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Chapter Author(s): Sebnem Kalemli-Ozcan, Bent E. Sørensen

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Misallocation, Property Rights, and Access to Finance

Evidence from within and across Africa

Sebnem Kalemli-Ozcan and Bent E. Sørensen

5.1 Introduction

A number of recent studies argue that misallocation of resources across firms is a prime cause of underdevelopment. Standard theory implies that if domestic capital markets are functioning well, the marginal product of capital (MPK) of each firm equals the market interest rate. If firms instead borrow at different interest rates, maybe due to differential access to informal finance or due to political connections, capital is likely to be misallocated and the MPK will differ across firms.

Alfaro, Charlton, and Kanczuk (2008), Banerjee and Duflo (2005), Bartelsman, Haltiwanger, and Scarpetta (2009), Hsieh and Klenow (2009), and Restuccia and Rogerson (2008) provide evidence of misallocation in different countries and show that misallocation of resources can explain up to 60 percent of the aggregate total factor productivity (TFP)-differences between poor and rich countries. Differential access to credit may not necessarily lead to severe misallocation if firms with higher MPK invest more, as Banerjee and Moll (2010) point out. However, in the absence of secure property rights owners may not reinvest profits: even if the return to investment is high, government officials may grab a large share of earnings, dilut-

Sebnem Kalemli-Ozcan is professor of economics at the University of Maryland and a research associate of the National Bureau of Economic Research. Bent E. Sørensen is the Lay Professor of Economics at the University of Houston.

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ing the incentive of owners to reinvest. Johnson, McMillan, and Woodruff (2002) find exactly such behavior in Russia and Ukraine after the breakdown of communism.

We ask two questions in this chapter: What is the extent of capital misallocation within African countries, and why does misallocation vary across these countries? We quantify capital misallocation across manufacturing establishments within ten African countries in 2005 and 2006 using establishment-level data from the World Bank Productivity and Investment Climate Survey.¹ This is a unique survey undertaken as part of a major World Bank initiative between 1999 and 2007 in eighty developed and developing countries around the world. The main purpose of the survey was to identify obstacles to firm performance and growth; hence the survey not only asks questions on firm characteristics and outcomes, but also asks many questions on the perceived severity of obstacles such as crime, infrastructure, and financing constraints. Having firms' own perceptions of financing constraints is a big advantage of the data set because much of the literature infers financing constraints from companies' financial statements using various modeling and econometric techniques. This data set has been used by, among others, Beck et al. (2006) and Beck, Demirgüç-Kunt, and Maksimovic (2005), who show that these self-perceived constraints actually bind and hurt firm growth. Our data set has information on small and large, as well as listed and private firms, which allows us to control for some important firm characteristics. To the best of our knowledge, there is no systematic study undertaken that calculates the extent of misallocation and its determinants for Africa using comparable firm-level data from many countries.

In the literature, there are various approaches employed for calculating the extent of misallocation of capital across firms within a country. As stated above, one of the advantages of our data set is that it allows us to compare the interest rates firms are paying with the market interest rate. This is our starting point because we have data on the interest rates each firm pays on loans. We show that many firms borrow at rates up to 30–40 percent, suggesting that firms have even higher marginal returns to capital.²

We calculate the MPK for each firm using firm-level output and capital stocks under the assumption that the production function is Cobb-Douglas (with parameters calibrated from the literature). Doing so reveals that the distribution of the MPK varies a lot within most African countries. This indicates that capital is inefficiently allocated—a fact that cannot be derived from country-level aggregate figures. We next calculate a measure of mis-

1. Here, “establishment” refers to a production unit that may be part of a larger firm, but for simpler reading we will also use the term “firm.”

2. Banerjee (2002) displays similar evidence for other developing countries. He emphasizes that these rates must be the rates that firms actually pay because default is rare.

allocation suggested by Hsieh and Klenow (2009), and this measure also indicates imperfect capital and/or labor allocation.³

Having calculated the extent of misallocation, we seek to explain firm-level differences in returns to capital within countries and the variation in misallocation across countries. First we show, using multiple regressions, that firms with less access to finance have higher MPK. Small firms have lower MPK (conditional on access to finance and other regressors), indicating that higher efficiency could be attained by allocating more capital to large firms. Moving from a firm where access to finance is no obstacle to a firm where access to finance is a very severe obstacle increases the MPK by 45 percent, revealing that obstacles to credit have important real effects. Second, we find a clear positive correlation between country-level misallocation and the strength of property rights, measured using expropriation risk and investment profile variables from the International Country Risk Guide (ICRG). These variables help explain the variation in misallocation across African countries consistent with the patterns found by Johnson, McMillan, and Woodruff (2002) for former communist countries.

Hence, we contribute to the recent debate on “what works in Africa?” in the following sense. Once we calculate the extent of misallocation using different methodologies, we can explain the determinants of this misallocation at the firm level and relate country variation in misallocation to the broader investment climate and business environment. This, in turn, helps us answer why certain countries have better allocation of capital across firms; that is, we can identify relatively successful countries, such as South Africa and Botswana, relative to unsuccessful ones, such as Ghana and Nigeria, and suggest reasons behind their success.

We use very simple measures of misallocation. In the process of writing the chapter, a large amount of measures were considered, using different production-function parameters depending on labor and capital type. These more complicated measures produced very noisy patterns and served little purpose. We believe that the lesson from this nonreported work is that fairly underdeveloped economies face many unmeasured obstacles, which obscure patterns in anything but simple straightforward measures.⁴ It may be the case that some firms pay higher interest rates due to risk premiums, and it may be the case that the simple functional forms we use to measure the MPK are misspecified, making our measures of misallocation noisy. We therefore

3. We attempted a final approach by estimating the correlation between productivity and size (see Alfaro, Charlton, and Kanczuk 2008; Bartelsman, Haltiwanger, and Scarpetta 2009); however, we did not find any clear patterns.

4. We studied alternative measures of labor cost (separating full-time, part-time, temporary, and nonproduction workers), other measures suggested by Hsieh and Klenow (2009), and more narrow indicators of financing constraints, such as use of collateral. We also attempted to include both manufacturing and nonmanufacturing firms.

compare the statistics calculated for African countries to corresponding statistics calculated for a selection of non-African countries at different levels of development—namely, Germany, Ireland, Spain, South Korea, and India. This comparison reveals that standard deviations across firms of all our misallocation measures are much larger in Africa. For example, the standard deviation of the interest rate is 2–5 times higher in African countries than in European countries and the standard deviation of the MPK is about 40 percent higher in African countries (and in India) than in European countries. More than 50 percent of firms in Africa report that access to finance is a severe obstacle, while very few firms in Europe report this as a severe obstacle.

The rest of the chapter is structured as follows. Section 5.2 reports on our field trip to Ghana, a country with a high level of misallocation. Section 5.3 describes our data in detail, while section 5.4 presents results from our empirical analysis. Section 5.5 concludes.

5.2 Observations from Investigators' Trip to Ghana

The authors visited Ghana in May 2011 and interviewed several people familiar with local conditions, such as academics and foreign entrepreneurs. Foreign firms are concentrated in Accra, the capital of Ghana, in a free trade zone that has reliable electricity (although many companies in Ghana rely on generators) and, most importantly, a large modern harbor that allows for easy shipping. Foreign entrepreneurs finance investments with retained earnings or nonlocal financing because contract enforcement in Africa is weak. Most projects are done with a 50 percent down payment up front. The main attraction by far of investing in Ghana (relative to alternative sub-Saharan countries) is political stability, although a reliable local workforce is another plus. It was mentioned that workers from some other African countries are considered less reliable. One multinational corporation located production in Ghana due to local demand for its product from other foreign companies operating in Ghana and sub-Saharan Africa. This corporation was originally shipping its product from an affiliate outside of Africa but could not keep up with the orders—the motivation for shipping from afar was put as: “Nobody wants to buy something made in Africa because quality is perceived to be poor.”

Foreign companies have to obey a 70 percent local content requirement, which means 70 percent of the workforce should be Ghanaians. This constitutes a problem because the local workforce lacks basic skills; for example, plumbers are hard to find. The companies bring in high-tech personnel from India and the Philippines or from the United States (although Americans sometimes do not want to stay) to train the local workforce. This, however, is costly, being very time intensive. Foreign entrepreneurs try to circumvent the 70 percent requirement by other means (one example given was plead-

ing with officials) in order to get things done. Companies import all capital goods and intermediate goods from the United States and other developed countries.

There was general agreement that access to capital through formal channels, such as banks, is severely limited in particular due to lack of clear property rights to land. Being unable to use land as collateral makes it difficult for small businesses to get loans. Microloans (informal) are often available but annual rates are very high, often above 50 percent. One US multinational company owner said that the main reason, more important than infrastructure, for investing in a factory in the free trade zone was that the land is owned by the government—the company paid for a forty-seven-year lease in advance. Local firms are shut out from financial intermediation and borrow from family or local unofficial lenders. Banks mainly serve the government.

Small-scale corruption is another major problem. (Maybe also large-scale corruption, although we did not learn about that.) Mango producers in the north of Ghana were not able to get fruit to the market in Accra without paying prohibitive bribes at police check points, which also slow down trucking on the already inadequate roads (by US standards; according to the foreign entrepreneur, the roads are good by Africa standards). As we understood, police bribes are not particularly large, maybe a few dollars, but with enough checkpoints, it becomes unprofitable to transport low-margin goods over any substantial distance. In the descriptive statistics tables to be discussed later, we show numbers for Ghana and for African countries pooled.

