. Our results suggest that such distortions to the marginal product of capital may in fact derive, at least in part, from an economy's economic structure or its institutions.

Finally, the vast body of work examines the puzzle of high saving retention coefficients (Feldstein and Horioka, 1980) in cross-country analyses of investment point, at least implicitly, to the need to account for endogeneity due to omitted variables, of which structural factors are key. While there have been subsequent theoretical (Kraay and Ventura, 2000; Bai and Zhang, 2010) and empirical (Byrne et al., 2009; Kam Hon, 2012) attempts to either reconcile or reject the notion that a high correlation between investment and saving necessarily implies home bias in investment activity, the underlying misspecification concern underscored by this strand of literature strongly suggests that institutional and structural variation between countries should be properly accounted for in cross-country studies of capital formation.

In this paper, we seek to empirically identify and estimate the relative importance of the structural and institutional determinants that may be associated with cross-country patterns of aggregate investment. Using a standard neoclassical model as our theoretical launching point, we systematically introduce various families of structural and institutional determinants. Our estimation methodology relies on dynamic panel estimation via GMM (Arellano and Bover, 1995; Blundell and Bond, 1998), which allows us to capture potential partial adjustment effects, as well as some (weak) control of possible endogeneity, at the expense of somewhat less precise estimates (Attanasio et al., 2000). Our main contribution is thus the simultaneous evaluation of a host of institutional and structural variables, with the goal of identifying key determinants of investment worldwide.

We obtain two key findings. First, across a range of specifications and alternative measures, financial development and institutional quality are reasonably robust determinants of investment. While the former typically enters with a larger magnitude vis-á-vis the latter, institutional quality displays both a more stable coefficient and consistent statistical significance. Second, and related to the first, when potential endogeneity concerns are addressed more explicitly using external instruments, financial development drops out of statistical significance entirely, suggesting that—to the extent that the external instruments are reliable—institutional quality is less likely to be contaminated by reverse causality concerns, at least insofar as investment activity is concerned.

The rest of the paper is organized as follows. The following section outlines the main data sources and definitions (Section 2.1), along with our empirical methodology (Section 2.2). Section 3 discusses both the benchmark results as well as the robustness of these results to alternative specifications and measurements (Section 3.3) and more stringent endogeneity testing (Section 3.4). The section also attempts to tease out the manner by which interaction effects (Section 3.5) and subsamples (Section 3.6) be driving the key findings. A final section concludes with some reflections on policy implications.

2. Data and methodology

2.1. Data sources and definitions

The dataset for the investment regressions is an unbalanced country-level panel, covering up to 129 economies[1] over 5-year periods[2] between 1980–2009. Variables for the benchmark regressions were sourced from the World Bank's World

[1] In the preferred benchmark specifications, however, the sample coverage is 105 economies. These are listed in Appendix Table A.2.

[2] We use 5-year averages to smooth out business cycle considerations, and to better accord with the data requirements of our estimator (system GMM), which calls for a relatively short T panel. Nevertheless, we report results using bias-corrected least squares dummy variable (LSDV) estimates in the annex (the qualitative findings are unchanged using annual data).

Development Indicators (WDI) as well as Financial Development and Structure (Beck et al., 2000) databases, the International Country Risk Guide (ICRG), and Chinn and Ito (2008). Additional variables included in the robustness tests were drawn from the World Bank's Global Economic Monitor (GEM) and Doing Business databases, and data from Beck et al. (2001) and Laeven and Valencia (2013).

Full details of variable sources, definitions, and other summary statistics are given in Appendices A.1, A.3, and A.4. Two important statistical features are worth noting. First, the standard deviation in the institutional and structural variables, while small relative to the level of investment, are nevertheless larger than most of the economic controls, which supports the notion that variations in the former may be important for better understanding cross-country investment patterns.

Second, the correlation among the distinct families of institutional and structural variables considered is actually fairly small; the highest correlation is between institutional quality and financial development ($\rho = 0.56$), and even then the relationship is not particularly strong. This suggests that the various variables of interest are sufficiently distinct—statistically speaking—to warrant their inclusion as independent variables.

Given the centrality of structural factors in this paper, we briefly discuss here the definitions for the main institutional and structural variables of interest, along with the motivation behind their selection. To accommodate the host of variables that we consider, we organize them into various classes of determinants, as suggested by theory.

One important factor we consider is the level of maturity of the financial sector as well as its structure, which are measured, respectively, by domestic credit to the private sector (as a share of GDP) and the ratio of the total value traded in the stock market to domestic credit. We motivate these variables by recognizing that constraints arising from limited access to finance have the potential to adversely affect investment activity (Schiantarelli, 1996), and even the organizational form of corporate financing (Dailami, 1992), may impact the ease of investment by firms.

Another important factor is related to quality of institutional mechanisms such as contract enforcement and property rights, both of which can influence aggregate investment through either altering incentives for new investment (Besley, 1995), or by increasing the sensitivity of investment to technological shocks at the macroeconomic level (Cooley et al., 2004). Even the overall structure of institutions may play a role in encouraging or discouraging investment, through the manner by which such institutions resolve commitment problems (Gehlbach and Keefer, 2011). We proxy for institutional quality by averaging indices of corruption and rule of law, while institutional structure is captured measure of democratic accountability.

The overall business environment may also matter, especially as embodied by investor protections (Shleifer and Wolfenzon, 2002) or the nature of corporate taxation (Devereux, 1996; Hall and Jorgenson, 1967). While at first glance there may appear to be some overlap in such measures with the overall institutional environment, business and regulatory factors typically affect investment more directly, and should be treated as distinct from the institutional setting that governs interactions between political-economic actors. Our gauge of the business environment is an index that approximates the strength of investor protection—selected in particular because it reflects the investment-related aspects of business regulation—while the tax structure is represented by the highest marginal corporate tax rate.

2.2. Empirical methodology

We motivate the empirical work to follow with a very simple theoretical specification of the (flexible) neoclassical model (Hall and Jorgenson, 1967), where the optimal capital stock in country i at time t, K^*_{it}, is a function of production, Y_{it}, and the cost of capital, R_{it}, so that

$$K^*_{it} = \frac{\alpha Y_{it}}{R^{\sigma}_{it}}, \tag{1}$$

where α and σ are, respectively, the output and substitution elasticities of capital. To obtain investment, substitute the optimal capital stock with the equation of motion of capital

$$K_{i,t+1} = (1-\delta)K_{it} + I_{it},$$

and apply the result that, in the steady state, the growth rate of capital is the growth rate of output (so that $K_{i,t+1} = (1+\mu_{it})K_{it}$, where μ is the GDP growth rate); this yields an estimable empirical specification

$$i_t = \beta + y_{it} + g_{it} - \sigma r_{it}, \tag{2}$$

where $\beta \equiv \ln \alpha$ and $g_{it} \equiv \ln(\mu_{it} + \delta)$ is the (depreciation-adjusted) growth rate, and lowercase letters indicate the logarithm of the respective uppercase variables. For the empirical specification that follows, we relax the parameter restriction of unity for the coefficient on growth and output, and include additional economic variables $\mathbf{X}_{it}$ related to the open economy, and institutional and structural variables that may affect investment, $\mathbf{Z}_{it}$:

$$i_{it} = \beta + \phi i_{i,t-1} + \psi y_{it} + \gamma g_{it} - \sigma r_{it} + \mathbf{\Phi}'\mathbf{X}_{it} + \mathbf{\Gamma}'\mathbf{Z}_{it} + \epsilon_{it}, \tag{3}$$

where ϵ_{it} is a disturbance term. (3) further includes the lagged dependent variable $i_{i,t-1}$, to allow for partial adjustment in fixed capital formation (Eberly et al., 2012; Fiori, 2012).

The econometric analysis of (3) is performed with system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998), which is well-suited for this application since estimates both account for between and within variation in the data, along with some (weak) endogeneity in the regressors. Moreover, system GMM resolves problems that may arise from Nickell (1981) bias due to the inclusion of the lagged dependent variable, which is especially important since aggregate investment is a persistent series (Bond et al., 2001). There are also additional efficiency gains that accrue to system (as opposed to difference) GMM, which is important given the relatively small size of the cross-section.

