Misallocation, Property Rights, and Access to Finance: Evidence from Within and Across Africa*

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Abstract

We use establishment-level survey data to quantify the extent of capital misallocation within 10 African countries. Interest rates vary dramatically across firms which is reflected in high variation in the marginal product of capital implying that countries could produce significantly more if capital was allocated optimally. Firms that have less access to finance have higher levels of return on capital. Non-exporting firms have less access to finance and there is some evidence that this also is the case for small and young firms. We present evidence that country variation in the strength of property rights and legal system help explain the variation in the extent of misallocation across African countries.

Keywords: Misallocation, Firms, Investor Rights, Financing Obstacles, MPK

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1 Introduction

A number of recent studies argue that misallocation of resources across firms is an important cause of underdevelopment. If domestic capital markets are functioning well in a country the marginal product of capital for each firm equals the market interest rate. If firms instead borrow at different interest rates, maybe due to different access to informal financial markets or due to political connections, capital is likely to be misallocated and the marginal product of capital will differ across firms. Alfaro, Charlton, and Kanczuk (2008), Banerjee and Duflo (2004), Bartelsman, Haltiwanger, and Scarpetta (2009), Hsieh and Klenow (2009), Restuccia and Rogerson (2008) all provide evidence of misallocation in different countries and show that misallocation of resources potentially can explain a big fraction of aggregate TFP-differences between poor and rich countries.

Differential access to credit may not necessarily lead to severe misallocation if firms with higher marginal product of capital invest more as Banerjee and Moll (2010) point out—owners with high returns have a stronger incentive to accumulate savings in the form of reinvested profits, which can alleviate misallocation. 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, diluting the incentive of the owner to reinvest. Johnson, McMillan, and Woodruff (2002) find exactly such behavior in Russia and Ukraine after the breakdown of communism and there are reasons to believe that similar patterns prevail in many African countries.

We ask two questions in this paper: What is the extent of capital misallocation within African countries and why does misallocation vary across these countries? We quantify the extent of capital misallocation across manufacturing establishments within 10 African countries in 2005 and 2006, utilizing 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 80 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 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, since many papers in the literature have had to infer financing constraints from companies' financial statements using various modeling and econometric techniques. These data has been used by, among others, Beck, Demirgüç-Kunt,

[1] Here, "establishment" refers to a production unit which may be part of a larger firm but for simpler reading we will also use the term "firm."

Laeven, and Maksimovic (2006) and Beck, Demirgüç-Kunt, and Maksimovic (2005) who show that these self-perceived constraints actually bind and hurt firm growth. Our dataset 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 which calculates the extent of misallocation and its determinants for Africa using comparable firm-level data from many countries.

We show that firms with limited access to finance have higher returns to capital, indicating that misallocation is pervasive in many African countries. We further present evidence that country-level variation in the strength of property rights 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 the extent of 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; i.e., we can identify relatively successful countries and suggest reasons behind their success.

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 simply compare the interest rates firms are paying with the market interest rate. This is our starting point since 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]

Next, we calculate the marginal product of capital (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 and assumed to be the same for all firms). Doing so reveals that the distribution of the marginal product of capital varies a lot within most African countries indicating that capital is inefficiently allocated—a fact that country level aggregate figures can not address. We also calculate a measure of misallocation following Hsieh and Klenow (2009) and compare the distribution across countries and this measure also indicates imperfect capital and/or labor allocation.[3]

[2]Banerjee (2002) displays similar evidence for other developing countries. He also emphasizes that these rates must be the rates that firm actually pay since default is rare.

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

Once we calculate the extent of misallocation, we seek to explain both the firm-level determinants of differences in returns to capital and the variation in the extent of misallocation across countries. First, we show, using multiple regressions, that firms that have less access to finance have higher returns to capital. Small firms have lower returns (conditional on access to finance and other regressors) indicating that higher macro efficiency could be attained by allocating more capital to large firms. Next, we show a strong positive correlation between the extent of misallocation and ease of doing business across countries measured by variables such as days it takes to access credit and investor protection. We find a strong negative correlation between capital misallocation and investment climate (which to a large extent captures risk of expropriation).

The measures of misallocation we use are very simple. In the process of writing the paper, a large amount of measures were considered (included other measures from Hsieh and Klenow) and measures using information on, for example, salaries of production and non-production workers, different returns to capital and labor, and etc. These more complicated measures produced very noisy patterns and served little purpose. We believe that the lesson from this non-reported work is that fairly undeveloped economies face many unmeasured obstacles which obscure patterns in anything but simple straightforward measures.[4]

The rest of the paper is structured as follows. Section 2 reports on a field trip to Ghana. Section 3 describes our data in detail while Section 4 presents preliminary results from our empirical analysis. Section 5 concludes.

2 Observations from Investigators' Trip to Ghana

The authors visited Ghana in May 2011 and interviewed several people familiar with local conditions such as local academics and foreign entrepreneurs. Foreign entrepreneurs are concentrated in a free trade zone in Accra, the capital of Ghana. The free trade zone has reliable electricity (although many companies in Ghana rely on generators) and, most importantly, a large modern harbor which allows for easy shipping. Foreign entrepreneurs rely on retained earnings or non-local financing and because contract enforcement in Africa is weak most projects are done with 50 percent down payment up front. The response to the question of what is the main attraction of Ghana (relative

clear patterns.