5.3 Data

5.3.1 Productivity and Investment Climate Survey

The firm-level data comes from the Productivity and Investment Climate Survey of the World Bank,⁵ administered in roughly parallel fashion to enterprises in twenty-one countries in Africa, mostly in face-to-face interviews. The data set provides a basis for making country comparisons of investment climate and severity of constraints affecting firms. It captures firms' perceptions of key constraints in the business environment that shape operational and investment decisions, as well as several quantitative indices of firm experience.

The first roll out of surveys was done in 2006 for thirteen countries: Burundi, Congo, Botswana, Angola, Guinea Bissau, Guinea-Conakry (or Republic of Guinea), Namibia, Gambia, Mauritania, Swaziland, Tanzania, Uganda, and Rwanda. In 2007, a second roll out was conducted in eight additional countries: South Africa, Mozambique, Zambia, Mali, Ghana,

5. The data and related documents are available at <http://www.enterprisesurveys.org/>.

Senegal, Kenya, and Nigeria. Questionnaires of the two roll outs are not systematically different, except that the second questionnaire generally has more detailed questions. The World Bank also surveys some developed and emerging market countries, but the structure of the questionnaires is somewhat different from that used in the African surveys. For comparison with Africa, we choose Germany, India, Ireland, South Korea, and Spain.⁶

The data set for African countries, merging the two roll outs, has information on 12,752 establishments. For the comparison countries, we have data for 1,196 German, 2,286 Indian, 501 Irish, 598 South Korean, and 606 Spanish establishments. Enterprises with five to nineteen, twenty to ninety-nine, and over one hundred employees are labeled small, medium, and large, respectively.

The Productivity and Investment Climate Survey comprises four sets of questionnaires, which are particularly designed for the following sectors: manufacturing, retail, residual (out of manufacturing and retail), and micro (also called the informal sector). Each questionnaire has several sections in which detailed information is given. In related surveys, entrepreneurs provided general information including legal status (e.g., proprietorship); the percentage owned by the largest shareholder; private, foreign, or government ownership; sex and ethnic origin of the majority owner; level of education and experience of the top manager; when the firm was established; and whether it was formally registered (section A). The survey also provides information on sales and exports (section C), supplies and import (section D), capacity and innovation (section E), investment climate constraints (section F), infrastructure (G), conflict resolution/legal environment (section H), business-government relations (section I), labor regulation (section J), finance (section K), and productivity (section L). The data was collected using similar survey-sampling methodologies because one of the main objectives in establishing this database is to provide a wide set of measures of firm outcomes and structures that are comparable across countries. The database is mainly a stratified sampling of firms from a representative sample provided by the national statistical offices. If this is not available, stratification is done on a randomly drawn sample. Sample stratification is based on having a third of the data be represented by each size group. Representation of several sectors was also an objective.⁷

5.3.2 Questions on Obstacles

The main question on obstacles is: Do you think the following (X) present any obstacle to the current operations of your establishment? The answers

6. The World Bank also surveys Brazil, China, and Turkey. However, the structure of those surveys is too different from that of the African surveys to allow us to make comparisons.

7. The World Bank provides sample selection notes giving detailed information on sampling methodologies for the Enterprise Surveys. Some notes are available at <http://www.enterprise-surveys.org/>. Details for the Africa sample are available from the authors by request, but sample selection notes are not available for Germany, India, Ireland, South Korea, and Spain.

are no obstacle, minor obstacle, moderate obstacle, major obstacle, and very severe obstacle, which are assigned the numerical values 1, 2, 3, 4, and 5, respectively. We have averaged answers to the question stated above into four groups: limited access to finance, weak infrastructure, weak law and order, and red tape. Weak infrastructure is the average of answers to this question where X is “electricity,” “telecommunications,” “transportation,” and “access to land.” Red tape is the average of answers to this question where X is “tax rates,” “tax administration,” “customs and trade regulations,” “labor regulations,” and “business licensing and permits.” Weak law and order is the average of answers to this question where X is “functioning of the courts,” “political instability,” “corruption,” “macroeconomic instability,” “crime, theft, and disorder,” and “practices of competitors in the informal sector.” Weak law and order and red tape are coded such that higher values correspond to less law and order and more red tape. For Indian firms, the answers vary between 0 (no obstacle), 1 (minor obstacle), 2 (moderate obstacle), 3 (major obstacle), and 4 (very severe obstacle).

5.3.3 Construction of Misallocation Measures

The variables we use from the Investment Climate Survey are annual interest rates (self reported), sales, capital stock at current replacement cost, labor, total cost of materials and intermediate inputs, total capital income, and total cost of labor. Variables in domestic monetary values are converted into US dollars using the annual exchange rates from World Development Indicators.⁸ The definitions are as follows:

- Annual nominal interest rate (R): For annual nominal interest rates, we directly use the information on interest rates paid on loans.⁹
- Annual real interest rate: To calculate real interest rates, we subtract inflation of the year the surveys are conducted. The inflation rate, obtained from the International Monetary Fund, is the annual percent change in consumer prices.
- Value added (Y): Value added is constructed as total sales minus total cost of raw materials and intermediate goods used in production.
- Replacement cost value of capital stock (K): Historical cost of replacing all machinery and equipment with new machines.
- Labor measure (L): We use information on the total number of full-time permanent employees at the end of the survey year to proxy labor used in the production process. Permanent employees are defined as all paid employees that work eight or more hours per day with a contract for a

8. We noticed that monetary values reported in the domestic currency of Ghana are equal to the ones supposedly converted to US dollars. In order to fix that, we multiplied monetary values in the domestic currency of Ghana by 0.00011, the annual dollar exchange rate of Ghana in 2006.

9. The question is as follows: Does your establishment currently have a line of credit or loan from a financial institution? If so, what is the average annual interest rate?

term of one or more fiscal years and/or have a guaranteed renewal of their employment contract.

- Total cost of labor (wL): Includes wages, salaries, bonuses, and social payments.
- Total capital income (RK): We multiply the replacement cost of capital (K) with R , which is taken as 15 percent. Hsieh and Klenow (2009) use a value of 10 percent, but because the average nominal interest rate for our African sample is about 15 percent, we choose this higher value. For our benchmark samples, the average nominal interest rates are given in table 5.3.

Using the above variables, we calculate two measures of misallocation previously used in the literature. We follow Hsieh and Klenow (2009) and outline the pertinent features of their model here.

Assume that aggregate output (or, in Hsieh and Klenow, sectoral output) is a CES index of differentiated outputs of firms $i = 1, \dots, M$; that is, $Y = (\sum_{i=1}^M Y_i^{(\sigma-1)/\sigma})^{\sigma/(\sigma-1)}$, with the production of each differentiated product given by a Cobb-Douglas production function

$$Y_i = A_i K_i^\alpha L_i^{1-\alpha},$$

where A_i is firm-level TFP, K_i is capital input, and L_i is labor. Profits are

$$\pi = (1 - \tau_{y_i}) P_i Y_i - w L_i - (1 + \tau_{K_i}) R K_i,$$

where P_i is the price of output and R is the rental price of capital; τ_{y_i} is an output distortion, such as a tax on firm i 's output, which does not affect the relative choice of capital and labor; τ_{y_i} is allowed to vary by firm and is intended to capture distortions such as corruption or any other impediment to production of firm i , which affects output but is not tied to capital or labor; and τ_{K_i} captures access to credit. A positive value indicates that a firm pays a higher cost of capital than the official interest rate R , for example, because the firm only has access to informal credit at high rates. Profit maximization gives price as a markup over marginal cost: $P_i = [\sigma / (\sigma - 1)] (R / \alpha)^\alpha [w / (1 - \alpha)]^{(1-\alpha)} [(1 - \tau_{K_i})^\alpha] / A_i (1 - \tau_{y_i})$. The capital-labor ratio is then

$$(1) \quad \frac{K_i}{L_i} = \frac{\alpha}{1 - \alpha} \frac{w}{R} \frac{1}{1 + \tau_{K_i}},$$

which reflects the relative capital/labor distortion. The marginal revenue product of capital (denoted $MRPK$) is

$$(2) \quad MRPK_i = \alpha \frac{\sigma - 1}{\sigma} \frac{P_i Y_i}{K_i} = R \frac{1 + \tau_{K_i}}{1 - \tau_{y_i}},$$

which is larger, the larger the output distortion and the larger the capital/labor distortion.

Based on these considerations, we use the following measures of misallocation

1. MPK:

$$(3) \quad MPK_i = \alpha \frac{P_i Y_i}{K_i}.$$

This measure corresponds to equation (2) for $\sigma = \infty$, the case of perfect competition. The scaling of $P_i Y_i / K_i$ by any constant will not affect our regressions, where we use the logarithm of MPK, and affects only the descriptive statistics where we focus on the dispersion, rather than the level, of MPK. Because we do not know what would be a suitable value of σ in our sample, we use the perfect competition benchmark.

2. Hsieh and Klenow Measure (HK): For $\alpha = 1/3$, we calculate the index introduced by Hsieh and Klenow as

$$(4) \quad HK_i = \frac{\alpha}{1 - \alpha} \frac{(wL)_i}{RK_i}.$$

This measure directly reflects the relative capital distortion because it, under the assumptions of Hsieh and Klenow's model, directly measures $1 + \tau K_i$ as can be seen from equation (1).