In all the specifications that follow, output, growth, and the real interest rate are treated as endogenous, and entered into the (orthogonalized) instrument matrix with two lags and deeper, while lagged investment, trade openness, and financial openness are treated as predetermined and entered with one or more lags. The institutional and structural variables are instrumented with their lagged values. The instrument set is then collapsed to limit instrument proliferation (Roodman, 2009), and all standard errors are corrected to account for heteroskedasticity and arbitrary patterns of autocorrelation within countries.

3. Results

3.1. Illustrative relationships

In order to establish an initial grasp on how structural factors may be related to investment, we plot the fixed investment rate against each of the structural variables of interest. This is shown in Fig. 1.

Several features are worth noting. First, there appear to be significant bivariate relationships for a number of the structural variables of interest, notably for financial development, institutional quality, the business environment, and the tax environment. Since these are bivariate relationships, however, it is premature to claim that these factors will all survive in a more systematic empirical treatment.

Second, where applicable, the expected effect of these variables accord with *a priori* intuition. For example, higher levels of institutional quality correspond with higher rates of investment, while higher tax rates imply the opposite. With regard to financial and institutional structure—where there are no definitive theoretical hypotheses—the small positive slopes appear to suggest that more market-based financial systems and more democratic systems are more likely to be associated with greater investment (although the relationships are weak and unlikely to be significant).

Finally, it is also worth noting that data limitations mean that the graphs are not all represented by the same sample. This is especially the case for financial structure and the tax environment, where the samples appear to be especially small. Such sample limitations may limit our ability to make strong inferences with the cross-country panel (an issue that we revisit in the more formal analysis that follows).

3.2. Benchmark results

Our benchmark results for Eq. (3) are reported in Table 1. Across all specifications, the included variables are jointly significant (as measured by the Wald χ^2 test), and the instrument set is coherent (the Hansen J statistics all fail to reject the null).[3] The z statistic for the Arellano-Bond AR(2) tests do indicate that autocorrelation may be an issue for the first two specifications; however, these two are offered more as initial baselines, and hence their potential misspecification is less of a concern.

Column (B1) is a minimal specification—corresponding to (2)—while column (B2) allows for open-economy effects by introducing two medium-term determinants of external accounts (Calderón et al., 2002; Chinn and Prasad, 2003): trade openness and financial openness. The coefficients on these economic determinants are consistent with *a priori* expectations regarding their sign: economic size and growth are both positively correlated with the level of fixed investment, and investment patterns display a fair degree of persistence. The cost of capital—as proxied by the real interest rate—is statistically insignificant, a result consistent with the broader literature, which has struggled to establish a strong empirical relationship between the two variables (Caballero, 1999).[4]

Interestingly, the coefficient on financial openness is negative and significant. This effect is non-trivial: a ten percent increase in financial openness—an decrease in restrictions on capital flows roughly comparable to moving from, say, that of Egypt to that of Singapore (for the year 2009)—could trigger a decrease in investment of between one and two percent. This implies that, *ceteris paribus*, more financially open economies tend to experience lower levels of investment. This would be the case if, for instance, foreign direct investment (FDI) flows not only substitute but displace domestic flows more than one-for-one. If FDI were more productive than domestic investment—a result that has some limited support in the empirical literature[5]—we would observe this outcome. Other explanations are also possible.[6] If returns to capital are higher abroad,

[3] As noted by Parente and Santos Silva (2012), tests of overidentifying restrictions offer little information on the ability of the instruments to identify the parameter of interest. Such tests, however, are useful as checks for whether all the included instruments identify the same vector of parameters (that is, whether the instruments are together coherent).

[4] Indeed, this has generally been the case even when more precise measures of the cost of capital (which account additional complications such as the corporate tax rate and investment tax credits) and more sophisticated econometric techniques, including the exploitation of natural experiments.

[5] For example, Agosin and Machado (2005); Görg and Greenaway (2004); and Narula and Driffield (2012) find that FDI has a relatively weak contribution to new domestic investment and growth.

[6] We are indebted to an anonymous referee for advancing these alternative possibilities.

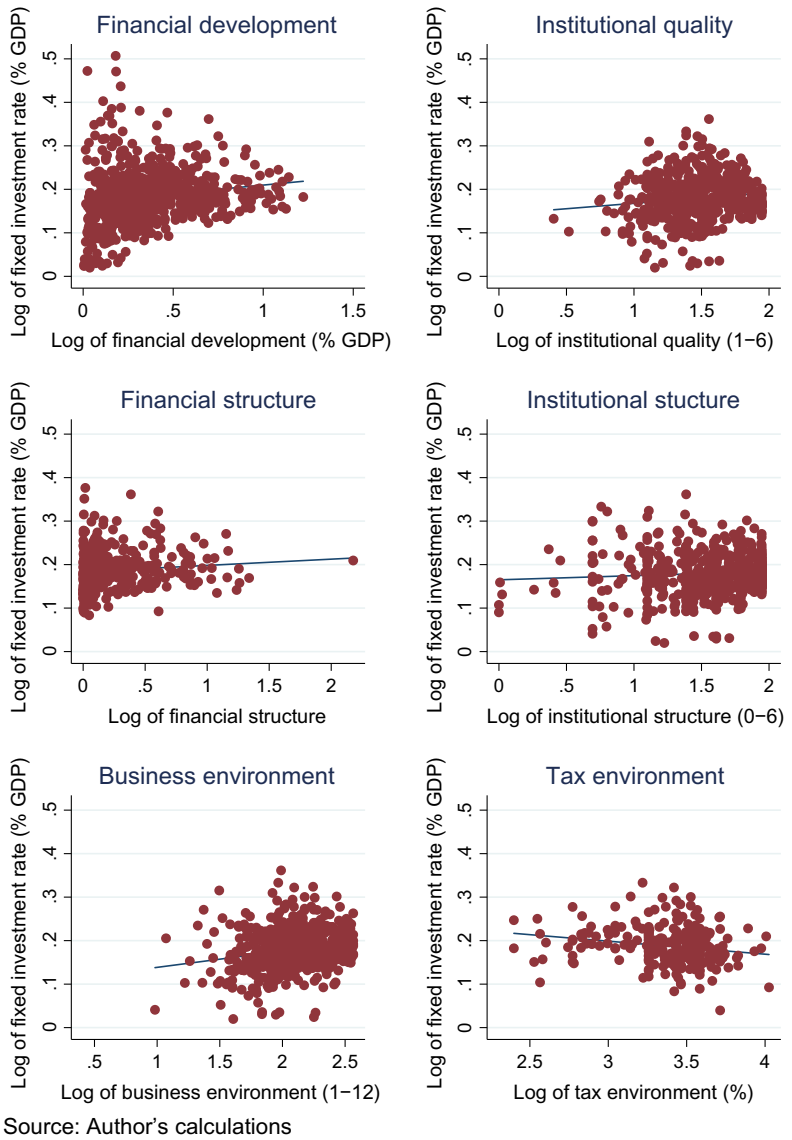

Fig. 1. Scatterplots of fixed investment rate (as a percentage of GDP) to structural variables of interest, unbalanced 5-year average panel, 1980–2009.

greater financial openness can lead to net capital outflows, which reduces the pool of saving available for investment. As another alternative explanation, greater financial openness can increase financial flow volatility, which may trigger financial crises that lead to investment contractions that never fully recover from their crisis-related declines. The answer as to which of these effects are truly operative is interesting, but beyond the scope of this paper.

Columns (B3)–(B8) incrementally introduce structural and institutional controls: financial development, institutional quality, the business environment, institutional structure, the tax environment, and financial structure. Due to data limitations, the final two specifications are added independently (as evident, the sample size drops dramatically as a result of their inclusion). These two variables are, in any case, insignificant; we henceforth proceed with specification (B6) as our preferred benchmark specification.

Across these different specifications, institutional quality typically enters with a statistically significant coefficient (although often only at the 10 percent level). The coefficient is bound by $[0.136, 0.158]$, which, while small, is nonetheless economically relevant: a ten percent increase in institutional quality could translate into an increase of investment of 1.6 percent. This would be equivalent to an improvement from 2009 levels in Ukraine to that of Italy, or around the improvement in Chile's institutional quality between 1996 and 2009, the period where it transitioned away from the military junta under Augusto Pinochet to a stable capitalistic system.