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

to alternative sub-Saharan countries) was that political stability is of overwhelming importance. Another thing mentioned was how reliable the local workforce is—in other words, "social capital." It was mentioned that workers from some other African countries are considered less reliable. The reason for the original locating decision of a multinational corporation is the local demand for their product from other foreign companies operating in Ghana. This corporation was shipping its product from an affiliate outside of Africa but could not keep up with the orders. The original reason 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 their workforce should be Ghanaians. This constitutes a problem since the local workforce lacks basic skills, for example plumbers are hard to find. The companies bring in high-tech personnel from India and Philippines or from the United States (although American 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 pleading with the officials) since otherwise nothing gets done. Companies bring all capital from the United States and import intermediate goods from developed countries.

There was a general agreement that access to capital through formal channels, such as banks, is severely limited and one major reason for that is ill defined property rights, in particular to land. The lack of a clean right to land makes it very hard for small business owners to post collateral. Micro, informal, loans are often available but rates are very high, often above 50 percent annually. One U.S. factory owner said that the main reason, more important than infrastructure, for investing in a factory in the free trade zone was that the land was indisputably owned by the government—the company paid for a 47 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 U.S. standards; according to the foreign entrepreneur the roads are good by Africa standards). As we understood, police bribes are not very large, maybe a few dollars, but with enough checkpoints it becomes unprofitable to transport low margin goods over any substantial distance.

3 Data

3.1 Productivity and Investment Climate Survey

The firm-level data comes from the "Productivity and Investment Climate Survey" of the World Bank, administered in roughly parallel fashion to enterprizes in 21 countries in Africa, mostly in face-to-face interviews. The dataset provides a basis for making country comparisons of investment climate conditions, as well as comparisons of the severity of constraints affecting the firm and performing country-specific evaluations. It captures firm perceptions of key constraints in the business environment, perceptions that shape operational and investment decisions, as well as several quantitative indices of firm experience.

The first roll-out of surveys was done in 2005 for 13 countries: Burundi, Congo, Botswana, Angola, Guinea Bissau, Guinea Conakry, Namibia, Gambia, Mauritania, Swaziland, Tanzania, Uganda, and Rwanda. In 2006, a second roll-out was conducted in 8 additional countries including South Africa, Mozambique, Zambia, Mali, Ghana, 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 countries. The structure of the questionnaires conducted in those countries is similar to the structure used for African countries and we choose Germany as a benchmark country for comparison to with a developed country.

The dataset for African countries, merging the two roll-outs, has information on 12,752 establishments and there are data for 1,196 German establishments. Enterprizes with 5-19 employees are considered small, enterprizes with 20-99 employees are considered medium sized, and large sized enterprizes employ 100 people or more.

The Productivity and Investment Climate Survey consists of 4 sets of questionnaires which are particularly designed for the following sectors: manufacturing, retail, residual (out of manufacturing and retail), and micro (also called 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 percentages owned by the largest share holder, private entities, foreign entities and government; 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). It 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 which 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: small, medium, and large. Representation of several sectors was also an objective.

3.2 Questions on Obstacles

The main question on obstacles is as follows: Do you think the following present any obstacle to the current operations of your establishment? The answers range from No Obstacle, Minor Obstacle, Moderate Obstacle, Major Obstacle, Very Severe Obstacle. The categories are: Telecommunications, Electricity, Transportation, Access to land, Tax rates, Tax administration, Customs and Trade Regulations, Functioning of the courts, Labor Regulations, Inadequately educated workforce, Business licensing and Permits, Access to finance (availability and cost), Political instability, Macroeconomic instability, Corruption, Crime, theft and disorder, Practices of competitors in the informal sector.

3.3 Construction of Misallocation Measures

The variables we use from the Investment Climate Survey are annual interest rates, 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 U.S. dollars using the annual exchange rates from World Development Indicators.[5] The definitions are as follows:

- *Annual Nominal Interest Rate (R):* For annual nominal interest rates, we directly use the information on the interest rates each firm paid on the loans they have borrowed.[6]

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

[6]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?

- *Annual Real Interest Rate:* To calculate real interest rates, we subtract the inflation of the related year that the surveys conducted.
- *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):* 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 year of survey to proxy labor used in the production process. Permanent employees is defined as all paid employees that work 8 or more hours per day with a contract for a 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, and bonuses and social payments.
- *Total Capital Income (RK):* We multiply the replacement cost of capital (K) with R, which is taken as 15%. Hsieh and Klenow used a value of 10% but because the average nominal interest rate for our sample is about 15%, we choose this higher value.

Using the above variables, we calculate the measures of misallocation for each establishment, i. We use two measures of misallocation based on the literature.

1. Marginal Product of Capital (MPK): Assuming a Cobb-Douglas production function and assuming α=1/3, we calculate the MPK as

$$MPK_i = \alpha \frac{Y_i}{K_i} \ . \tag{1}$$

   If firms literally have identical Cobb-Douglas production functions and quantities are correctly measured, the MPK-measure will take a value of unity. However, it is a simple intuitive measure of use of capital and its distribution across firms is likely to be informative in many economic environments.

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

$$HK_i = \frac{\alpha}{1-\alpha}\frac{(wL)_i}{RK_i} \ . \tag{2}$$

This "HK-measure" is also derived from a Cobb-Douglas production function and—as the MPK-measure—it is normalized to take a value of unity in ideal circumstances. It is also a simple intuitive measure because it is the simple ratio of labor cost to capital cost, albeit under the assumption that all firms in a country have the same cost of capital. This measure is designed to capture relative labor/capital distortions. Labor market regulations (for example, requirements of local hiring) may encourage firms to rely on capital more than labor and the measure would take a value less than unity. In case of capital distortions, the ratio would be larger than unity; however, we will focus on the distribution of this ratio across countries.