5.3.4 Sample Selection Criteria

In our analysis, we use manufacturing firms and limit ourselves to countries with at least thirty-five firms having observations on nominal interest rates. Thus, the baseline sample comprises ten African countries with 4,039 firms, Germany with 221 firms, India with 2,286 firms, Ireland with 175 firms, South Korea with 215 firms, and Spain with 134 firms.

We apply the following sample selection criteria to all firms in the baseline sample:

- We drop firms with missing information on key variables such as value added, capital stock, and labor.
- We drop government-owned firms.
- We drop firms with negative age, which is calculated as the difference of the corresponding year that the firm is surveyed and its date of establishment. Thus, if age is negative, we treat the date of establishment as faulty.
- We drop firms with negative values of sales, capital stock, labor, total cost of raw materials and intermediate goods.
- We drop firms whose replacement cost of capital stock is zero and whose replacement cost is bigger than the net book value of capital.
- We drop firms below the 1 percent and above the 99 percent tails of replacement cost value of capital stock.

In the final sample, the total number of firms in African countries (Botswana, Burundi, Ghana, Kenya, Nigeria, Senegal, South Africa, Tanzania, Uganda, and Zambia) is 3,908. The final sample has 168 German firms, 2,129 Indian firms, 140 Irish firms, 178 South Korean firms, and 114 Spanish firms.

5.3.5 Country-Level Data

Our country-level broad institutional measures come from the ICRG Researcher Dataset and World Bank Doing Business databases.

The first mentioned data set collects political information and financial and economic data, converting these into risk points for each individual risk component on the basis of a consistent pattern of evaluation. The political risk components are “government stability,” “socioeconomic conditions,” “investment profile,” “external conflict,” “internal conflict,” “corruption,” “military in politics,” “religious tensions,” “weak law and order,” “ethnic tensions,” “democratic accountability,” and “bureaucracy quality.” The main variables used from this data set are “corruption” and “investment profile.”

The second data set provides quantitative measures of regulations regarding starting a business, dealing with construction permits, employing workers, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, and closing a business. The main variable we use from this data set is “registering property (days).”

- *Registering property*: The number of days it takes to register property that an entrepreneur wants to purchase.
- *Corruption*: This is a measure that assesses actual or potential corruption in the form of excessive patronage, nepotism, job reservations, “favors for favors,” and secret party funding. Larger values of the index indicate higher risk of conducting business ineffectively.
- *Investment profile*: This is an assessment of factors affecting the risk to investment that are not covered by other political, economic, and financial risk components. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of zero points. A score of four points indicates very low risk and a score of zero indicates very high risk. The subcomponents are “contract viability/expropriation,” “profits,” “repatriation,” and “payment delays.” Larger values of the index indicate higher risk of expropriation, payment delays, and so forth.

5.4 Empirical Analysis

5.4.1 The Extent of Capital Misallocation

In table 5.1, we display descriptive statistics for our main sample of countries (Burundi, Kenya, South Africa, Senegal, Botswana, Nigeria, Uganda,

Table 5.1 Descriptive statistics

	Obs.	Mean	Std. dev.	Min.	Max.	Median	Kurtosis
<i>A. African countries, 2005–2006</i>							
Nominal interest rate	811	15.3	6.1	0	50	14	6.6
Real interest rate	811	8.7	6.2	-11.6	44.4	7.7	6.3
log (K/L)	3,538	1.5	1.8	-3.7	9.1	1.5	2.8
log MPK	3,533	-0.9	1.4	-7.3	5.6	-0.9	3.9
log HK-index	3,539	0.2	1.5	-6.3	6.1	0.3	3.4
<i>B. Ghana, 2006</i>							
Nominal interest rate	52	20.5	7.3	1.5	33.3	21.1	3
Real interest rate	52	9.8	7.3	-9.2	22.6	10.4	3
log (K/L)	284	0.1	1.6	-3.7	5.9	-0.1	3.5
log MPK	284	-0.6	1.5	-7.3	5.6	-0.6	7.1
log HK-index	284	0.7	1.4	-6.3	5.4	0.7	6
<i>C. Germany, 2005</i>							
Nominal interest rate	114	8.5	2.9	4.1	17	7.8	4.2
Real interest rate	114	6.6	2.9	2.2	15.1	5.9	4.2
log (K/L)	158	4	1.1	0	6.7	4.1	4.3
log MPK	155	-0.7	1.1	-3.6	2.7	-0.7	4
<i>D. India, 2004</i>							
Nominal interest rate	694	12	6.3	0	95	11.5	94.3
Real interest rate	694	8.2	6.3	-3.8	91.2	7.7	94.3
log (K/L)	1,495	1.3	1.5	-6.4	9.3	1.4	7.1
log MPK	1,462	-1.2	1.6	-8.9	12.6	-1.4	9.9
log HK-index	1,481	-0.2	1.9	-9.2	13.7	-0.2	8.6
<i>E. Ireland, 2005</i>							
Nominal interest rate	96	4.7	1.6	2.7	9.5	4.2	3.5
Real interest rate	96	2.3	1.6	0.3	7.1	1.8	3.5
log (K/L)	132	4.4	1.1	0.2	7	4.4	4.9
log MPK	119	-2.4	1.2	-5	2.4	-2.5	6.4
log HK-index	131	1.4	1.2	-1.6	5.3	1.5	4.4
<i>F. South Korea, 2005</i>							
Nominal interest rate	106	6.4	1.5	2	12	6	5.6
Real interest rate	106	3.6	1.5	-0.8	9.2	3.2	5.6
log (K/L)	152	4.3	1	1.6	6.5	4.3	2.7
log MPK	144	-1	1	-3.8	1.9	-1.1	3.7
<i>G. Spain, 2005</i>							
Nominal interest rate	63	4.1	1.5	2.5	12	3.7	12.5
Real interest rate	63	0.7	1.5	-0.9	8.6	0.3	12.5
log (K/L)	90	4.2	1	2.1	6.8	4.2	2.5
log MPK	88	-1	0.8	-2.5	0.9	-1.2	2.3
log HK-index	88	1.5	0.9	-0.4	3.7	1.4	2.5

Notes: The nominal interest rate is the response to the question “What is the annual cost of loans (i.e., rate of interest)?” To calculate the real interest rate, we subtract the annual inflation rate (percent change in consumer prices) in the year of the survey. The marginal product of capital (MPK) is calculated as $\alpha(Y/K)$ where Y and K are value added and replacement cost of capital stock, respectively. The Hsieh-Klenow (HK) index is calculated as $[\alpha/(1-\alpha)][(wL)/(RK)]$ where wL and RK stand for total cost of labor and capital, respectively. The standard deviation is calculated for each country and then averaged. The Africa sample comprises Botswana, Burundi, Tanzania, Uganda, Kenya, South Africa, Ghana, Nigeria, Zambia, and Senegal. The firms being surveyed in Germany and South Korea are not asked about the total cost of labor (wL), thus values of the HK-index are not available for those firms; K/L is calculated using the total number of full-time workers at the end of the year of the survey. See the data section for detailed explanations of the variables.

Ghana, Tanzania, and Zambia). These statistics are calculated for each country and then averaged. We display statistics for Ghana separately and—for comparison to emerging and developing countries—Germany, India, Ireland, South Korea, and Spain. The table displays nominal and real interest rates, the logarithm of the capital-labor ratio, the logarithm of the MPK, and the logarithm of the Hsieh-Klenow HK-index. We choose to show the variables in logarithmic form, where the variables are close to normally distributed, because this is how they are used in the regression analysis.

For the African countries, nominal interest rates have a mean of 15.3 with a standard deviation of 6.1, have minimum and maximum values of 0 and 50, respectively, and exhibit high kurtosis (compared with the value of 3 for the normal distribution). Real interest rates have a mean of 8.7 percent, a standard deviation of 6.2, a minimum of -11.6 , and a maximum of 44.4. Inflation rates may differ widely between rural and urban areas, and in either event such negative, numerically large, real rates are suspicious, so we will focus on nominal interest rates—see Deaton and Heston (2010) for some issues in measuring price levels in developing countries. It is hard to know what is the optimal level of the interest rate in these countries, but large variation in interest rates indicates suboptimal allocation of capital. Ghana seems fairly similar to other African countries, with a large standard deviation of nominal interest rates at 7.3. Szabo (2011) points out that family loans in Ghana are quite common and often carry very small nominal interest rates, and combined with the very high interest rates in the informal market pointed out earlier, this helps explain the enormous spread in interest rates. Interest rates display similar large spreads within India (standard deviation of 6.3) while they are much less dispersed, with standard deviations at 2.9 and below in the developed countries Germany, Ireland, South Korea, and Spain. This indicates that the large spreads observed in Africa do not reflect actuarially fair risk premiums.

Capital-labor ratios are approximately log-normally distributed with the log-ratio having a kurtosis of about 3 in Africa. If capital is efficiently allocated, all firms have the same MPK but, obviously, our MPK measures are estimated under highly simplifying conditions and therefore estimated MPKs will vary, maybe due to the simplifying conditions. In order to evaluate if the variation in the MPKs indicates bad allocation of capital, we compare to the spread in estimated MPKs in developed countries. We find low standard deviations of log-MPK of about 1 in developed countries versus 1.4 for the African sample (1.5 for Ghana) and 1.6 for India, indicating misallocation in Africa (and India). The HK-measure takes a theoretical value of unity under efficient allocation and this measure also displays significantly higher variation in Africa and India (due to lack of data, this index is not available for Germany and South Korea).