It is interesting to contrast the positive and significant coefficient on the institutional quality variable against that of the business environment variable, which is insignificant. Given the specificity of the latter variable for investment activity, this

Table 1
Benchmark regressions for fixed investment, unbalanced 5-year average panel, 1980–2009.[a]

	B1	B2	B3	B4	B5	B6	B7	B8
Lagged investment	0.463	0.608	0.373	0.466	0.471	0.475	0.359	0.458
	(0.18)***	(0.11)***	(0.23)	(0.17)***	(0.16)***	(0.18)***	(0.10)***	(0.08)***
Output	0.583	0.393	0.614	0.518	0.509	0.495	0.663	0.536
	(0.21)***	(0.12)***	(0.22)***	(0.19)***	(0.17)***	(0.19)***	(0.12)***	(0.09)***
Output growth	0.594	1.071	1.488	1.430	1.395	1.423	1.249	1.241
	(0.24)**	(0.25)***	(0.38)***	(0.26)***	(0.26)***	(0.30)***	(0.23)***	(0.29)***
Cost of capital	0.419	−0.895	−0.201	1.241	1.168	1.251	0.246	0.662
	(1.98)	(1.04)	(1.08)	(1.67)	(1.54)	(1.49)	(1.23)	(1.13)
Trade openness		−0.166	−0.046	−0.079	−0.017	−0.105	0.098	0.028
		(0.25)	(0.27)	(0.26)	(0.23)	(0.23)	(0.14)	(0.11)
Financial openness		−0.141	−0.140	−0.185	−0.169	−0.184	−0.116	−0.108
		(0.06)**	(0.08)*	(0.08)**	(0.07)**	(0.07)**	(0.08)	(0.05)**
Financial development			0.275	0.273	0.270	0.329	0.007	0.048
			(0.15)*	(0.13)**	(0.13)**	(0.13)***	(0.07)	(0.08)
Institutional quality				0.138	0.140	0.149	0.158	0.159
				(0.08)*	(0.08)*	(0.09)*	(0.09)*	(0.08)**
Business environment					−0.015	−0.130	−0.123	−0.023
					(0.10)	(0.18)	(0.12)	(0.12)
Institutional structure						0.101	0.112	0.053
						(0.08)	(0.08)	(0.08)
Tax environment							−0.045	
							(0.04)	
Financial structure								0.007
								(0.10)
Wald χ^2	1858***	3287***	10,798***	8977***	9642***	11,448***	20,917***	18,830***
Hansen J	19.663	35.256	34.427	29.065	29.541	30.135	30.029	40.157
AR(2) z	−1.936*	−2.364**	−1.588	−1.570	−1.547	−1.446	0.000	−0.763
Instruments	24	39	40	39	41	43	46	44
N (countries)	483 (129)	467 (125)	364 (123)	333 (105)	333 (105)	333 (105)	138 (79)	191 (81)

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects and a constant term were included in the regressions, but not reported.
* Significance at 10 percent level.
** Significance at 5 percent level.
*** Significance at 1 percent level.

result suggests that the importance of the rule of law goes beyond the manner by which institutions foster investment; rather, a strong institutional framework likely affords broad-based economic opportunity and fosters competition dynamics, which in turn lead to economywide incentives that support greater levels of investment. This result provides an alternative view of the institutions that are central to investment activity, in contrast to, for example, Acemoğlu and Johnson (2005), who argue that property rights institutions dominate contracting institutions in the determination of investment.[7]

The magnitude of the positive coefficient on financial development—which averages 0.20 across the six specifications in which it is included—is also economically relevant, and around twice that of institutional quality in most specifications (although in the limited subsample of the final two specifications, the coefficient drops out of statistical significance). Given the sharp contraction in the size of the sample resulting from the inclusion of institutional structure or the tax environment, it is difficult to draw strong conclusions regarding the robustness of the statistical significance of financial development; however, we revisit the issue in the following subsections.

3.3. Robustness of the benchmark

In this section we consider the robustness of the benchmark results—as embodied by specification (B6)—to alternative measures of our variables of interest. Our choices of these alternative measures for the institutional and structural variables are predicated by the desire to offer a variant to the conceptualization of the variable in the benchmark, rather than simply an alternative measure. Nevertheless, we recognize that different data sources may result in changes to the potential accuracy, reliability, and coverage of the variable in question. Accordingly, we considered several alternative sources for the variables in our benchmark (as before, detailed definitions are provided in Annex Table A.1).

In columns (R1) and (R2) of Table 2, we consider two alternative definitions of our dependent variable. (R1) uses the fixed investment *rate* (the fixed capital formation share of GDP), while (R2) employs *gross* investment (inclusive of inventory

[7] Acemoğlu and Johnson (2005) favor legal measures—such as the extent of formalism and procedural complexity and depth—as measures of contractual institutions, while they treat protection against expropriation as a property rights institution. We believe that all these measures are more reflective of the commercial and business climate, whereas the broader institutional environment, as measured by the rule of law and corruption, represents a more distinctive alternative determinant of investment activity.

Table 2
Robustness regressions for fixed investment, unbalanced 5-year average panel, 1980–2009.[a]

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
Lagged investment/ share	0.404 (0.16)**	0.429 (0.09)***	0.470 (0.18)***	0.438 (0.18)**	0.578 (0.18)***	0.528 (0.23)**	0.503 (0.19)***	0.315 (0.12)***	0.445 (0.17)***	0.667 (0.09)***	0.476 (0.15)***	0.498 (0.18)***
Output	0.202 (0.04)***	1.334 (0.22)***	1.000	1.464 (0.27)***	1.565 (0.33)***	1.129 (0.34)***	1.474 (0.32)***	1.636 (0.24)***	1.376 (0.25)***	1.535 (0.34)***	1.643 (0.34)***	1.419 (0.28)***
Output growth		0.507 (0.08)***	1.000	0.543 (0.18)***	0.402 (0.18)**	0.431 (0.22)**	0.470 (0.19)**	0.711 (0.13)***	0.543 (0.18)***	0.343 (0.10)***	0.162 (0.30)	0.472 (0.18)***
Cost of capital	0.210 (0.17)	0.422 (0.76)	2.204 (1.45)		0.870 (1.45)	1.399 (1.55)	1.152 (1.55)	1.994 (1.38)	1.538 (1.76)	−1.850 (1.37)	2.537 (1.06)**	1.361 (1.61)
Cost of capital alt.				0.003 (0.01)								
Trade openness	0.005 (0.03)	0.085 (0.13)	0.232 (0.19)	0.001 (0.21)	−0.021 (0.19)	−0.020 (0.20)	−0.052 (0.22)	0.058 (0.11)	0.021 (0.27)	−0.425 (0.15)***	−0.155 (0.20)	−0.120 (0.23)
Financial openness	−0.035 (0.01)***	−0.048 (0.05)	−0.123 (0.09)	−0.202 (0.07)***	−0.181 (0.08)**	−0.176 (0.07)**	−0.192 (0.07)***	−0.108 (0.07)*	−0.173 (0.07)**	−0.178 (0.08)**	−0.188 (0.09)**	−0.185 (0.07)**
Financial development	0.046 (0.02)***	0.238 (0.11)**	0.242 (0.11)**	0.257 (0.12)**		0.305 (0.15)**	0.337 (0.14)**	0.063 (0.10)	0.246 (0.13)*	−0.031 (0.11)	0.366 (0.15)**	0.332 (0.13)**
Financial development, alt.					0.257 (0.17)							
Institutional quality	0.026 (0.01)*	0.086 (0.06)	0.090 (0.09)	0.053 (0.10)	0.170 (0.09)*			0.185 (0.08)**	0.142 (0.08)*	0.254 (0.12)**	0.178 (0.10)*	0.147 (0.09)*
Rule of law						0.182 (0.10)*						
Corruption							0.060 (0.07)					
Business environment	−0.033 (0.03)	−0.152 (0.08)*	−0.083 (0.17)	0.105 (0.18)	−0.117 (0.18)	−0.194 (0.21)	−0.124 (0.20)	−0.094 (0.10)	−0.009 (0.11)		−0.224 (0.20)	−0.139 (0.17)
Business environment, alt.										−0.014 (0.02)		
Institutional structure	0.008 (0.02)	0.032 (0.05)	0.010 (0.09)	0.091 (0.09)	0.128 (0.11)	0.130 (0.12)	0.140 (0.11)	0.065 (0.05)		0.068 (0.09)	0.115 (0.10)	0.104 (0.11)
Institutional structure, alt.									−0.003 (0.02)			
Financial structure, alt.								−0.050 (0.05)				
Capital stock											0.327 (0.23)	
Financial crisis												−0.075 (0.15)
Wald χ^2	131***	8638***	346***	14,417***	19,590***	10,673***	11,240***	8955***	9806***	9179***	10,976***	10,721***
Hansen J	23.814	38.293	30.135	28.374	35.864	30.080	28.900	31.060	28.159	21.872	25.591	30.596
AR(2) z	−1.763*	−1.205	−0.876	−1.282	−1.528	−1.344	−1.668	0.108	−1.465	0.000	−1.173	−1.435
Instruments	39	50	43	43	46	41	41	45	42	38	46	44
N (countries)	333 (105)	340 (107)	328 (104)	324 (105)	334 (105)	333 (105)	333 (105)	234 (82)	330 (104)	174 (97)	317 (102)	333 (105)