3.4 Sample Selection Criteria

We apply the following sample selection criteria to all firms both in African countries and in Germany:

- We use manufacturing firms only.
- We drop firms with missing information on our key variables such as value added, capital stock and labor.
- We drop government-owned firms.
- We drop firms with faulty records on the date of establishment.
- We drop firms with negative values of sales, capital stock, labor, total cost of raw materials and intermediate goods.
- We drop firms where replacement cost of capital stock is zero and where 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.
- We drop countries with less than 35 firms on key variables such as interest rates paid on loans.

We end up with 10 countries. The total number of firms in these countries (Botswana, Burundi, Ghana, Kenya, Nigeria, Senegal, South Africa, Tanzania, Uganda, Zambia) is 3,906. The number of firms in Germany is 168 firms.

3.5 Country-Level Data

Our country-level broad institutional measures come from the World Bank Doing Business database. This data set provides quantitative measures of regulations for 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 "Access to Credit (days)."

- *Access to credit:* We use an index of access to credit which is based on the number of days establishments typically spent to get a loan.
- *Investment Profile:* This index evaluates the investment climate in which firms are operating. It is mainly based on the risk of expropriation with higher values indicating a better investment climate.

4 Empirical Analysis

4.1 The Extent of Capital Misallocation

In Tables 1 and 2, we display descriptive statistics for our main sample of countries: Burundi, Kenya, South Africa, Senegal, Botswana, Nigeria, Uganda, Ghana, Tanzania, and Zambia plus—for comparison to a highly developed country—Germany. 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 display the variables in logarithmic form, where the variables are close to normally distributed, because this is how they are used in the regression analysis.

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 low kurtosis (compared with the value of 3 for the normal distribution). Real interest rates have a mean of 7.1 percent and a standard deviation of about 6.8, with a minimum of –16.8 and a maximum of 44.6. 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 very large variation in interest rates indicates suboptimal allocation of capital. In an efficient economy firms pay different interest rates according to how risky they are to the lender and we give numbers for Germany in the bottom panel to benchmark the variation in a modern economy. Germany's average interest rate is 8.5 with a standard deviation of 2.9 and nominal interest rates in Germany are in a comparatively tight range between 4.1 and 17. The capital-labor ratios are approximately log-normally distributed with the log-ratio having a kurtosis of about 3. For Germany, the average log ratio, at about 4, is twice as large as the average ratio for Africa, an indication that German firms in our sample use four times as much capital per worker as the African firms. The standard deviation is also clearly lower for Germany although the kurtosis is not.

If capital is efficiently allocated all firms have the same MPK. Of course, MPKs are estimated under highly simplifying conditions (here, a simple Cobb-Douglas production function) and therefore estimated MPKs will vary and is therefore important to compare to Germany in order to know the spread of this measure in a developed economy—we find a standard deviation of log-MPK in Germany is 1.1 versus 1.4 across the African sample indicating misallocation in Africa. The HK-measure takes a theoretical value of unity under efficient allocation and the average of the logarithm is 0.3 for Africa while we do not have this measure for Germany due to missing data. Table 2 gives a breakdown of the number of firms into exporters, listed, and small firms and Table 3 shows the statistics of Table 1 broken down by types of firms. Listed and large firms have more capital and pay lower interest rates. Similarly, exporting and foreign owned firms have more capital relative to labor while foreign owned firms pay slightly lower interest rates. We next consider these indicators in graphical form where more information can be compactly shown by country.

Figure 1 displays nominal interest rates for Burundi, Kenya, South Africa, Senegal, Botswana, Nigeria, Uganda, Ghana, Tanzania, and Zambia. The countries are shown with Germany, the country with the lowest variation in interest rates, to the left with countries ordered by the standard deviation of interest rates. Among the African countries Burundi displays the lowest variation in interest rates follow by Kenya and South Africa. Zambia has the highest spread followed by Tanzania, Ghana, and Uganda. In Figure 1(b), we display Box-plots for the distribution of interest rates. 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. There is a tendency for

the distribution of interest rates to be caused by outliers in Uganda and Ghana. Visually, if a low interest rate and a low 25-75 spread is consider healthy as we think it should be, Kenya and South Africa (and Germany) have the best distribution while those of Zambia, Nigeria, and Ghana are less good.

Figure 2 considers the spread of our two suballocation measures, the MPK and HK indices, in panels (a) and (b), respectively. "Spread" is defined as the absolute distance to the country average. By these measures, Ghana stands out as having a particularly bad allocation of capital while Senegal and Nigeria have a big spread in the MPK and, to a smaller extent, in the HK index. Botswana show little indication of misallocation while the numbers for Kenya, Uganda, Tanzania, and Zambia indicate too little capital—although still with moderate misallocation compared to other countries. Panel (c) of Figure 2 analyzes the distribution of interest rate spreads, where Ghana and Zambia turn out to have the largest interest rate spreads.

Figure 3 displays self-reported obstacles to growth. Typically, access to finance is the main reported obstacle with over 60 percent of all firms mentioning access to finance being the main 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. In Zambia, the number is 30 percent and in Senegal it is 50 percent. Infrastructure is typically mentioned by about 30-35 percent of the firms although the number is much lower for Botswana, South Africa, and Zambia. Corruption is a problem for 10-20 percent of firms, although the number is higher in Burundi and Kenya and closer to 10 percent in Botswana, South Africa, and Zambia. Finally, red tape is mentioned by about 15-20 percent of firms with a very low number in South Africa and about 10 percent in Zambia. 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.