Table 5.2 gives a breakdown of the number of firms into exporters, listed, and small firms while table 5.3 shows the statistics of table 5.1 broken down

Table 5.2 **Distribution of firm types**

	<i>N</i>	(%)
<i>A. African countries</i>		
All firms	3,908	100
Exporters	77	1.97
Listed	22	0.56
Small	1,998	51.13
<i>B. Germany</i>		
All firms	168	100
Exporters	4	2.38
Listed	0	0
Small	53	31.55
<i>C. India</i>		
All firms	2,129	100
Exporters	374	17.57
Listed	127	5.97
Small	959	45.04
<i>D. Ireland</i>		
All firms	140	100
Exporters	16	11.43
Listed	1	0.71
Small	51	36.43
<i>E. South Korea</i>		
All firms	178	100
Exporters	25	14.04
Listed	18	10.11
Small	53	29.78
<i>F. Spain</i>		
All firms	114	100
Exporters	7	6.14
Listed	0	0
Small	30	26.32

Notes: The first column reports the number of firms. The second column reports the percent of firm types. Exporters have a ratio of exports to total sales above 50 percent. Listed firms are listed on a stock exchange. Small firms have five to nineteen employees. The Africa sample comprises Botswana, Burundi, Tanzania, Uganda, Kenya, South Africa, Ghana, Nigeria, Zambia, and Senegal.

by type of firm. Large firms have more capital per worker and pay lower interest rates and this holds even more for listed firms. Similarly, exporting and foreign-owned firms have more capital relative to labor, while foreign-owned firms pay slightly lower interest rates. There is also less dispersion of interest rates within the group of listed firms, indicating less misallocation of capital within this group of firms.

We next study these indicators in graphical form where more information can be shown compactly by country. Figure 5.1, panel (a) displays inflation

Table 5.3 Descriptive statistics by firm types

	Obs.	Mean	Std. dev.	Min.	Max.	Median	Kurtosis
Small firms							
Nominal interest rate	217	16.3	6.9	0	50	15	7.4
Real interest rate	217	9.9	7.1	-11.6	44.4	9.6	7.5
log (K/L)	1,985	1	1.7	-3.7	9.1	0.9	3
log MPK	1,984	-0.8	1.3	-6.1	3.5	-0.8	3.3
log HK-index	1,985	0.4	1.4	-6.2	4.7	0.5	3.4
Large firms							
Nominal interest rate	594	14.9	5.8	1.5	38	13	5.5
Real interest rate	594	8.3	5.9	-9.2	30.7	7.7	5
log (K/L)	1,553	2.1	1.8	-3.6	7.9	2.3	3.2
log MPK	1,549	-0.9	1.5	-7.3	5.6	-1	4.5
log HK-index	1,554	0.1	1.5	-6.3	6.1	0	3.7
Listed firms							
Nominal interest rate	10	14.3	4.2	7.5	21.2	14.3	2.3
Real interest rate	10	5.2	3.4	0.9	10.5	4.6	1.8
log (K/L)	22	2.8	1.2	0.1	4.8	3.1	2.5
log MPK	22	-0.9	1	-2.5	1.4	-1.1	2.9
log HK-index	22	0.1	0.9	-1.6	2.5	0	3.9
Nonlisted firms							
Nominal interest rate	801	15.3	6.1	0	50	14	6.6
Real interest rate	801	8.8	6.3	-11.6	44.4	7.7	6.3
log (K/L)	3,516	1.5	1.8	-3.7	9.1	1.5	2.8
log MPK	3,511	-0.9	1.4	-7.3	5.6	-0.9	3.9
log HK-index	3,517	0.3	1.5	-6.3	6.1	0.3	3.4
Exporting firms							
Nominal interest rate	34	12.4	4.1	5	30	12	11.8
Real interest rate	34	5.9	4.2	-5.7	19.3	6.4	5.7
log (K/L)	73	2.1	1.6	-1.6	7.2	2	3.5
log MPK	71	-1	1.5	-4.4	4	-1	4.3
log HK-index	73	0	1.6	-3.4	5.3	-0.2	4
Nonexporting firms							
Nominal interest rate	777	15.4	6.2	0	50	14	6.5
Real interest rate	777	8.8	6.3	-11.6	44.4	7.9	6.3
log (K/L)	3,465	1.5	1.8	-3.7	9.1	1.5	2.7
log MPK	3,462	-0.9	1.4	-7.3	5.6	-0.9	3.9
log HK-index	3,466	0.3	1.5	-6.3	6.1	0.3	3.4

Notes: The sample is for Africa only and comprises Botswana, Burundi, Tanzania, Uganda, Kenya, South Africa, Ghana, Nigeria, Zambia, and Senegal. See notes to the previous tables for detailed explanations of the variables.

and the mean and standard deviation of nominal interest rates for South Korea, Spain, Ireland, Germany, Burundi, Kenya, South Africa, Senegal, Botswana, India, Nigeria, Uganda, Ghana, Tanzania, and Zambia, in this order, where we have ordered the countries by the standard deviation of interest rates from low to high. Among the African countries, Burundi displays the lowest variation in interest rates, followed by Kenya and South

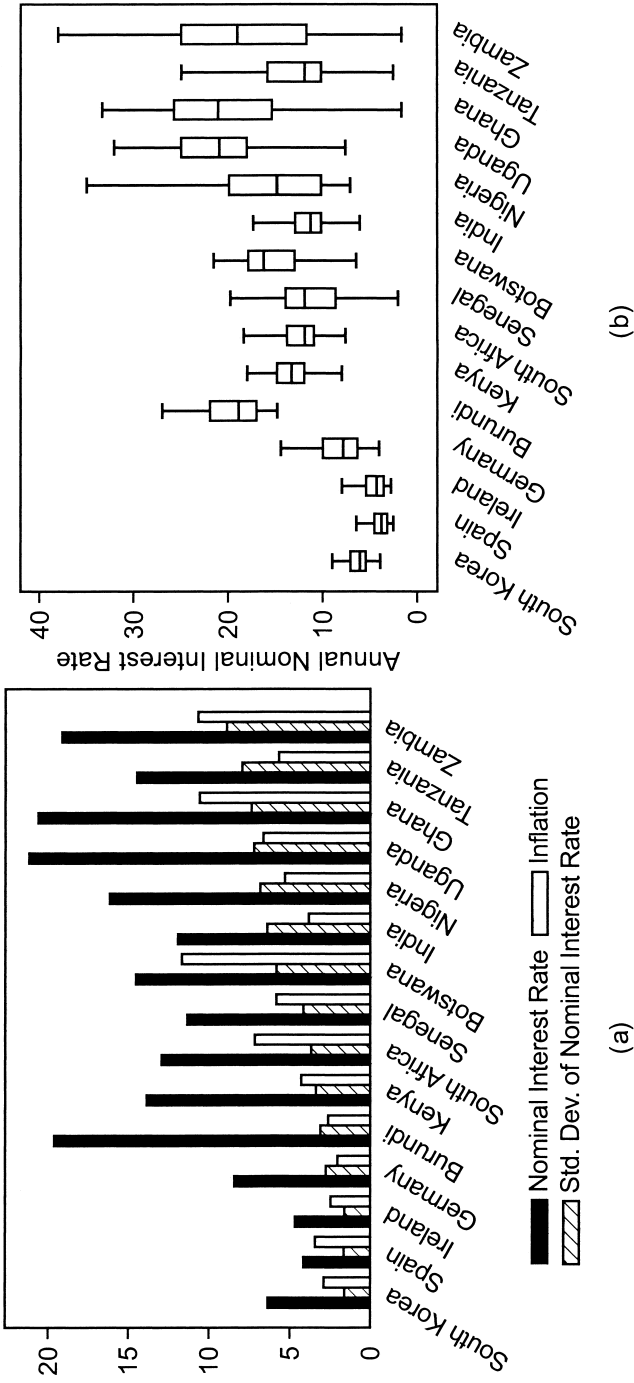


Fig. 5.1 Distribution of nominal interest rate and inflation

Notes: Panel (a) displays the mean and standard deviation of nominal interest rates and inflation. The data used are: 2005 data for Botswana, Burundi, Tanzania, and Uganda; 2006 data for Kenya, South Africa, Ghana, Nigeria, Zambia, and Senegal; 2005 data for Germany, Ireland, South Korea and Spain; and 2004 data for India. Panel (b) displays box plots for the distribution of nominal interest rates where the nominal interest rate is the response to the question “What is the annual cost of loans?” (i.e., rate of interest). Inflation rate is the annual percent change in consumer prices. In both panels, countries are ordered according to the standard deviation of nominal interest rates.

Africa, while Zambia has the highest spread, followed by Tanzania, Ghana, and Uganda. Developed countries have much lower variation in interest rates. Figure 5.1, panel (b) shows box plots for the distribution of interest rates (albeit with extreme outliers removed). The main “box” of data for each country shows the range of the 25–75 percentiles. Such plots will reveal if the standard deviations are mainly caused by outliers. Visually, if a low interest rate combined with a low 25–75 spread is considered healthy, as we think it should be, Kenya and South Africa (as well as the developed countries) have the best distribution, while the distributions of interest rates within Zambia, Nigeria, and Ghana are less good.