[a] All variables, except the financial crisis dummy, are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects and a constant term were included in the regressions, but not reported.
* Significance at 10 percent level.
** Significance at 5 percent level.
*** Significance at 1 percent level.

accumulation). Although the coefficients are not directly comparable, the qualitative messages are similar; notably, that financial development and institutional quality are important structural determinants, and the magnitude of the coefficient on the former is larger than that on the latter.[8]

Somewhat interestingly, the coefficient on business environment enters with a negative sign (and is marginally significant) in specification (R2). While counterintuitive at first, a careful perusal of the underlying data is illuminative: many economies with strong investor protection scores tend to be relatively less developed. This result may be rationalized by acceding to the possibility that when investor protection clauses are in conflict with the overall rule of law (as captured by institutional quality), investors may regard *de jure* laws as a negative signal and reduce their investment activity, resulting in a negative relationship.

Columns (R3) and (R4) introduce two alternatives to the baseline specification for the economic controls. The first of these imposes the constraint, suggested by (2), where the coefficient on growth and output are held at unity. The second substitutes the real interest rate measure of the cost of capital with an alternative computed from the differential between the domestic interest rate and an exchange rate-adjusted risk-free interest rate (an interest rate "arbitrage" measure); this

[8] The coefficient on institutional quality in (R2), while statistically insignificant, is approaching significance ($p = 0.20$), and the sign remains unchanged.

Table 3
Regressions for fixed investment with exogenous instruments, unbalanced 5-year average panel, 1980–2009.[a]

	E1	E5	E2	E6	E3	E7
Financial development	−0.297 (0.26)	−0.131 (0.39)	−0.042 (0.27)	0.292 (0.15)**	−0.202 (0.23)	−0.185 (0.20)
Institutional quality	0.461 (0.19)**	0.453 (0.23)**	0.368 (0.20)*	0.256 (0.33)	0.266 (0.13)**	0.201 (0.08)**
Economic controls	Yes	Yes	Yes	Yes	Yes	Yes
Structural controls	No	Yes	No	Yes	No	Yes
Wald χ^2	17,411***	5766***	18,052***	9832***	8422***	16,822***
Hansen *J*	38.280	33.215	35.482	28.811	36.237	39.364
AR(2) *z*	−1.446	−1.339	−1.286	−1.457	−1.536	−1.481
Instruments	42	41	41	41	41	43
External?	Both	Both	IQ only	IQ only	FD only	FD only
N (countries)	408 (106)	337 (105)	403 (106)	333 (105)	337 (105)	337 (105)

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects, a constant term, and economic (all specifications) and additional structural controls (E2, E4, E6) were included in the regressions, but not reported. IQ = institutional quality, FD = financial development.

* Significance at 10 percent level.

** Significance at 5 percent level.

*** Significance at 1 percent level.

alternative is to allow for the possibility that, at the margin, the real interest rate operates relative to the global risk-free rate.[9] Both changes have little impact on the main results, although predictably the coefficient on the alternative cost of capital measure in (R4) is much smaller (and still statistically insignificant).

The robustness of the two key structural variables of interest is considered in columns (R5)–(R7). Specification (R5) utilizes an alternative definition of financial development, domestic credit by banks, which excludes non-bank sources of credit. Since investment financing in many developing economies are typically obtained from bank lending, using this alternative measure provides a better sense of the importance of financial development via the pure credit channel, as opposed to the possibility that the presence of deep capital markets may also play some role (which introduces elements of financial structure). Doing so renders financial development insignificant, which suggests that—to the extent that this factor is relevant—it is the economywide level of credit to firms that matters, not just credit via the formal banking system.

Specifications (R6) and (R7) decompose the institutional quality variable into, respectively, its rule of law and corruption subindices. Doing so renders the coefficient on the rule of law significant, while that on corruption is insignificant. This implies that the results may be driven more by cross-country variations in property rights and the rule of law, as opposed to the pervasiveness of corruption.[10]

In columns (R8)–(R10) we consider alternative measures of the other structural variables. (R8) substitutes the financial structure variable with the ratio of stock market capitalization to domestic credit, which better approximates the influence of financial structure size as distinct from financial structure activity (Levine, 2002). Nevertheless, using this alternative measures makes little difference to the coefficient, which remains insignificant. We conclude that, in contrast to financial development, financial structure appears to exert no independent effect on investment, a finding that echoes that of Ndikumana (2005).

Column (R9) offers an alternative measure of the structure of political institutions, a concentration index of the relative size of parties in parliament. This measure may offer a better sense of the level of political competition, as opposed to an index of democratic accountability alone (which is broader but may capture elements of representation distinct from inter-party competition). Finally, column (R10) replaces the business environment variable with an index of the extent of commercial contract enforcement. The main results in Table 1 are largely undisturbed by these three alternative measures, although we note that the coefficient on institutional quality tends to retain its statistical significance (and increase its magnitude) relative to the benchmark.

Finally, Table 2 also considers the robustness of the benchmark results to the inclusion of several additional covariates.

Column (R11) adds the capital stock, which is calculated assuming a constant rate of depreciation at 5 percent.[11] In the final column (R12), we introduce an additional indicator variable for financial crises, defined as the coincidence of banking and currency crises. In contrast to, say, a currency crisis—which may only result in nominal dislocations—such "twin crises" typically

[9] The reason why this measure is not favored for the baseline, however, is that there remain significant frictions to cross-border capital flows, so that domestic investors do not typically have ready access to global capital markets.

[10] The correlation on the two is $\rho = 0.57$, which is certainly high but not excessively so. Indeed, replications of the benchmark regressions in Table 1 using only the rule of law variable generally result in more statistically significant coefficients for institutional quality (these are available from the author on request). We have retained the aggregate measure in the benchmark as we regard an aggregated measure as a more complete representation of institutional quality, rather than a measure of rule of law alone.

[11] Using an alternative depreciation method, such as hyperbolic discounting, does not markedly change the results.

Table 4
Regressions for fixed investment with interaction terms (variables of interest), unbalanced 5-year average panel, 1980–2009.[a]

	I1	I2	I3	I4	I5
Financial development	0.017 (0.11)	0.028 (0.11)	0.034 (0.12)	0.102 (0.16)	0.097 (0.15)
Financial structure			0.052 (0.14)	0.166 (0.24)	0.084 (0.23)
Fin. dev. × fin. struc.				−0.153 (0.22)	−0.057 (0.21)
Institutional quality	−1.158 (0.60)*	−1.152 (0.60)*	−1.396 (0.91)*	0.162 (0.08)**	0.136 (0.10)
Institutional structure	−0.934 (0.48)*	−0.935 (0.47)**	−1.221 (0.75)		0.098 (0.09)
Inst. qual. × inst. struc.	0.692 (0.34)**	0.697 (0.33)**	0.869 (0.51)*		
Economic controls	Yes	Yes	Yes	Yes	Yes
Structural controls	No	Partial	Full	No	Yes
Wald χ^2	18,421***	18,225***	9250***	10,117***	13,206***
Hansen *J*	29.435	28.634	30.755	28.874	29.156
AR(2) *z*	−1.927*	−1.853*	−1.003	0.165	0.105
Instruments	45	46	47	41	44
N (countries)	321 (105)	321 (105)	229 (82)	236 (82)	236 (82)

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects, a constant term, and economic (all specifications) and additional structural controls (I2–I4) were included in the regressions, but not reported. Partial (full) structural controls exclude (include) financial structure.
* Significance at 10 percent level.
** Significance at 5 percent level.
*** Significance at 1 percent level.

exact a large output cost (Hutchison and Noy, 2005), and hence are likely to be especially devastating for investment. The coefficients on these variables are of the expected sign, but are statistically indistinguishable from zero, and the other results are qualitatively unaltered by the inclusion of these additional conditioning factors.