4.2 Misallocation, Country-Level Institutions, and Investment Climate

We next turn to the broader policy question of whether good institutions are relevant for the performance at the firm level. Our broad institutional variables capture protection of investor rights (corruption, shareholder and investor protection, legal rights), and general investment climate and ease of doing business (bureaucratic quality, cost of starting a business). These variables are quite correlated among themselves and we chose to show their correlations with different indicators of misallocation in Figures 4 and 5.

In Figure 4(a), we see a positive relation between misallocation, measured by average log(MPK), and access to credit. This implies that the longer it takes to secure a loan, the harder is access to finance and 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 4(b). This means that countries with a better investment climate (lower expropriation risk) 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 a road check-points. The picture is similar regardless of which misallocation measure we use, the MPK or the HK index, and we proceed with firm-level determinants of the misallocation.

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 the extent of misallocation. Table 4 gives descriptive statistics for obstacles. We group the obstacles into four groups: Limited Access to Finance, Weak Infrastructure, Corruption and Red Tape. The obstacle-measure is the response to the question "Do you think that X presents any obstacle to the current operations of your establishment?" Answers vary between 1 (no obstacle), 2 (minor obstacle), 3 (moderate obstacle), 4 (major obstacle) and 5 (very severe). 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." Corruption is the average of answers to this question where X is "Functioning of the Courts," "Inadequately educated workforce," "Political instability," "Corruption," "Macroeconomic instability," "Crime, theft and disorder," and "Practices of competitors in the informal sector." Panel A gives descriptive statistics for the Africa sample while Panel B displays similar descriptive statistics for Germany. Compared to Germany, access to capital and infrastructure are common obstacles in Africa.

In Table 5, we use OLS-regressions to examine determinants of misallocation using the log-MPK as the dependent variable. Since the MPK is equalized across firms under ideal conditions,

we interpret significant values as determinants of capital market distortion. We find in column (1) that access to finance is significantly correlated with capital markets distortions, as firms with bad access to finance have high MPKs as expected, although the effect is not significant. Column (2) adds industry dummies and in column (3), we add age, size, and export status of the firm. This leads to a significant positive affect of access to finance on misallocation. Weak infrastructure only becomes significant when we omit the country dummies in the last column, suggesting that there are no differences within countries in this measure. Red Tape and Corruption are always negatively significant; i.e., the marginal product of capital is lower when there is a lot of bureaucracy and corruption.[7] This implies that good institutions and a good legal environment is associated with less misallocation. Small firms have low MPKs (significantly so, if country dummies are included). We also run differences-in-differences specifications in the last two columns to see whether the effect of obstacles are bigger or smaller for exporters and that financial constraints seem to have a negative effect on the MPK of exporters.

Table 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). A natural first hypothesis is that limited access to finance leads to capital distortion and the estimated coefficient to "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 8 percent higher capital distortion (while moving from "no obstacle" to "very severe obstacle" increases capital distortions by about 36 percent). Red tape has a negative coefficient, implying that bureaucracy leads to relatively higher labor distortion. In column (4), we see that for exporters limited access to finance is not important while corruption leads to labor distortion for exporters and red tape leads to capital distortion for exporters (as the sum of the coefficients to the interacted term and the main term is positive).

Finally, in Table 7, we use the within-country firm-by-firm interest rate spread ($|r_i - \overline{r}_c|$) as the dependent variable (where r_i is the real interest rate paid by firm i and $\overline{r}_c$ is the average over the firms in country c). We find that access to finance is a highly significant predictor of the interest rate spread while other obstacles do not have any impact except that the results with no country dummies indicate that exporting firms have higher interest rate spreads in countries with financial obstacles and lower spreads in countries with weak infrastructure.

[7] The sign of these variables is a priori indeterminate. Each would lower output for given capital but firms might respond by investing less so as to equalize MPKs.

5 Conclusion

We quantify the extent of misallocation within manufacturing using establishment level data from World Bank Enterprize Surveys for 10 Africa countries. Our main measures of misallocation are the distribution of interest rates, of the marginal product of capital, and of a related index ("HK") developed by Hsieh and Klenow. Both measures show a great deal of capital misallocation in Africa. The measures do not always agree but capital markets appears to function relatively well in South Africa and, a little less so, in Kenya and Burundi. Botswana and Uganda are doing well only by some measures as these countries display large variation in interest rates paid. The firm-level regressions demonstrate that the most important determinant of this misallocation is limited access to finance. When we compare mean levels of misallocation across countries, we find that countries with higher risk of expropriation; i.e., lower degrees of property right protection, tend to be the countries with higher degrees of misallocation. These are typically countries where local financial markets do not work well, measured as access to credit from local banks. Both the within country firm-level results and across country results points to the importance of strong property rights and a functioning financial system for the efficient allocation of capital.

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Appendix: Sample Selection Notes.

The World Bank Enterprise Survey provides sampling methodology notes for all 21 African countries. Below, details of the sampling methodology for our 10 African countries available in the baseline sample are given:[8]

- *Bostwana:* The World Bank Enterprise Survey of Botswana targeted establishments located in Gabarone and Francistown in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. The survey also sampled a selection of micro establishments (establishments with less than five full-time permanent paid employees) from the targeted universe, without stratification by industry. The first population contains 1685 establishments. For the three manufacturing strata, the lists of establishments were obtained from a number of sources. Because representative lists from the national statistical bureau were out of date, EEC Canada chose to compile a new list by undertaking a census of manufacturing establishments. EEC Canada also provided the lists of the industries of retail, rest of universe and micro. Out of the starting population, some establishments refused to participate and some were unavailable, thus the final sample consists of 444 establishments.