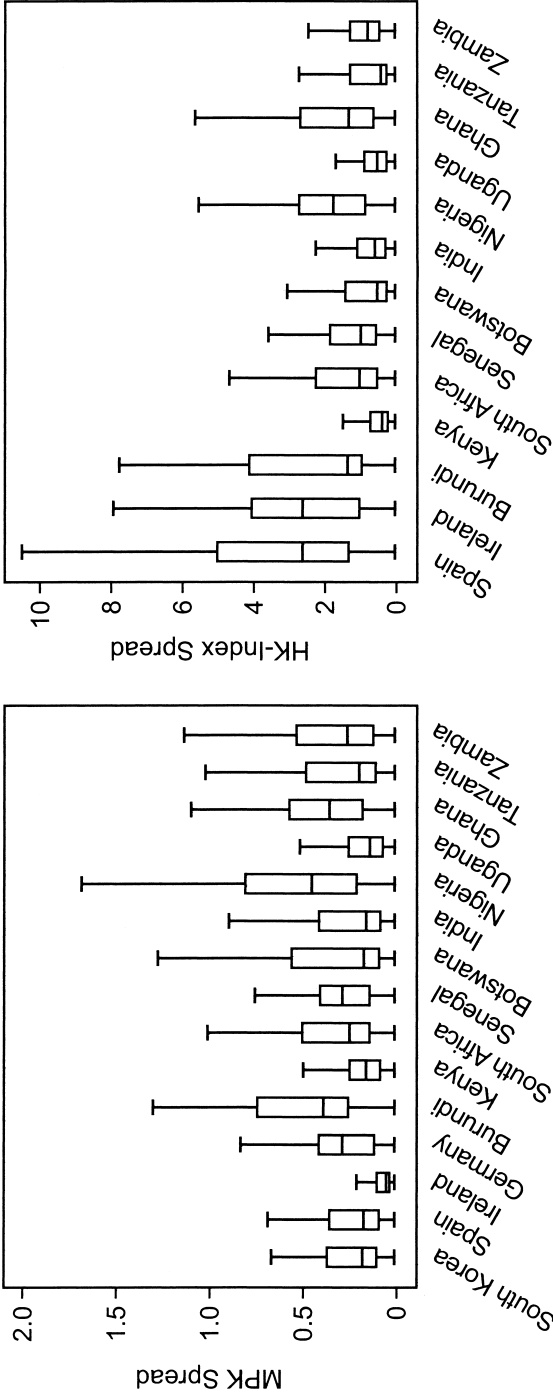
Figure 5.2, panels (a) and (b) display the spread of our two misallocation measures, the MPK and HK indices, respectively. “Spread” is defined as the absolute distance to the country median. Burundi, Botswana, and Nigeria have large spreads in the MPK and, less strongly, in the HK index. The HK-index has very large spreads for Spain and Ireland, which indicates that a high spread of this measure may be driven by outliers and, therefore, may not be a good indicator of misallocation.

Figure 5.3 displays self-reported obstacles to growth for the African countries. Typically, access to finance plays the leading role with over 60 percent of all firms mentioning access to finance as a major obstacle in Burundi, Ghana, Nigeria, and Uganda. In South Africa less than 15 percent of firms mention finance, while the number is about 40 percent in Botswana, Kenya, and Tanzania, 50 percent in Senegal, and 30 percent in Zambia. Weak infrastructure is typically mentioned by about 30–35 percent of the firms, although the number is much lower for Botswana, South Africa, and Zambia. Law and order is a problem for 10–20 percent of firms, although the number is higher in Burundi and Kenya. Finally, red tape is mentioned by about 15–20 percent of firms in most countries with a very low number in South Africa. In Kenya, 35 percent of firms point to red tape—Kenya stands out in these figures as having a significant amount of firms mentioning each of the main obstacles, while most other countries have finance dominating other obstacles.

5.4.2 Misallocation, Country-Level Institutions, and Investment Climate

We next turn to the broader policy question of whether good institutions are relevant for performance at the firm level. Our broad institutional variables capture protection of investor rights measured as corruption, the general investment climate, measured as the risk factors affecting the investment and ease of doing business, measured as the days it takes to register a property. These variables are quite correlated among themselves and we show their correlations with the MPK index in figure 5.4 and with the HK index in figure 5.5.

In figure 5.4, panel (a), we see a positive relation between misallocation,



(a) MPK Spread

(b) HK-index Spread

Fig. 5.2 The distribution of misallocation measures

Notes: Panels (a) and (b) display box plots for the distribution of the MPK spread and the HK-index spread, respectively. The spread is the absolute value of the difference between the firm-level value of the corresponding variable and its country-level median. In panel (a), the misallocation measure MPK, is calculated as $\alpha = Y/K$ where Y is value added and K is replacement cost of capital. In panel (b), the misallocation measure, the HK-index, is calculated as $[(\alpha/(1-\alpha))^{1/wL}/wL]$ where wL and wZ stand for total cost of labor and capital, respectively. German and South Korean firms do not provide information on wL , thus the HK-index is not calculated for those firms. In both panels, countries are ranked according to the standard deviation of annual nominal interest rates and outside values are excluded. An outside value is defined as a value that is smaller than the lower quartile minus 1.5 times the interquartile range or larger than the upper quartile plus 1.5 times the interquartile range.

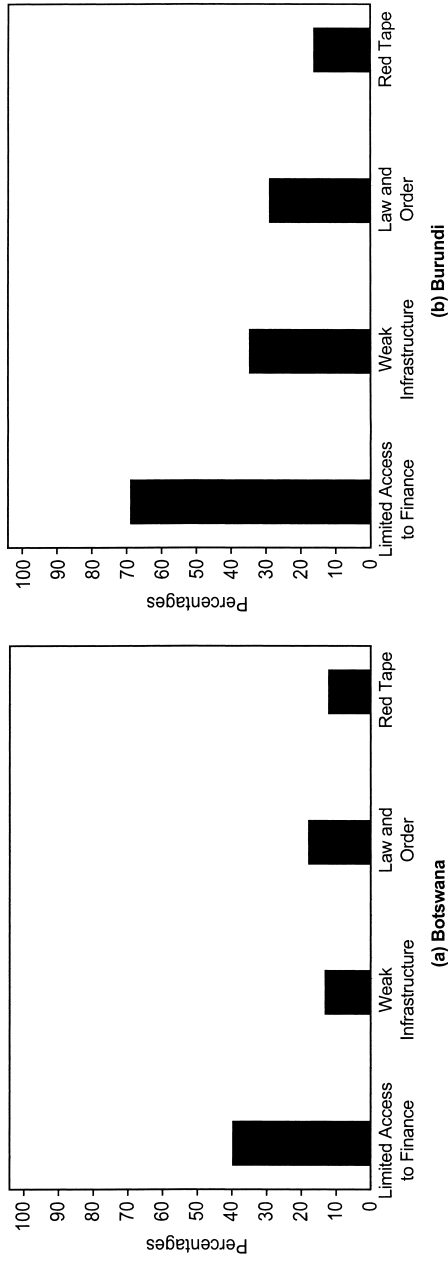
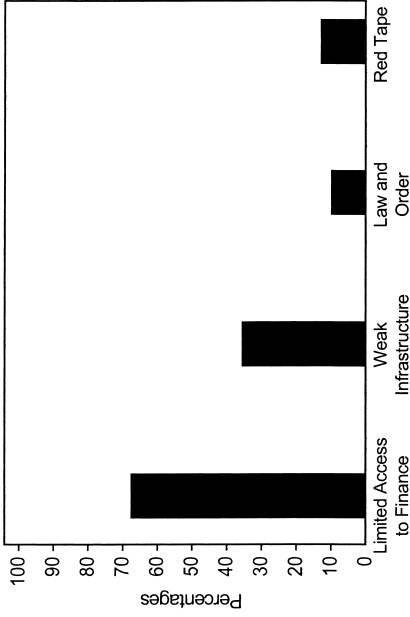
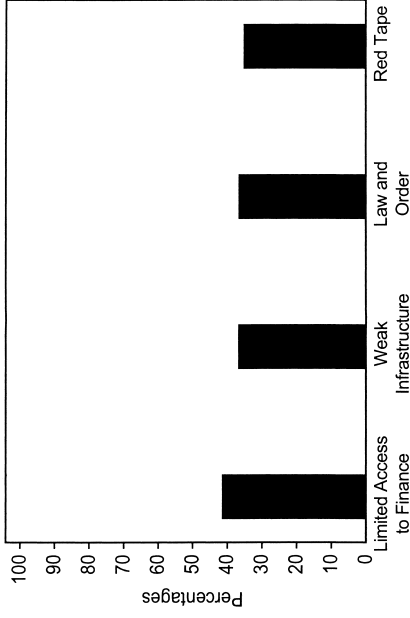