3.4. Possible channels of endogeneity

In this subsection we consider the issue of endogeneity in the two structural variables of interest—financial development and institutional quality—more seriously. In particular, we exploit two external instruments for institutional quality and financial development that have been commonly used in the existing literature—legal origin for financial development (La Porta et al., 1998), and fraction of population speaking European languages for institutional quality (Hall and Jones, 1999)[12]—and embed them in the system GMM framework as additional exogenous instruments.

The results can be found in Table 3, both without (columns (E1)–(E3)) and with (columns (E5)–(E7)) additional institutional and structural controls (so that they are analogous to specifications (B4) and (B6), respectively). To better understand the sensitivity of the results to the use of internal instruments, the first two columns (E1/E5)[13] include both external instruments as a benchmark. The next two (E2/E6) take the external institutional quality instrument seriously by using *only* the language share instruments alongside lagged financial development (as internal instruments) in the exogenous instrument matrix. The final two columns (E3/E7) take the external financial development instrument seriously by using only legal origins alongside lagged institutional quality in the exogenous instrument matrix.

Taken together, these results convey a consistent message: Conditional on the external instruments being valid, institutional quality is more likely to have a causal impact on investment, as opposed to financial development. Institutional quality retains its positive and significant coefficient in virtually all specifications, while financial development is only significant in one specification (E6), which relies on the internal instruments for financial development. Although the relatively weak result for financial development does not necessarily negate the possibility that it could still be an important structural determinant of fixed investment activity—there are potential issues with the quality of legal origin as an instrument, after all (Kraay, 2012)—we are nevertheless led to the conclusion that institutional quality is more likely to exert an unequivocal causal effect on investment.

3.5. Interactions between development and structure

In this subsection we explore the interaction effects of financial development and institutional quality—which we regard as *development* measures associated with finance and institutions, respectively—with that of *structure* measures

[12] An alternative (and somewhat popular) instrument for institutions is settler mortality (Acemoğlu et al., 2001). For the sake of parsimony, we report results using this instrument—which are similar to the language share instrument—in the annex.
[13] The non-consecutive numbering of the columns is to allow correspondence with the full results, which are provided in the annex.

Table 5
Regressions for fixed investment on selected subsamples, unbalanced 5-year average panel, 1980–2009.[a]

	S1	S2	S3	S4	S5
Financial development	0.192 (0.10)**	−0.025 (0.14)	0.117 (0.11)	0.154 (0.09)*	0.403 (0.62)
Fin. dev. × ind.					−0.076 (1.15)
Institutional quality	−0.279 (0.18)	0.315 (0.19)*	0.223 (0.10)**	0.139 (0.17)	0.981 (0.43)**
Inst. qual. × ind.					−1.980 (1.30)
Economic controls	Yes	Yes	Yes	Yes	Yes
Structural controls	Yes	Yes	Yes	Yes	Yes
Wald χ^2	33,096***	3454***	18,604***	255***	173***
Hansen J	16.147	26.271	33.258	29.902	10.205
AR(2) z	0.004	−1.191	−0.834	0.287	−0.628
Instruments	42	42	43	48	42
N (countries)	104 (32)	220 (73)	144 (51)	177 (68)	333 (105)
Subsample?	Ind.	Non-ind.	High FD	High IQ	Full

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects and a constant term were included in the regressions, but not reported. FD = financial development, IQ = institutional quality.
* Significance at 10 percent level.
** Significance at 5 percent level.
*** Significance at 1 percent level.

Table A.1
Sources and definitions for main variables of interest.

Variable	Definition	Source
Economic variables		
Fixed investment	Gross fixed capital formation in constant 2000 U.S. dollars	WDI.[a]
Output	Gross domestic product (GDP) in constant 2000 U.S. dollars	WDI
Output growth	Growth in real output[b]	WDI
Cost of capital	Real interest rate (lending rate adjusted for inflation)	WDI
Trade openness	Imports plus exports divided by GDP	WDI
Financial openness	Index of restrictions on capital account openness	Chinn and Ito (2008)
Structural and institutional variables		
Financial development	Domestic credit to private sector	WDI
Financial structure	Stock market value traded divided by domestic credit	Beck et al. (2000)
Institutional quality	Simple average of rule of law and control of corruption indices	ICRG[a]
Institutional structure	Index of democratic accountability	ICRG
Business environment	Index of strength of investment protection	ICRG
Tax structure	Highest marginal corporate tax rate	WDI
Alternative measures		
Gross investment	Gross capital formation in constant 2000 U.S. dollars	WDI
Investment rate	Gross fixed capital formation as share of GDP	WDI
Alternative cost of capital	Difference in domestic and exchange-adjusted risk-free rate[c]	Bloomberg, WDI
Alternative financial development	Domestic credit by banking sector	WDI
Alternative financial structure	Stock market capitalization divided by domestic credit	Beck et al. (2000)
Alternative institutional structure	Herfindahl index of government parties	Beck et al. (2001)
Alternative business environment	Commercial contract enforcement index	Doing Business
Capital stock	Stocks of capital in constant 2000 U.S. dollars.[d]	WDI and GEM[a]
Financial crisis	Indicator variable for occurrence of financial crisis[e]	Laeven and Valencia (2013)

[a] WDI = World Development Indicators, ICRG = International Country Risk Guide, GEM = Global Economic Monitor. ICRG indicators are measured such that higher values indicate lower risk (better outcomes).
[b] Since the depreciation rate is (assumed) constant across countries, the difference between adjusting output growth for depreciation, as implied by the theoretical model, is trivial.
[c] Computed as the U.S. real interest rate, multiplied by the change in the exchange rate.
[d] Computed using the perpetual inventory method, with an assumed constant depreciation rate of 5 percent. Countries with insufficient data in the constant investment series were backcasted using a regression of the investment deflator on the GDP deflator and available investment data.
[e] Financial crisis defined as the coincident occurrence of a banking and currency crisis within the 5-year period.

corresponding to each. More specifically, we interact our measure of financial development with that of financial structure, and institutional quality with that of institutional structure. In doing so, we hope to obtain further insight on the conditions in which our key variables of interest may or may not be operative.

These results are summarized in Table 4. We consider interaction effects pertaining to financial development and structure (I1)–(I3), and institutional quality and structure (I4)–(I5). In an analogous fashion to Table 3, we report the results

Table A.2
Sample of countries.