- *Burundi:* The survey targeted establishments located in Bujumbura in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. The survey also sampled a selection of micro establishments (establishments with less than five full-time permanent paid employees) from the targeted universe, without stratification by industry. The starting population consists of 2170 establishments. Those establishments are compiled from different sources, including the CCIAAB, the ISTEEBU, and the Direction Gnrale des Impts. Out of the starting population, some establishments refused to participate and some were unavailable, thus the final sample consists of 407 establishments.

- *Ghana:* The survey targeted establishments located in Accra, Kumasi, Takoradi, and Tamale in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. The survey also sampled a selection of micro establishments (establishments with less than five full-time permanent paid employees) from the targeted universe, without stratification by industry. A

[8]The details on the construction of the baseline sample are given in the following section.

satisfactory list of establishments was sourced from the Ghana Statistical Service. This list was used to set the target sample size for each stratum. During the survey period, the master list was updated as new information regarding establishments that had closed or were out-of-scope was gathered. The final population size in all strata and locations was 22,123 with the vast majority of establishments operating in the micro and manufacturing strata. In Ghana, the survey collected from establishments surveyed in the 2003 Oxford ICS of Ghana. That survey included establishments in all four manufacturing strata distributed across the entire country. The remainder of the sample (including the entire rest of universe and retail sample in each city) was selected at random from the master list by a computer program. For the small sized establishments, EEC Canada selected an aerial sampling approach to estimate the population of establishments and select the sample in this stratum for all regions of the survey. Out of the starting population, some establishments refused to participate and some were unavailable, thus the final sample consists of 616 establishments.

- *Kenya:* The surveys focused on establishments located in Nairobi, Mombasa, Nakuru and Kisumu in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. The survey also sampled a selection of micro establishments (establishments with less than five full-time permanent paid employees) from the targeted universe, without stratification by industry. A satisfactory list of establishments was sourced from the Kenya National Bureau of Statistics, the Kenya Association of Manufacturers, the Kenya National Chamber of Commerce, the Kenya Private Sector Alliance, and from the Federation of Kenya Employers. These lists were merged together into a master list which was validated, updated where possible, and then used to establish the initial population size for each stratum. The final population size in all strata and locations was 6,562 with the vast majority of establishments operating in the rest of the universe, and manufacturing strata. For the small sized establishments, EEC Canada selected an aerial sampling approach to estimate the population of establishments and select the sample in this stratum for all regions of the survey. Out of the starting population, some establishments refused to participate and some were unavailable, thus the final sample consists of 781 establishments.

- *Nigeria:* The survey in Nigeria consisted of a series of structured face-to-face interviews with key senior managers/owners of the establishments across 11 states (Abia, Anambra, Abuja, Bauchi, Cross Rivers, Enugu, Kaduna, Kano, Lagos, Ogun and Sokoto) in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage

and communications, computer and related activities. The survey also sampled a selection of micro establishments (establishments with less than five full-time permanent paid employees) from the targeted universe, without stratification by industry. A satisfactory list of establishments was built with lists sourced from the Nigeria Manufacturer Association, the National Bureau of Statistics in Abia, Anambra, Abuja, Cross River, Enugu, Kaduna, Lagos, the ministry of commerce and industry in Ogun, Kano, Bauchi, and from the Abuja Business Directory, the Sokoto Business Directory. This list was used to set the target sample size for each stratum. During the survey period, the master list was updated as new information regarding establishments that had closed or were out-of-scope was gathered. For small sized establishments, EEC Canada selected an aerial sampling approach to estimate the population of establishments and select the sample in this stratum for all regions of the survey. The final population size in all strata and locations was 771,018 with the vast majority of establishments operating in the rest of the universe, and manufacturing strata. Out of that population, some establishments refused to participate and some were unavailable, thus the final sample consists of 2,387 establishments.

- *Senegal:* Stratification targeted establishments located in Dakar, Kaolack, Saint-Louis, and Thies in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. This survey also sampled a selection of micro establishments (establishments with less than 5 full-time employees) from the above targeted universe, without stratification by industry. A list of establishments was built with the lists sourced from L'Institut National de la Statisque du Senegai. For the small sized establishments, EEC Canada selected an aerial sampling approach to estimate the population of establishments and select the sample in this stratum for all regions of the survey. The final population size in all strata and locations was 1,733 with the vast majority of establishments operating in the rest of the universe, and manufacturing strata. Out of that population, some establishments refused to participate and some were unavailable, thus the final sample consists of 625 establishments.

- *South Africa:* The department of Trade and Industry Companies and Intellectual Property Registration Office provided a list of companies that contains 800,000 establishments. But this list is not satisfactory for the stratification purposes which targeted establishments in all size groups located in Johannesburg, Cape Town, Port Elizabeth and Durban in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. The survey selected a random sample

of 9550 establishments out of these 800,000 and contacted them. 40 percent of these contacts failed due to insufficient contact information. From the remaining 75 percent did not meet the size criterion of at least 5 full time permanent employees. The remaining sample was 1439 establishments, of which 77 percent are small, 19 percent are medium and 4 percent are large. Out of these 706 sampled and 733 refused to participate. Also since 33.3 percent of size stratification is not met, WB changed the target to minimum 15 percent large firms.