Fig. 5.3 Major obstacle figures

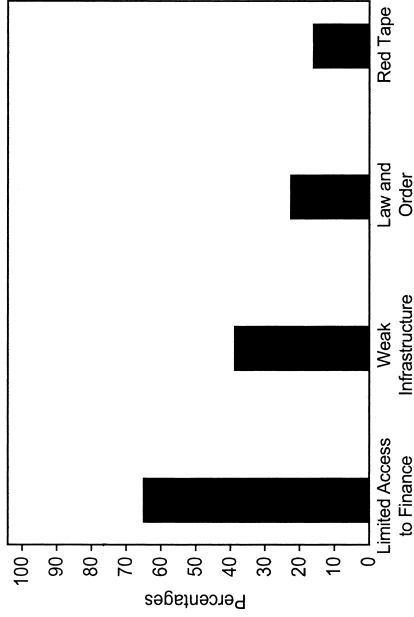
Notes: Limited access to finance, weak infrastructure, weak law and order, and red tape represent the major obstacle groups that establishments face during their operation. The measures are constructed using answers to the question “Do you think that . . . presents any obstacle to the current operations of your establishment?” For example, in the case of limited access to finance, the question is as follows: “Do you think that limited access to finance presents any obstacle to the current operation of your establishment?” Answers to these questions can be no obstacle, minor obstacle, moderate obstacle, major obstacle, and very severe obstacle, which are coded as 1, 2, 3, 4, and 5, respectively. The way we construct our measure of limited access to finance is as follows: We take the number of establishments that answered the question “Do you think that limited access to finance presents any obstacle to the current operation of your establishment?” as “major obstacle and very severe obstacle” and divide by the total number of establishments that answered the question. Hence, our measures represent the percentage of establishments that consider limited access to finance a very important obstacle for their operations. In the case of weak infrastructure, the questions are “Do you think that electricity, telecommunication, transportation, or access to land presents a major/severe obstacle to the current operations of your establishment?” In the case of red tape, the questions we use are “Do you think that tax rates, tax administration, customs and trade regulations, labor regulations, or business licensing and permits present a major/severe obstacle to the current operations of your establishment?” In the case of weak law and order, the questions are “Do you think that the functioning of the courts, political instability, corruption, macroeconomic instability, crime, theft and disorder, or practices of competitors in the informal sector present major/severe obstacles to the current operations of your establishment?”



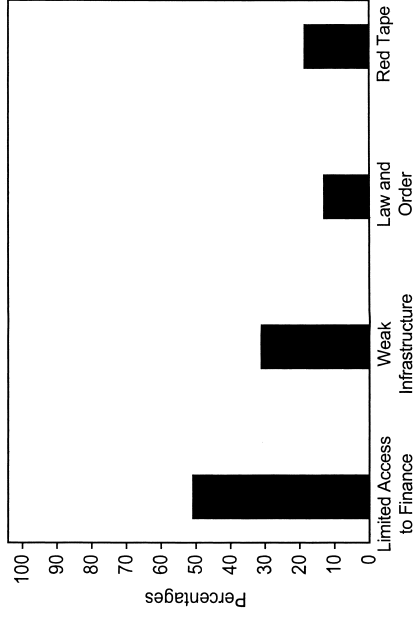
(c) Ghana



(d) Kenya

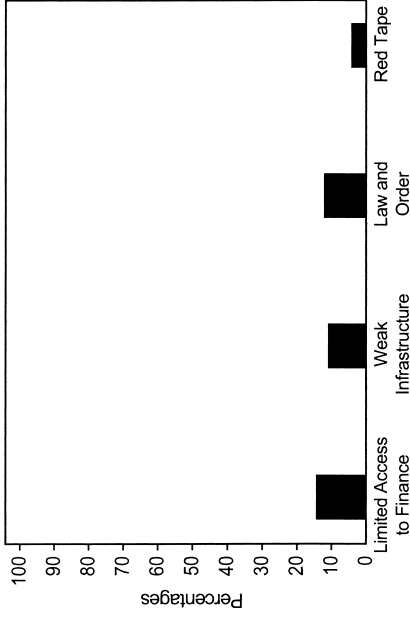


(e) Nigeria

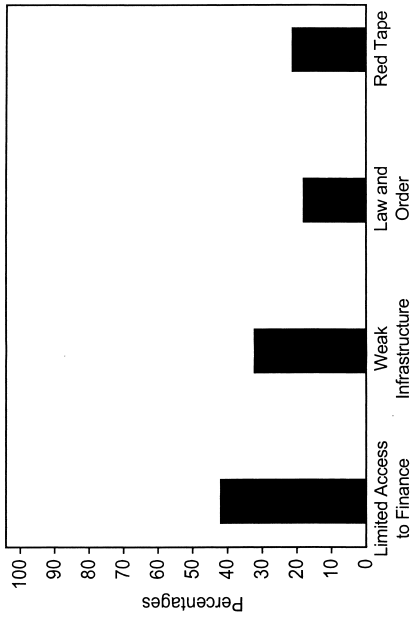


(f) Senegal

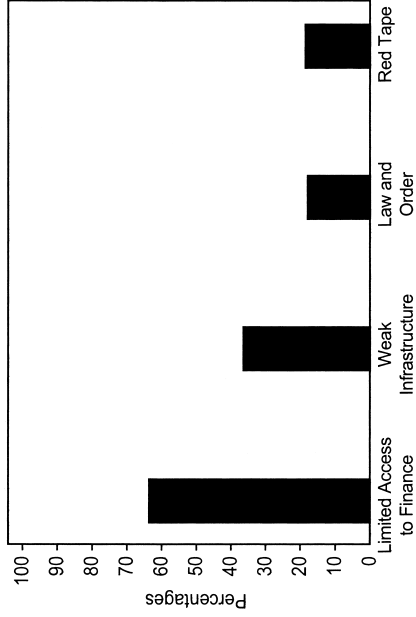
Fig. 5.3 (cont.)



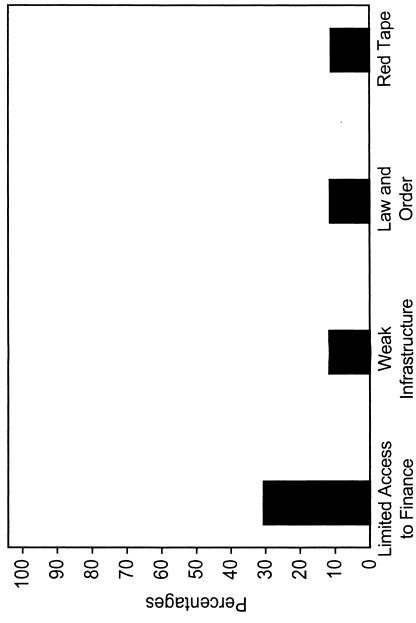
(g) South Africa



(h) Tanzania

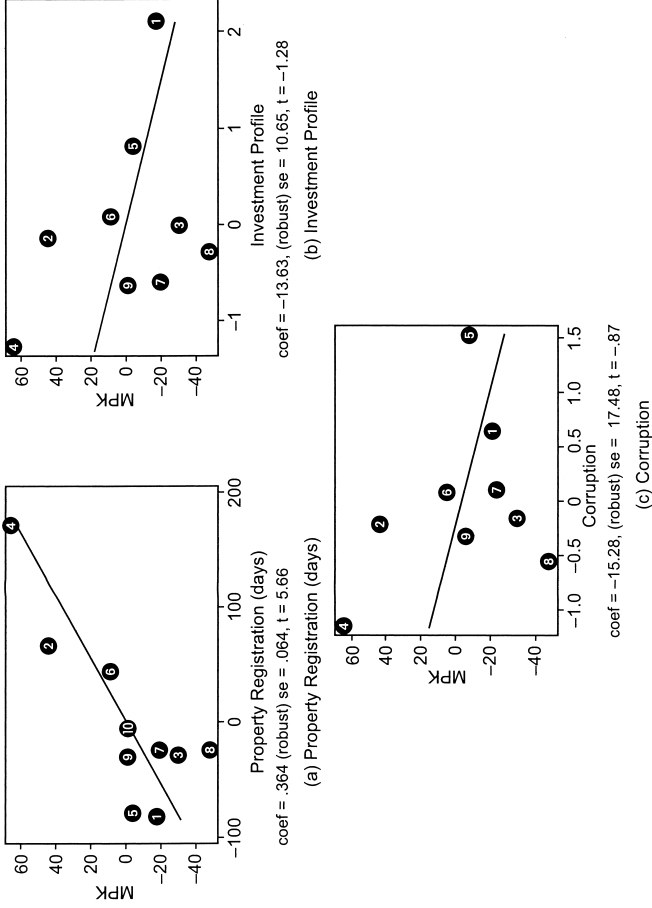


(i) Uganda



(j) Zambia

Fig. 5.3 (cont.)



1 Botswana 2 Ghana 3 Kenya 4 Nigeria 5 Rep. of South Africa 6 Senegal 7 Tanzania 8 Uganda 9 Zambia 10 Burundi

Fig. 5.4 The relationship between misallocation (MPK) and institutional variables

Notes: Panels (a), (b), and (c) display cross-country correlation plots of the (country) average $\log(\text{MPK})$ against the country-level measures property registration (days), investment profile, and corruption, respectively. $\text{Log}(\text{MPK})$ is the logarithm of MPK, which is calculated as $\alpha(Y/K)$ where Y is value added and K is replacement value of capital. Property registration is the number of days it takes to register a property that an entrepreneur wants to purchase. Investment profile is an assessment of factors affecting the risk to investment that are not covered by other political, economic, or financial risk components. The risk rating assigned is the sum of three subcomponents: contract viability/expropriation, profits repatriation, and Payment delays. As that index value increases, the risk of expropriation, payment delays, and so forth, increases. Corruption is a measure that assesses actual or potential corruption in the form of excessive patronage, nepotism, job reservations, “favors for favors,” and secret party funding. As that index value increases, the risk of conducting business ineffectively increases. See the data section for detailed explanations.