Albania	Finland	Netherlands
Algeria	France	New Zealand
Argentina	Gabon	Nicaragua
Armenia	Gambia	Norway
Australia	Germany	Pakistan
Austria	Greece	Panama
Azerbaijan	Guatemala	Papua N/Guinea
Bahamas	Guinea	Paraguay
Bangladesh	Honduras	Peru
Barbados*	Hong Kong SAR	Philippines
Belarus	Hungary	Poland
Belgium	Iceland	Portugal
Belize*	India	Romania
Benin*	Indonesia	Russia
Bolivia	Iran	Senegal
Bosnia & Herz.*	Ireland	Serbia*
Botswana	Israel	Seychelles*
Brazil	Italy	Singapore
Brunei*	Japan	Slovak Rep.
Bulgaria	Jordan	Slovenia
Burkina Faso	Kenya	South Africa
Cameroon	Kyrgyz Rep.*	South Korea
Canada	Lao PDR*	Spain
Cape Verde*	Latvia	Sri Lanka
Cent. Afr. Rep.*	Lebanon	Swaziland*
Chad*	Lesotho*	Sweden
Chile	Liberia	Switzerland
China	Lithuania	Syria
Colombia	Luxembourg*	Tajikistan*
Costa Rica	Macao SAR*	Tanzania
Cote d'Ivoire	Macedonia, FYR*	Thailand
Croatia	Madagascar	Togo
Cyprus	Malaysia	Trin. & Tob.
Czech Republic	Maldives*	Tunisia*
Denmark	Mali	Uganda
Djibouti*	Malta	Ukraine
Dominica*	Mauritania*	United Kingdom
Dominican Rep.	Mauritius*	United States
Ecuador	Mexico	Uruguay
Egypt	Moldova	Venezuela
El Salvador	Morocco	Vietnam
Estonia	Mozambique	Yemen
Ethiopia	Namibia	Zambia

* Countries that were excluded (due to data limitations) from the preferred benchmark specifications (B4)–(B6) are denoted with an asterisk.

with only economic controls (I1 and I4), and with both economic and additional structural controls (I2, I3, and I5) (for reasons documented in Section 3.2, including financial structure severely decreases the sample size; we therefore allow for either the exclusion (I2) or inclusion (I3) of this variable to ensure that sample choice is not driving our results).

We consider these effects in turn. Insofar as institutional quality is concerned, the effect of institutional quality *does* appear to be conditioned by structure; the coefficient on the interaction term is significant across all three specifications (I1)–(I3). This suggests that, conditional on the quality of institutions, the degree of democratic development in an economy (recall, our benchmark institutional structure variable is an index of democratic accountability) raises the level of investment; this contrasts to the *unconditioned* effect of institutional structure being insignificant (Tables 1 and 2).[14] The important conditioning effect required by institutional quality for institutional structure to play a role serves as an important caveat to more straightforward claims that merely improving democratic accountability and voice will necessarily lead to improved economic performance (which, in this case, is investment).[15]

Note that, while the coefficient on institutional quality is now negative, the total effect—which requires that we add this coefficient to the product of institutional structure and the coefficient on the interaction term—is likely to be positive for the majority of observations. For example, for the fullest specification (I3), the sample mean of institutional quality and structure

[14] It is also useful to recall, as noted in Table A.3, that these two variables are actually fairly distinct, with the correlation between them (in our sample) being 0.45.

[15] Another way to frame this point is that inclusive political institutions (Acemoğlu and Robinson, 2012) require not only that such institutions encourage broad-based participation from economic agents, but that this participation be premised on rules of the game that are supportive of economic activity.

Table A.3
Correlation matrix for main variables of interest.

	Fixed inv.	Output	Output growth	Cost of capital	Trade open.	Fin. open.	Fin. dev.	Fin. struc.	Inv. climate	Tax env.	Inst. quality	Inst. struc.
Fixed investment	1.000											
Output	0.989	1.000										
Output growth	0.056	0.007	1.000									
Cost of capital	−0.101	−0.091	−0.027	1.000								
Trade openness	−0.292	−0.326	0.132	−0.112	1.000							
Financial openness	0.302	0.316	0.049	0.080	0.159	1.000						
Financial development	0.585	0.575	0.053	−0.120	0.172	0.408	1.000					
Financial structure	0.569	0.559	0.075	−0.185	0.037	0.233	0.424	1.000				
Investment climate	0.303	0.290	0.245	0.006	0.319	0.478	0.478	0.343	1.000			
Tax environment	0.265	0.285	−0.049	0.085	−0.254	0.138	−0.032	0.074	−0.199	1.000		
Institutional quality	0.372	0.376	−0.052	−0.049	0.184	0.328	0.561	0.245	0.348	−0.021	1.000	
Institutional structure	0.339	0.358	−0.109	0.013	0.005	0.417	0.379	0.081	0.384	−0.008	0.453	1.000

Table A.4
Summary statistics for main variables of interest.

Variable	*N*	Mean	Std Dev	Min	Max
Fixed investment	483	22.331	2.294	16.810	28.368
Output	483	23.916	2.229	19.319	30.066
Output growth	483	0.177	0.141	−0.691	0.865
Cost of capital	483	0.717	0.051	0.370	1.199
Trade openness	482	0.584	0.244	0.124	1.646
Financial openness	468	1.051	0.510	0.000	1.670
Financial development	482	0.370	0.262	0.016	1.223
Financial structure	323	0.241	0.279	0.000	1.256
Business environment	418	2.117	0.270	1.071	2.565
Tax environment	234	3.338	0.478	0.000	3.976
Institutional quality	418	1.490	0.275	0.405	1.946
Institutional structure	418	1.598	0.336	0.024	1.946

are 1.54 and 1.70, respectively, which yields the partial derivative of $-1.40 + 0.87(1.70) = 0.08$. Furthermore, when taken in tandem with the negative (and significant in 2 of the 3 specifications) coefficient on institutional structure, the combination points to why including institutional structure alone (without an interaction term) may yield a coefficient statistically indistinguishable from zero, as the two cancel out.

For financial development, including an interaction term with financial structure leads to the coefficient on all three being statistically insignificant. This echoes the result in column (B8) of Table 1, and could be due to a more restrictive sample being employed when financial structure is included. However, another reason can be surmised by examining the coefficient on the interaction term: since it is negative (and relatively large), allowing for interaction effects likely means that the negative conditioning effect of financial structure on development may potentially give rise to a statistically insignificant coefficient on the independent term.

Finally, we should also note that, across all specifications, institutional quality tends to be statistically significant,[16] but not so for financial development. While we hesitate to rule out financial development altogether due to the more restrictive sample in most of the specifications in Table 4, it is nonetheless the case that—as it was in Table 3—the significant impact of financial development on investment is, nevertheless, a more fragile result.

3.6. Subsample analysis

In this subsection we probe further into when financial development and institutional quality may matter by splitting the main sample into distinct subsamples, chosen to potentially offer additional insight into the circumstances under which these variables are operative.

The first column (S1) of Table 5 presents results for a subsample comprising industrialized economies, as captured by membership in the Organisation for Economic Cooperation and Development (OECD) or its status as a Newly Industrialized Economy (NIE),[17] using our preferred specification (B6) that includes both structural and economic controls. Column (S2) reports results from the mutually exclusive (from S1) subsample of non-industrialized economies. For the next two columns,

[16] Even for column (I5), where the coefficient on institutional quality is insignificant, $p = 0.158$.

[17] Defined to include Hong Kong SAR, South Korea, Singapore, and Taiwan; in our dataset, this only expands the OECD subsample to include Hong Kong and Singapore, since Taiwan is not in our data, and South Korea is in any case a member of the OECD.

Table A.5
Regressions for fixed investment with exogenous instruments (economic controls only), unbalanced 5-year average panel, 1980–2009.[a]

	A.E1	A.E2	A.E3	A.E4
Lagged investment	0.647	0.537	0.606	0.382
	(0.13)***	(0.19)***	(0.15)***	(0.23)*
Output	0.371	0.458	0.420	0.688
	(0.13)***	(0.18)**	(0.16)***	(0.22)***
Output growth	1.233	1.134	1.495	1.253
	(0.32)***	(0.28)***	(0.35)***	(0.61)**
Cost of capital	0.711	1.119	−0.588	−0.052
	(1.35)	(1.34)	(0.89)	(0.76)
Trade openness	−0.214	−0.091	−0.286	−0.020
	(0.26)	(0.23)	(0.22)	(0.38)
Financial openness	−0.194	−0.193	−0.140	−0.280
	(0.07)***	(0.07)***	(0.07)**	(0.08)***
Financial	−0.297	−0.042	−0.202	−0.452
development	(0.26)	(0.27)	(0.23)	(0.38)
Institutional	0.461	0.368	0.266	0.660
quality	(0.19)**	(0.20)*	(0.13)**	(0.31)**
Wald χ^2	17,411***	18,052***	8422***	2299***
Hansen J	38.280	35.482	36.237	22.966
AR(2) z	−1.446	−1.286	−1.536	−1.332
Instruments	42	41	41	36
N (countries) 408 (106)	403 (106)	337 (105)	408 (106)	

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects and a constant term were included in the regressions, but not reported.
* Significance at 10 percent level.
** Significance at 5 percent level.
*** Significance at 1 percent level.