- *Tanzania:* The survey targeted establishments located in Dar-es-Salaam, Arusha, Mbeya, and Zanzibar in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. This survey also sampled a selection of micro establishments (establishments with less than 5 full-time employees) from the above targeted universe, without stratification by industry. A satisfactory list of establishments was sourced from the National Bureau of Statistics in for Mainland Tanzania and from the Office of the Chief Statistician for Zanzibar. These lists were merged together into a master list which was used to establish the initial population size, and then to set the target sample size for each stratum. During the survey period, the master list was updated as new information regarding establishments that had closed or were out-of-scope was gathered. For the small sized establishments, EEC Canada selected an aerial sampling approach to estimate the population of establishments and select the sample in this stratum for all regions of the survey. The starting population size in all strata and locations was 107,477 with the vast majority of establishments operating in the rest of the universe, and manufacturing strata. Out of that population, some establishments refused to participate and some were unavailable, thus the final sample consists of 484 establishments.

- *Uganda:* The survey in Uganda targeted establishments located in Kampala, Mbarara, Jinja, Mbale, and Lira in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. This survey also sampled a selection of micro establishments (establishments with less than 5 full-time employees) from the above targeted universe, without stratification by industry. A satisfactory list of establishments was sourced from the Ugandan government. This list was used to establish the initial population size, and then to set the target sample size for each stratum. During the survey period, the list was updated as new information regarding establishments that had closed or were out-of-scope was gathered. For small sized establishments, EEC Canada selected an aerial sampling approach to estimate the population of establishments and selected the sample in this stratum for all regions of the survey. The

starting population size is 15,943. Out of that population, some establishments refused to participate and some were unavailable, thus the final sample consists of 484 establishments.

- *Zambia:* Stratification targeted establishments located in Lusaka, Kitwe, Ndola, and Livingstone in the industries of manufacturing, construction, retail and wholesale, hotels and restaurants, transport, storage and communications, computer and related activities. This survey also sampled a selection of micro establishments (establishments with less than 5 full-time employees) from the above targeted universe, without stratification by industry. The sample was drawn from a Master list obtained by compiling two different updates of a list of establishments provided by the Central Statistical Office. This excludes companies exempt from paying taxes as their earnings are too small, excludes very large companies that are given special tax exemptions, and excludes all companies that are not formally registered.For small sized establishments, EEC Canada selected an aerial sampling approach to estimate the population of establishments and selected the sample in this stratum for all regions of the survey. The starting population size in all strata and locations was 3336. Out of that population, some establishments refused to participate and some were unavailable, thus the final sample consists of 603 establishments.

Table 1: Descriptive Statistics

Panel A: African Countries, 2005–2006	Obs.	Mean	Std. Dev.	Min	Max	Median	Kurtosis
Nominal Interest Rate	811	15.3	6.1	0	50	14	6.6
Real Interest Rate	811	7.1	6.8	-16.8	44.6	6.8	6.6
log (K/L)	3536	1.5	1.8	-3.7	9.1	1.5	2.8
log MPK	3531	-0.9	1.4	-7.3	5.6	-0.9	3.9
log HK-index	3537	0.3	1.5	-6.3	6.1	0.3	3.4
Panel B: Germany, 2004	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Median**	**Kurtosis**
Nominal Interest rate	115	8.5	2.9	4.1	17	7.8	4.3
Real Interest rate	115	7.4	2.9	3	15.9	6.7	4.3
log (K/L)	158	4.0	1.1	0.0	6.7	4.2	4.3
log (MPK)	155	-0.7	1.1	-3.6	2.7	-0.7	4.1

Notes: Panel A displays descriptive statistics for African countries while Panel B displays descriptive statistics for Germany. The nominal interest rate is measured as 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 inflation rate in the year of the survey. The misallocation measures Marginal Product of Capital (MPK) and Hsieh-Klenow index (HK) are calculated as $\alpha\frac{Y}{K}$ and $\frac{\alpha}{1-\alpha}\frac{(wL)}{RK}$, respectively. German firms are not asked about the total cost of labor (WL), thus values of the HK-index are not available. See the data section for detailed explanations of other variables.

Table 2: Distribution of Firm Types

Panel A: African Countries

	N	%
All firms	3906	100
Exporters	77	2.0
Listed	22	0.6
Small	1997	51.1

Panel B: Germany

	N	%
All firms	168	100
Exporters	4	0.0
Listed	0	0
Small	53	31.5

Notes: N indicates the number of firms. In the second column, % indicates the percentage of corresponding type of firms among all firms. Export dummy indicates firms with percentage of direct exports to total sales greater than 50. Listed dummy indicates firms that are listed on a stock exchange. Small dummy indicates firms with 5 to 19 employees.

Table 3: Descriptive Statistics by Firm Types

Small Firms	Obs.	Mean	Std. Dev.	Min	Max	Median	Kurtosis
Nominal Interest Rate	217	16.3	6.9	0	50	15	7.4
Real Interest Rate	217	8.3	7.6	-13.6.0	44.6	7.7	7.6
log (K/L)	1984	1.0	1.7	-3.7	9.1	1.0	3
log MPK	1983	-0.8	1.4	-6.1	3.4	-0.8	3.3
log HK-index	1984	0.4	1.4	-6.2	4.7	0.4	3.3
Large Firms	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Median**	**Kurtosis**
Nominal Interest Rate	594	14.9	5.8	1.5	38	13	5.5
Real Interest Rate	594	6.6	6.3	-16.8	33.4	6.7	5.6
log (K/L)	1552	2.1	1.8	-3.6	7.9	2.3	3.2
log MPK	1548	-0.9	1.4	-7.3	5.6	-1.0	4.4
log HK-index	1553	0.0	1.5	-6.3	6.1	0.0	3.7
Listed Firms	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Median**	**Kurtosis**
Nominal Interest Rate	10	14.3	4.2	7.5	21.2	14.3	2.3
Real Interest Rate	10	4.3	4.9	-6.3	9.5	4.5	3.3
log (K/L)	22	2.7	1.2	0.1	4.8	3.1	2.4
log MPK	22	-0.9	1.0	-2.5	1.4	-1.1	2.9
log HK-index	22	0.1	0.9	-1.6	2.5	-0.0	3.9
Non-Listed Firms	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Median**	**Kurtosis**
Nominal Interest Rate	801	15.3	6.1	0	50	14	6.6
Real Interest Rate	801	7.1	6.8	-16.8	44.6	6.9	6.5
log (K/L)	3514	1.5	1.8	-3.7	9.1	1.5	2.8
log MPK	3509	-0.9	1.4	-7.3	5.6	-0.9	3.9
log HK-index	3515	0.3	1.5	-6.3	6.1	0.3	3.4

Notes: See notes to the previous tables.