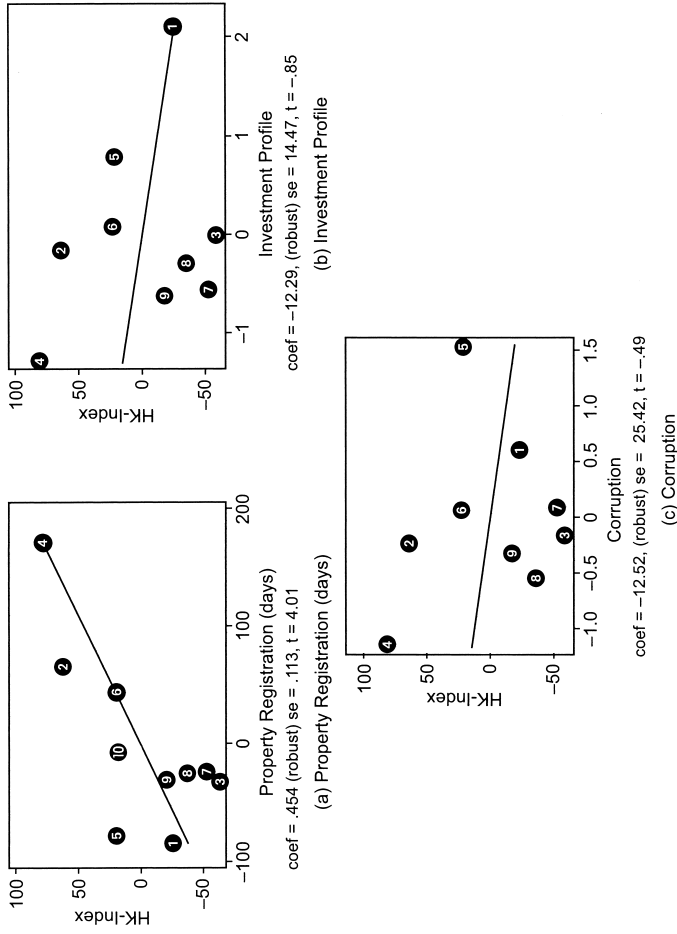


Fig. 5.5 The relationship between misallocation (HK-index) and institutional variables

Panels (a), (b), and (c) display cross-country correlation plots of the (country) average $\log(\text{HK-index})$ against the country-level measures property registration (days), investment profile, and corruption, respectively. $\log(\text{HK-index})$ is the logarithm of HK-index, which is calculated as $[\alpha/(1-\alpha)] \times [(wL)/RK]$ where wL and RK stand for total cost of labor and capital, respectively. Property registration is the number of days it takes to register a property that an entrepreneur wants to purchase. Investment profile is an assessment of factors affecting the risk to investment that are not covered by other political, economic, or financial-risk components. The risk rating assigned is the sum of three subcomponents: “contract viability/expropriation,” “profits repatriation,” and “payment delays.” As that index gets bigger, the risk of expropriation, payment delays, and so forth, increases. Corruption is a measure that assesses actual or potential corruption in the form of excessive patronage, nepotism, job reservations, “favors for favors,” and secret party funding. As that index value increases, the risk of conducting business ineffectively increases. See the data section for detailed explanations.

measured by average $\log(\text{MPK})$, and registering property. This implies that the longer it takes to register a property, the higher is misallocation. The implication is that informal lending or retained earnings do not make up for the impediments to formal credit. We see a negative slope for the relation between the (country-mean) level of misallocation and the index for investment profile in figure 5.4, panel (b). Figure 5.4, panel (c), which uses an index for corruption on the X-axis, is very similar. This means that countries with a better investment climate (lower expropriation risk/corruption) have lower levels of capital misallocation on average, which is consistent with the patterns found by Johnson, McMillan, and Woodruff (2002): firms are not likely to reinvest profits when property rights (broadly defined) are weak. For example, according to our field study, we would not expect mango producers in northern Ghana to reinvest profits to increase production for shipping to Accra, because profits would be exhausted by bribes at road checkpoints. The picture is the same for the HK index, as shown in figure 5.5. We proceed with firm-level determinants of the misallocation.

5.4.3 Misallocation and Access to Finance: Firm-Level Evidence

In this section, we investigate the role of various constraints faced by firms in explaining misallocation. Table 5.4 gives descriptive statistics for obstacles averaged into four groups: limited access to finance, weak infrastructure, weak law and order, and red tape, as described earlier. Table 5.4 shows that for African countries and Ghana the most serious obstacle is limited access to finance, which has the highest mean, followed by weak infrastructure. Developed countries have lower means in general for all the obstacles. In developed countries, limited access to finance seems to be equivalent to weak infrastructure for developing countries in terms of importance of obstacles (India is left out of this table because the answers to the questions are scored on a different scale).

In table 5.5, we use ordinary least squares (OLS)-regressions to examine determinants of misallocation using $\log\text{-MPK}$ as the dependent variable. The MPK is equalized across firms under ideal conditions, so in the absence of distortions all regressors should be insignificant and no firm-level obstacle should significantly predict MPK. We interpret positive significant values as determinants of capital market distortions relative to labor market distortions. This is because higher MPK of a firm as a result of a certain obstacle indicates that relatively little capital was allocated to that firm. We find in column (1) that limited access to finance and weak infrastructure are insignificantly correlated with distortions, while the MPK is negative and significantly correlated with weak law and order and red tape. The coefficient of -9.3 to weak law and order implies that an increase of one unit in the weak law and order index (moving from, say, “no obstacle” to “minor obstacle”) is associated with a 9.3 percent increase in distortion in the direction of having too much capital relative to labor. That is, the negative coefficient

Table 5.4 Descriptive statistics of obstacles to firm operations

	Obs.	Mean	Std. dev.	Min.	Max.	Median	Kurtosis
<i>A. African countries</i>							
Limited access to finance	3,908	3	1.5	1	5	3	1.5
Weak infrastructure	3,908	2.4	0.9	1	5	2.5	2.4
Weak law and order	3,908	2.1	0.8	1	5	2	2.6
Red tape	3,908	2	0.8	1	5	1.8	2.9
<i>B. Ghana</i>							
Limited access to finance	305	3.6	1.4	1	5	4	2.4
Weak infrastructure	305	2.5	0.7	1	4.5	2.5	2.6
Weak law and order	305	1.6	0.5	1	3.5	1.5	3.6
Red tape	305	1.8	0.7	1	4	1.6	3.1
<i>C. Germany</i>							
Limited access to finance	168	2.2	1	1	4	2	1.9
Weak infrastructure	168	1.4	0.5	1	4	1.3	9.9
Weak law and order	168	1.7	0.6	1	3.7	1.5	3.9
Red tape	168	2.1	0.7	1	4	2	2.7
<i>D. Ireland</i>							
Limited access to finance	140	1.9	1	1	4	1.5	2.3
Weak infrastructure	140	1.7	0.8	1	4	1.5	2.9
Weak law and order	140	1.6	0.6	1	4	1.5	5.8
Red tape	140	1.8	0.8	1	4	1.7	3.3
<i>E. South Korea</i>							
Limited access to finance	177	2	1.1	1	4	1.5	2.1
Weak infrastructure	176	1.5	0.8	1	4	1	4.5
Weak law and order	176	1.9	0.7	1	4	2	2.9
Red tape	177	1.7	0.8	1	4	1.5	3.3
<i>F. Spain</i>							
Limited access to finance	114	2.3	1	1	4	2	1.8
Weak infrastructure	114	1.8	0.9	1	3.8	1.5	2.9
Weak law and order	114	1.9	0.9	1	4	1.6	3
Red tape	114	2	0.9	1	4	1.7	2.5

Notes: We use 2005 data for Botswana, Burundi, Tanzania, and Uganda; 2006 data for Kenya, South Africa, Ghana, Nigeria, Zambia, and Senegal; and 2005 data for Germany, Ireland, South Korea, and Spain. We average answers to questions about obstacles into four groups: limited access to finance, weak infrastructure, weak law and order, and red tape. The basic obstacle measure is the response to the question “Do you think that X presents any obstacle to the current operations of your establishment?” where X represents various questions whose answers are averaged into these four groups. Answers vary between 1 (no obstacle), 2 (minor obstacle), 3 (moderate obstacle), 4 (major obstacle), and 5 (very severe obstacle). Weak infrastructure is composed of the following Xs: electricity, telecommunications, transportation, and access to land. Red tape is composed of the following Xs: tax rates, tax administration, customs and trade regulations, labor regulations, and business licensing and permits. Weak law and order is composed of the following Xs: functioning of the courts; political instability; corruption; macroeconomic instability; crime, theft, and disorder; and practices of competitors in the informal sector. Limited access to finance is a stand alone question that represents a single X. Weak law and order and red tape are coded such that higher values correspond to less law and order and more red tape.