Table A.6
Regressions for fixed investment with exogenous instruments (economic and structural controls), unbalanced 5-year average panel, 1980–2009.[a]

	A.E5	A.E6	A.E7	A.E8
Lagged investment	0.608	0.523	0.657	0.321
	(0.22)***	(0.23)**	(0.08)***	(0.26)
Output	0.415	0.454	0.368	0.755
	(0.23)*	(0.24)*	(0.10)***	(0.26)***
Output growth	1.415	1.513	1.395	1.053
	(0.42)***	(0.35)***	(0.26)***	(0.68)
Cost of capital	0.423	1.573	0.824	0.848
	(1.30)	(1.48)	(0.94)	(2.14)
Trade openness	−0.157	−0.083	−0.024	0.319
	(0.20)	(0.21)	(0.16)	(0.52)
Financial openness	−0.140	−0.195	−0.187	−0.148
	(0.08)*	(0.08)**	(0.06)***	(0.10)
Financial	−0.131	0.292	−0.185	−0.133
development	(0.39)	(0.15)**	(0.20)	(0.42)
Institutional	0.453	0.256	0.201	1.068
quality	(0.23)**	(0.33)	(0.08)**	(0.55)*
Business	−0.250	−0.268	0.031	−0.720
environment	(0.34)	(0.30)	(0.17)	(0.53)
Institutional	0.028	0.118	0.081	−0.192
structure	(0.14)	(0.12)	(0.09)	(0.27)
Wald χ^2	5766***	9832***	16,822***	1817***
Hansen J	33.215	28.811	39.364	20.809
AR(2) z	−1.339	−1.457	−1.481	−0.459
Instruments	41	41	43	37
N (countries)	337 (105)	333 (105)	337 (105)	408 (106)

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects and a constant term were included in the regressions, but not reported.
* Significance at 10 percent level.
** Significance at 5 percent level.
*** Significance at 1 percent level.

we split the sample by the mean level of financial development and institutional quality, and report regressions using the above-average subsample for the former (S3) and latter (S4). For the final column (S5), we utilize the full sample, but allow

Table A.7
Regressions for fixed investment with interaction terms, unbalanced 5-year average panel, 1980–2009.[a]

	A.I1	A.I2	A.I3	A.I4	A.I5
Lagged investment	0.600	0.620	0.421	0.356	0.403
	(0.11)***	(0.11)***	(0.08)***	(0.09)***	(0.10)***
Output	0.414	0.393	0.572	0.629	0.592
	(0.12)***	(0.11)***	(0.10)***	(0.10)***	(0.12)***
Output growth	1.078	1.068	1.723	1.175	1.374
	(0.29)***	(0.29)***	(0.30)***	(0.23)***	(0.33)***
Cost of capital	0.768	1.095	0.306	1.278	1.555
	(0.88)	(0.87)	(0.93)	(1.29)	(1.31)
Trade openness	0.158	0.185	0.056	0.086	0.087
	(0.16)	(0.16)	(0.13)	(0.12)	(0.11)
Financial openness	−0.156	−0.146	−0.075	−0.103	−0.123
	(0.06)**	(0.06)**	(0.08)	(0.06)*	(0.07)*
Financial development	0.017	0.028	0.034	0.102	0.097
	(0.11)	(0.11)	(0.12)	(0.16)	(0.15)
Financial structure			0.052	0.166	0.084
			(0.14)	(0.24)	(0.23)
Fin. dev. × fin. struc.				−0.153	−0.057
				(0.22)	(0.21)
Institutional quality	−1.158	−1.152	−1.396	0.162	0.136
	(0.60)*	(0.60)*	(0.91)*	(0.08)**	(0.10)
Institutional structure	−0.934	−0.935	−1.221		0.098
	(0.48)*	(0.47)**	(0.75)		(0.09)
Inst. qual. × inst. struc.	0.692	0.697	0.869		
	(0.34)**	(0.33)**	(0.51)*		
Business environment		−0.069	−0.055		−0.099
		(0.16)	(0.18)		(0.20)
Wald χ^2	18,421***	18,225***	9250***	10,117***	13,206***
Hansen J	29.435	28.634	30.755	28.874	29.156
AR(2) z	−1.927*	−1.853*	−1.003	0.165	0.105
Instruments	45	46	47	41	44
N (countries)	321 (105)	321 (105)	229 (82)	236 (82)	236 (82)

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects and a constant term were included in the regressions, but not reported.
* Significance at 10 percent level.
** Significance at 5 percent level.
*** Significance at 1 percent level.

for heterogeneous slopes between industrialized and non-industrialized economies by introducing interactions for all conditioning variables with an indicator corresponding to industrialized economies.[18]

The results in Table 5 offers further hints as to what drives our main results. Consider, first, the results from the industrialized/non-industrialized subsamples in (S1)–(S2). It is clear that, for industrialized economies, financial development is far more important in stimulating investment activity, whereas institutional quality is more central for investment in non-industrialized ones.[19] This result suggests that—in non-industrialized economies where the strength of institutions is typically weak—it is institutional quality that binds as a constraint on higher levels of investment, whereas financial depth is more central in industrialized economies. This overall finding is somewhat corroborated by specification (S5): although statistically insignificant, the total effect of financial development—as given by the sum of the coefficients on the interacted and uninteracted variable—is indeed positive (suggesting that in industrialized economies, financial development is positively related to investment activity), while the coefficient on institutional quality is only positive and significant in the uninteracted term (suggesting that institutional quality matters more in pre-industrialization environments).

The results from the high financial development/institutional quality subsamples—columns (S3)–(S4)—further indicate that the influence of each on investment may well be non-linear: At above-average levels of each respective variable, their effects flatten out, so that—while they retain their positive coefficients—their magnitudes are smaller, so they are no longer statistically significant (although the effect of the other corresponding variable remains at least marginally significant). Importantly, there is limited overlap between the two above-average subsamples: 34 economies appear in the high institutional quality subsample that do not appear in the high financial development subsample, and conversely, 18 countries appear in the high financial development subsample but not the high institutional quality one. Nor do these countries appear

[18] As noted by Robertson and Symons (1992), small differences in slopes can create substantial bias in estimates, especially in a dynamic context. The particular approach we employ implies that the effects of any given uninteracted variable would be the average effect across the full sample, and the sum of the coefficients on the uninteracted and interacted variable would provide the effects that pertain to industrialized economies alone. We are indebted to an anonymous referee for suggesting this approach.
[19] This finding survives in a pure-OECD/non-OECD subsample as well; these results are available on request.

to be mainly high-income or developing. The implication of this fairly large non-overlap, then, is that the non-linearity result does not seem to be driven by a small set of countries, but is reflective of a more systematic difference between economies that demonstrate high levels of either financial development or institutional quality.

4. Conclusion

In this paper, we have sought to empirically examine the manner by which structural and institutional factors contribute to cross-country variation in investment activity. We obtain two main findings. First, we find that financial development and institutional quality are reasonably robust determinants of investment, even after controlling for a host of additional candidate structural variables and economic controls, alternative measures of both investment and structural factors, and additional confounding variables. Second, while these results are likely to be robust to weak endogeneity concerns, using external instruments leads to the conclusion that institutional quality is likely to be less sensitive to reverse causality concerns.

Our findings offer a nice complement to the existing literature on the role of financial development and institutions in economic growth. But in contrast to that voluminous literature, we are able to establish the contribution of these variables on a specific channel for growth—capital accumulation—and to demonstrate the dominance of institutional quality in influencing economic performance (Rodrik et al., 2004), while not ruling out the important role that financial development can play, in contrast to other structural determinants. Future research that seeks to model the key dynamics of investment can thus benefit from a more intentional modeling of these two factors, in particular the manner by which the two may interact to influence capital accumulation decisions.