Table 3: Descriptive Statistics by Firm Types

Exporting Firms	Obs.	Mean	Std. Dev.	Min	Max	Median	Kurtosis
Nominal Interest Rate	34	12.4	4.1	5	30	12	11.8
Real Interest Rate	34	3.1	5.5	-13.3	14.9	2.7	4.2
log (K/L)	73	2.1	1.6	-1.6	7.2	2.0	3.5
log MPK	71	-1.0	1.5	-4.4	4.0	-1.0	4.3
log HK-index	73	-0.0	1.6	-3.4	5.3	-0.2	4.0
Non-Exporting Firms	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Median**	**Kurtosis**
Nominal Interest Rate	777	15.4	6.2	0	50	14	6.5
Real Interest Rate	777	7.2	6.7	-16.8	44.6	7.0	6.6
log (K/L)	3463	1.5	1.8	-3.7	9.1	1.5	2.7
log MPK	3460	-0.9	1.4	-7.3	5.6	-0.9	3.9
log HK-index	3464	0.3	1.5	-6.3	6.1	0.3	3.4

Notes: See notes to the previous tables.

Table 4: Descriptive Statistics of Obstacles to Firm Operations

Panel A: African Countries	Obs.	Mean	Std. Dev.	Min	Max	Median	Kurtosis
Limited Access to Finance	3906	3.0	1.6	1	5	3	1.5
Weak Infrastructure	3906	2.5	0.9	1	5	2.5	2.4
Corruption	3906	2.0	0.8	1	5	1.8	2.8
Red Tape	3906	2.1	0.8	1	5	2	2.8
Panel B: Germany	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Median**	**Kurtosis**
Limited Access to Finance	168	2.2	1.0	1	4	2	1.8
Weak Infrastructure	168	1.4	0.5	1	4	1.2	9.8
Corruption	168	1.7	0.6	1	3.5	1.5	3.1
Red Tape	168	2.1	0.7	1	4	2	2.6

Notes: We have averaged answers to question about obstacles into four groups: Limited Access to Finance, Weak Infrastructure, Corruption 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?" Answers vary between 1 (no obstacle), 2 (minor obstacle), 3 (moderate obstacle), 4 (major obstacle) and 5 (very severe). 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." Corruption is the average of answers to this question where X is "Functioning of the Courts," "Inadequately educated workforce," "Political instability," "Corruption," "Macroeconomic instability," "Crime, theft and disorder," and "Practices of competitors in the informal sector." Red Tape and Corruption are coded such that higher values correspond to more corruption or more red tape. Panel A gives descriptive statistics for the Africa sample while Panel B displays similar descriptive statistics for Germany.

Table 5: Firm-Level Determinants of Misallocation

Dependent Variable: Log MPK	(1)	(2)	(3)	(4)	(5)
Limited Access to Finance	4.5	3.2	4.1*	3.7*	6.3**
	(1.7)	(1.4)	(1.9)	(2.0)	(3.3)
Weak Infrastructure	6.5	5.9	6.3	6.4	13.2**
	(1.4)	(1.2)	(1.3)	(1.3)	(2.8)
Corruption	–8.9*	–7.5*	–8.3*	–8.4*	–3.7
	(–2.2)	(–1.9)	(–1.9)	(–2.0)	(–0.7)
Red Tape	–9.3**	–7.4**	–8.2**	–8.0**	–19.0***
	(–2.8)	(–2.5)	(–2.7)	(–2.6)	(–5.1)
Age			–0.2	–0.2	–0.4**
			(–0.7)	(–0.7)	(–2.6)
Export			13.0	–0.5	–8.4
			(0.6)	(–0.0)	(–0.3)
Small			–16.5***	–16.6***	–9.0
			(–3.5)	(–3.5)	(–1.4)
Fin*Export				–26.2**	–26.5***
				(–3.1)	(–3.6)
Inf*Export				3.5	–5.1
				(0.2)	(–0.3)
Corr*Export				–8.9	–28.3
				(–0.4)	(–1.4)
Red*Export				11.2	28.7
				(0.4)	(1.1)
Country effects	Yes	Yes	Yes	Yes	No
Industry effects	No	Yes	Yes	Yes	Yes
Adj. R sq.	0.1	0.1	0.1	0.1	0.0
N	3531	3531	3527	3527	3527

Notes: See notes to the previous tables for variable explanations. Red Tape and Corruption are coded such that higher values correspond to more corruption or red tape. The interaction variables are constructed by the multiplication of $(Export - \overline{Export})$ with $(X - \overline{X})$ where X refers to an obstacle group and $\overline{X}$ refers to the mean of the corresponding variable over all firms. *Export* is a dummy which indicates firms with percentage of direct exports to total sales greater than 50. Standard errors are robust and t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Firm-Level Determinants of Misallocation