Table 5.5 Firm-level determinants of misallocation

Dependent variable: Log MPK	(Africa)	(Africa)	(Africa)	(Africa)	(India)	(S. Korea)	(Europe)
Limited access to finance	4.5 (1.8)	3.2 (1.5)	2.6 (1.6)	4.9** (2.4)	2.3 (0.5)	13.4 (1.2)	-5.3 (-0.8)
Weak infrastructure	6.1 (1.3)	5.4 (1.1)	6.1 (1.2)	12.0** (2.4)	16.9** (2.3)	8.5 (0.9)	-22.1 (-1.6)
Weak law and order	-9.3** (-2.5)	-8.6* (-2.2)	-8.2* (-2.2)	-4.8 (-0.8)	-11.8 (-1.3)	-2.8 (-0.2)	-0.5 (-0.0)
Red tape	-7.4* (-1.9)	-4.9 (-1.4)	-6.4* (-1.9)	-15.1*** (-4.1)	11.8*** (3.2)	-13.6 (-0.4)	18.2* (1.9)
Age			-0.2 (-0.7)	-0.4** (-2.7)	-0.2 (-0.5)	-0.9 (-1.6)	-0.2 (-1.2)
Export			14.5 (0.5)	13.5 (0.5)	89.1*** (5.8)	-9.5 (-0.3)	21.3 (0.8)
Small			-16.0*** (-3.4)	-9.0 (-1.3)	-61.9*** (-6.9)	-12.4 (-1.0)	-26.0* (-1.9)
Fin. * export			-24.8** (-2.5)	-23.6** (-2.8)	-15.0 (-1.0)	-50.4** (-2.9)	64.4*** (5.3)
Inf. * export			3.9 (0.2)	-4.5 (-0.2)	45.6** (2.7)	-32.2 (-0.8)	42.9 (1.2)
Law * export			4.4 (0.2)	-13.3 (-0.8)	3.8 (0.3)	-23.9 (-0.6)	-69.8 (-1.5)
Red * export			-3.3 (-0.2)	11.3 (0.5)	-23.6 (-0.8)	84.9** (2.8)	-53.3 (-1.2)
Country effects	Yes	Yes	Yes	No	No	No	No
Industry effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R sq.	0.1	0.1	0.1	0.0	0.1	-0.1	0.4
N	3,533	3,533	3,529	3,529	1,449	141	362

Notes: See notes to the previous tables for variable explanations. The interaction variables are constructed by the multiplication of $(\text{Export} - \bar{\text{Export}})$ with $(X - \bar{X})$, where X refers to an obstacle group and \bar{X} refers to the mean of the corresponding variable over all firms. Export is a dummy, which indicates firms whose percentage of direct exports to total sales exceed 50. The Africa sample comprises Botswana, Burundi, Ghana, Kenya, Nigeria, Senegal, South Africa, Tanzania, Uganda, and Zambia. The Europe sample comprises Germany, Ireland, and Spain. Standard errors are robust and t -statistics are reported in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

implies that the MPK is lower when law and order is lacking, indicating that it correlates more with labor market than with capital market distortions (see equation [2]).

Column (2) adds industry dummies and column (3) adds age, size, and export status of the firm. Small firms have lower MPKs, meaning higher distortions. This implies that aggregate efficiency could be improved by moving capital to larger, more efficient firms. Limited access to finance now matters for exporting firms; such firms have lower returns and more distortions if

their access to finance is limited. Column (4) drops country dummies. The coefficient of limited access to finance becomes significant in column (4), which implies that limited access to finance in particular explains differences in MPK between countries. Limited access to finance is not significant for developed countries nor for India, even without the country effects.

Weak infrastructure is significant when we omit the country dummies in column (4), suggesting that this variable in particular explains cross-country differences in MPK. This variable has strong explanatory power for MPK differences within India, but is insignificant for Korea and Europe. The coefficient to weak infrastructure is positive, indicating that firms invest less in physical capital when infrastructure is lacking. The coefficient to red tape also is negative in column (4), indicating that cumbersome bureaucracy is important in explaining differences in MPK across African countries as well as within countries (recall that a negative coefficient means lower MPK and so higher distortions). The coefficient to this variable is significantly positive for India and Europe, possibly due to high tax rates and a high degree of bureaucracy discouraging investment, although we do not further explore what underlies this. For Africa, the coefficient to red tape is negative, indicating labor market distortion, and it is possible that labor distortions stem from rules such as those imposing minimum numbers of local employees that we described for the case study of Ghana—such rules would likely be referred to as red tape in the surveys.

As in column (3), when we include interaction terms, we see that the sign for exporting firms interacted with limited access to finance is negative in all columns (not significant for India and positive for Europe). The interpretation of this is that nonexporting firms are relatively more affected by imperfections in financial markets, leading to high MPKs consistent with such firms having too low a capital/labor ration relative to exporting firms—possibly, exporting firms are able to raise funds through long-term relations with foreign customers. The other interactions are not significant for the African sample on which we focus.

Table 5.6 repeats the same exercise using the Hsieh-Klenow index. The HK-index takes a high value in the case of capital distortions (too low capital) and a negative value in the case of labor distortions (too little labor compensation). In contrast to the MPK-measure of table 5.5, it relies on labor costs being correctly measured. A natural first hypothesis is that imperfect financial markets lead to capital distortions, and the estimated coefficient to limited access to finance in column (1) confirms this with a very high level of significance. The coefficient indicates that a firm that moves from, say, “no obstacle” to “minor” obstacle, will have 11 percent higher capital distortion (while moving from “no obstacle” to “very severe obstacle” increases capital distortions by 44.4 percent). Red tape has a negative coefficient, implying that bureaucracy leads to higher labor distortion relative to capital distortions (the opposite holds for India, where capital distortions seems to be

Table 5.6 Firm-level determinants of misallocation

Dependent variable: Log HK-index	(Africa)	(Africa)	(Africa)	(Africa)	(India)	(Europe)
Limited access to finance	11.0*** (3.5)	8.6*** (3.4)	7.1*** (4.2)	10.8*** (4.6)	2.9 (0.5)	-2.6 (-0.3)
Weak infrastructure	-2.6 (-0.5)	-2.7 (-0.6)	-2.4 (-0.5)	4.2 (0.9)	3.9 (0.4)	-9.7 (-0.6)
Weak law and order	-5.8 (-1.6)	-5.4 (-1.4)	-6.2 (-1.8)	-4.1 (-0.7)	-15.2 (-1.5)	-9.4 (-1.2)
Red tape	-11.5* (-2.2)	-8.5 (-1.8)	-8.1 (-1.8)	-24.9*** (-6.0)	16.0*** (3.4)	11.3 (1.2)
Age			-0.0 (-0.0)	-0.3 (-1.4)	-0.1 (-0.3)	0.0 (0.1)
Export			11.5 (0.4)	12.8 (0.6)	96.4*** (3.3)	6.4 (0.3)
Small			-10.3 (-1.3)	-1.4 (-0.1)	-60.0*** (-7.2)	3.7 (0.4)
Fin. * export			-35.1* (-2.2)	-29.1** (-3.0)	-6.6 (-0.4)	-23.4 (-1.2)
Inf. * export			-3.7 (-0.2)	-13.8 (-0.7)	25.5 (1.0)	20.2 (0.3)
Law * export			-14.7 (-0.6)	-41.0** (-2.7)	32.9 (1.2)	7.3 (0.1)
Red * export			28.0 (1.0)	42.3** (2.4)	-49.2 (-1.2)	-14.7 (-0.3)
Country effects	Yes	Yes	Yes	No	No	Yes
Industry effects	No	Yes	Yes	Yes	Yes	Yes
Adj. R sq.	0.1	0.2	0.2	0.1	0.1	-0.0
N	3,539	3,539	3,535	3,535	1,467	219

Notes: See notes to the previous tables for variable explanations. The interaction variables are constructed by the multiplication of $(\text{Export} - \bar{\text{Export}})$ with $(X - \bar{X})$ where X refers to an obstacle group and \bar{X} refers to the mean of the corresponding variable over all firms. Export is a dummy that indicates firms with percentage of direct exports to total sales greater than 50. The Africa sample comprises Botswana, Burundi, Ghana, Kenya, Nigeria, Senegal, South Africa, Tanzania, Uganda, and Zambia. The Europe sample comprises Ireland and Spain. Because German and South Korean firms are not asked to provide information on total cost of labor, the HK-index measure cannot be calculated. Standard errors are robust and t -statistics are reported in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

more important). In column (4), we see that for exporters, a high value of limited access to finance implies less relative capital distortion compared to nonexporters. Red tape in particular explains differences between countries as can be seen from the larger coefficient when country dummies are dropped. The interaction effects for exporters reveal negative coefficients, meaning for exporters limited access to finance leads to more labor distor-

tions, though column (4) suggests this pattern might be driven by country differences.

Overall, the patterns of table 5.6 are quite similar to those of table 5.5, which indicates that the obstacles we consider distort capital/labor ratios, rather than output—if output distortions dominated, the regressors would be significant in table 5.5 and insignificant in table 5.6 and not similar as in our results.

5.5 Conclusion

Using establishment-level survey data from the World Bank, we quantify the extent of misallocation within the manufacturing sector for ten African countries. To benchmark our results, we use similar data for India, another developing country, and developed countries such as Germany. Our main measures of misallocation are the MPK and an index suggested by Hsieh and Klenow (2009). Both measures reveal a great deal of capital misallocation in Africa and India and little misallocation in developed countries. Within Africa, capital markets appear to function relatively well in South Africa and, a little less so, in Kenya and Burundi, while Nigeria and Ghana display high levels of misallocation.

The firm-level regressions demonstrate that an important determinant of within-country misallocation is limited access to finance. The MPK is 45 percent higher in firms where access to finance is a serious problem compared to firms where access to finance is not a problem. Comparing mean levels of misallocation across countries, we find that countries with higher risk of expropriation that is, lower degrees of property-right protection, display more misallocation. The within-country firm-level results and across-country results both point to the importance of strong property rights and a well-functioning financial system for the efficient allocation of capital.

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