The results in this paper also point to the fact that a favorable investment climate is characterized not so much by traditional policy areas that have been known to foster private sector investment—such as a stable macroeconomic and regulatory regime, or tax credits favoring business investment—but more by the broader institutional environment in which firms operate, which includes secure property rights and stable rule of law, and by the governance framework, such as adequate control of corruption. In an analogous fashion, policy that seeks to enhance investment financing should probably focus on improving the level of development of the financial sector, as opposed to more narrowly-conceived investment credits and incentives. Such well-functioning financial systems are more likely to ensure a superior mobilization and corresponding allocation of saving toward the most productive investment opportunities, and raise the level of investment in the economy overall.

Table A.8
Regressions for fixed investment on selected subsamples, unbalanced 5-year average panel, 1980–2009.[a]

	A.S1	A.S2	A.S3	A.S4
Lagged investment	0.634	0.591	0.471	0.698
	(0.10)***	(0.13)***	(0.18)**	(0.21)***
Output	1.012	1.164	1.060	1.385
	(0.39)***	(0.39)***	(0.39)***	(0.32)***
Output growth	0.318	0.437	0.501	0.266
	(0.11)***	(0.14)***	(0.18)***	(0.21)
Cost of capital	−3.686	1.995	−0.431	−0.439
	(1.94)*	(1.26)	(0.84)	(1.02)
Trade openness	−0.099	0.243	−0.094	−0.071
	(0.16)	(0.24)	(0.11)	(0.14)
Financial openness	−0.096	−0.174	−0.068	0.002
	(0.08)	(0.09)*	(0.06)	(0.05)
Financial	0.192	−0.025	0.117	0.154
development	(0.10)**	(0.14)	(0.11)	(0.09)*
Institutional	−0.279	0.315	0.223	0.139
quality	(0.18)	(0.19)*	(0.10)**	(0.17)
Business	0.641	−0.209	−0.085	−0.103
environment	(0.26)**	(0.19)	(0.28)	(0.14)
Institutional	−0.041	−0.058	−0.162	0.063
structure	(0.14)	(0.11)	(0.13)	(0.08)
Wald χ^2	33,096***	3454***	18,604***	51,763***
Hansen J	16.147	26.271	33.258	29.902
AR(2) z	0.004	−1.191	−0.834	0.287
Instruments	42	42	43	48
N (countries)	104 (32)	220 (73)	144 (51)	177 (68)
Subsample?	Ind.	Non-ind.	High FD	High IQ

[a] All variables are in log form. Heteroskedasticity and autocorrelation-robust standard errors are reported in parentheses. Period fixed effects and a constant term were included in the regressions, but not reported. FD = financial development, IQ = institutional quality.

* Significance at 10 percent level.

** Significance at 5 percent level.

*** Significance at 1 percent level.

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Appendix A. Technical appendix

A.1. Data description

This subsection reports basic features related to the data, for the main variables of interest. This includes detailed sources and definitions (Table A.1), countries included in the sample (Table A.2), standard summary statistics (Table A.4), and the corresponding correlation matrix (Table A.3).

A.2. Detailed robustness regression results

This subsection reports the full results of the regressions for fixed investment with exogenous instruments, with (Table A.6) and without (Table A.5) additional institutional and structural variables, analogous to specifications (B4) and (B6), respectively. The specifications below rely on exogenous instrument sets that vary from the benchmark according to: (A.E1) and (A.E5) utilize the Hall and Jones (1999) language share and La Porta et al. (1998) legal origin instruments; (A.E2) and (A.E6) utilize only language shares, with lagged domestic credit included as internal exogenous instruments; (A.E3) and (A.E7) utilize only legal origin, with lagged institutional quality included as internal exogenous instruments; and (A.E4) and (A.E8) utilize the Acemoğlu et al. (2001) settler mortality and legal origin instruments.

Table A.9
Benchmark regressions for fixed investment, unbalanced annual panel, 1980–2009.[a]

	A.B1	A.B2	A.B3	A.B4	A.B5	A.B6	A.B7	A.B8
Lagged investment	0.869	0.865	0.857	0.835	0.833	0.834	0.785	0.858
	(0.01)***	(0.01)***	(0.01)***	(0.02)***	(0.02)***	(0.02)***	(0.03)***	(0.02)***
Output	1.754	1.699	1.733	1.845	1.834	1.837	2.048	2.140
	(0.06)***	(0.06)***	(0.06)***	(0.08)***	(0.08)***	(0.08)***	(0.10)***	(0.09)***
Output growth	0.141	0.117	0.115	0.161	0.156	0.155	0.276	0.145
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.05)***	(0.03)***
Cost of capital	0.003	0.004	0.017	0.048	0.043	0.042	−0.232	−0.166
	(0.04)	(0.04)	(0.05)	(0.03)	(0.03)	(0.03)	(0.14)*	(0.06)***
Trade openness		0.145	0.130	0.130	0.124	0.130	−0.029	−0.075
		(0.04)***	(0.03)***	(0.04)***	(0.04)***	(0.05)***	(0.08)	(0.05)
Financial openness		0.023	0.023	0.003	0.001	0.001	−0.008	0.011
		(0.01)***	(0.01)**	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Financial development			0.055	0.060	0.055	0.055	0.198	0.069
			(0.03)**	(0.03)*	(0.03)*	(0.03)*	(0.05)***	(0.03)**
Institutional quality				0.022	0.023	0.028	0.035	0.043
				(0.02)	(0.02)	(0.02)*	(0.04)	(0.02)**
Business environment					0.020	0.023	0.031	0.013
					(0.02)	(0.01)	(0.03)	(0.01)
Institutional structure						−0.018	0.004	−0.033
						(0.02)	(0.04)	(0.02)**
Tax environment							0.011	
							(0.03)	
Financial structure								0.012
								(0.02)
Adj. R^2	0.733	0.723	0.736	0.799	0.801	0.802	0.811	0.832
R^2 (within)	0.733	0.723	0.737	0.800	0.801	0.803	0.813	0.834
N (countries)	2869 (157)	2684 (157)	2646 (153)	1903 (118)	1903 (118)	1903 (118)	763 (91)	1267 (89)
I	157	153	153	118	118	118	91	89

[a] All variables are in log form. Standard errors (in parentheses), corrected for Nickell (1981) bias up to $O(1/T)$, are generated from bootstrapped variance-covariance matrices with 50 replications and initialized using the Blundell and Bond (1998) estimator. A constant term was included in the regressions, but not reported.

* Significance at 10 percent level.

** Significance at 5 percent level.

*** Significance at 1 percent level.

We also report full results for the regressions with interaction terms; these are likewise reported with and without additional institutional and structural controls (Table A.7). (A.I1) includes only economic controls for regressions that include an interaction term for institutional quality and structure, while (A.I2) includes additional structural controls, with the exception of financial structure (since this reduced the sample significantly). To ensure that the results were not dependent on the expanded sample, (A.I3) includes financial structure in the set of structural controls. (A.I4) and (A.I5) repeat the exercise with the interaction between financial development and structure, both without and with additional structural controls, respectively.

Next, we report full results for regressions on subsamples, all with additional institutional and structural controls, analogous to specification (B6) (Table A.8). (A.S1) is for a subsample comprised of only economies in the OECD or are NIEs, while (A.S2) is for the mutually exclusive subsample of non-OECD/NIE economies. (A.S3) and (A.S4) are, respectively, subsamples where economies possess levels of financial development and institutional quality higher than their respective sample means.

Finally, we report results corresponding to *annual* data (Table A.9), replicating the benchmark specification in Table 1 (which is in 5-year averages). Because of the lagged dependent variable, estimates from a standard fixed effects specification would be subject to Nickell (1981) bias. We therefore apply a bias-corrected LSDV estimator due to Bruno (2005), and obtain standard errors from bootstrapped variance-covariance matrices initialized using the Blundell and Bond (1998) estimator, over 50 replications (results are qualitatively similar when initialized with other estimators). Although the coefficients are not strictly comparable (since they correspond to data at different frequencies),[20] the two main qualitative messages—that financial development and institutional quality are the main robust determinants of investment, with the former effect around twice as large in magnitude as the latter—continues to hold, albeit the statistical significance of the institutional quality variable is weaker than the benchmark results (likely owing to its reduced variation in the annual data; within estimators of this nature do not account for between variation, which is relevant for our dataset).

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[20] In particular, at an annual frequency the lagged dependent variable absorbs more of the variation (as might be expected), and so any effects from variation in the structural variables are more muted.

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