Dependent Variable: Log HK-index	(1)	(2)	(3)	(4)	(5)
Limited Access to Finance	11.1***	8.7***	9.4***	8.8***	12.6***
	(3.5)	(3.3)	(3.9)	(4.3)	(6.3)
Weak Infrastructure	–2.4	–2.4	–2.0	–1.9	5.7
	(–0.5)	(–0.5)	(–0.4)	(–0.4)	(1.2)
Corruption	–6.3	–4.8	–5.2	–5.6	–0.8
	(–1.7)	(–1.3)	(–1.3)	(–1.5)	(–0.1)
Red Tape	–12.3**	–10.4**	–11.1**	–10.5**	–30.6***
	(–2.7)	(–2.5)	(–2.8)	(–2.7)	(–7.3)
Age			–0.0	–0.0	–0.3
			(–0.1)	(–0.0)	(–1.3)
Export			11.9	–13.1	–20.2
			(0.6)	(–0.6)	(–1.1)
Small			–10.3	–10.5	–0.5
			(–1.3)	(–1.3)	(–0.1)
Fin*Export				–38.7**	–34.6***
				(–2.5)	(–4.1)
Inf*Export				–4.5	–15.1
				(–0.2)	(–0.9)
Corr*Export				–26.3	–55.6**
				(–1.1)	(–2.6)
Red*Export				44.5	62.9**
				(1.3)	(2.8)
Country effects	Yes	Yes	Yes	Yes	No
Industry effects	No	Yes	Yes	Yes	Yes
Adj. R sq.	0.1	0.2	0.2	0.2	0.1
N	3537	3537	3533	3533	3533

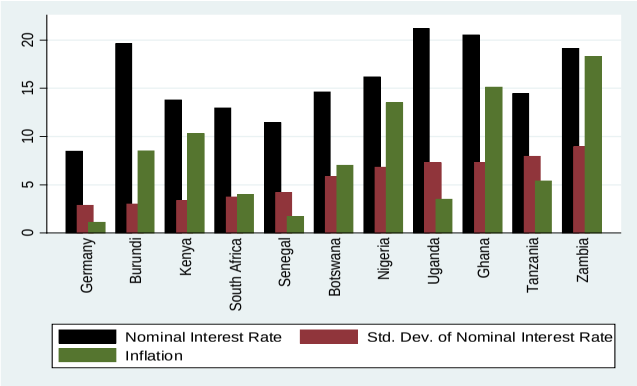
Notes: See notes to the previous tables for variable explanations. Red Tape and Corruption are coded such that higher values correspond to more corruption or red tape. The interaction variables are constructed by the multiplication of $(Export - \overline{Export})$ with $(X - \overline{X})$ where X refers to an obstacle group and $\overline{X}$ refers to the mean of the corresponding variable over all firms. *Export* is a dummy which indicates firms with percentage of direct exports to total sales greater than 50. Standard errors are robust and t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Firm-Level Determinants of Misallocation

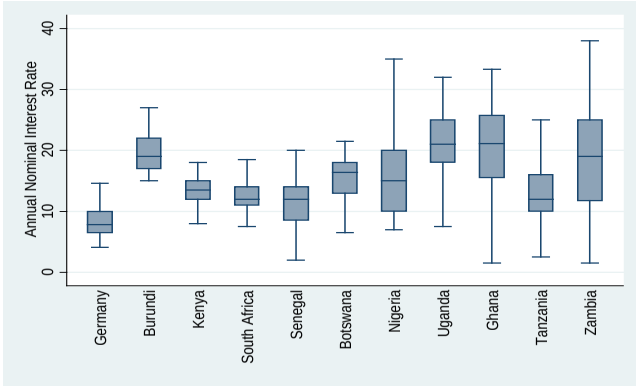
Dependent Variable: Log Real Interest Rate	(1)	(2)	(3)	(4)	(5)
Limited Access to Finance	5.5***	5.2**	4.4**	4.4**	5.2**
	(3.5)	(3.0)	(2.5)	(2.4)	(2.5)
Weak Infrastructure	–2.2	–1.7	–1.6	–1.5	3.5
	(–0.6)	(–0.5)	(–0.5)	(–0.5)	(1.3)
Corruption	–3.5	–3.4	–2.2	–2.2	–6.7
	(–1.0)	(–1.0)	(–0.6)	(–0.6)	(–1.7)
Red Tape	3.8	3.9	3.8	3.6	–2.6
	(0.9)	(0.9)	(0.9)	(0.8)	(–0.9)
Age			–0.1	–0.1	–0.3**
			(–0.7)	(–0.6)	(–2.8)
Export			–16.0*	–10.0	–0.8
			(–2.2)	(–0.9)	(–0.1)
Small			7.2	7.3	7.4
			(1.7)	(1.7)	(1.3)
Fin*Export				2.0	10.9**
				(0.4)	(2.7)
Inf*Export				–11.1*	–26.8**
				(–2.2)	(–3.2)
Corr*Export				–3.9	–5.2
				(–0.4)	(–0.4)
Red*Export				2.3	3.8
				(0.4)	(0.3)
Country effects	Yes	Yes	Yes	Yes	No
Industry effects	No	Yes	Yes	Yes	Yes
Adj. R sq.	0.3	0.3	0.3	0.3	0.0
N	713	713	713	713	713

Notes: See notes to the previous tables for variable explanations. Red Tape and Corruption are coded such that higher values correspond to more corruption or red tape. The interaction variables are constructed by the multiplication of $(Export - \overline{Export})$ with $(X - \overline{X})$ where X refers to an obstacle group and $\overline{X}$ refers to the mean of the corresponding variable over all firms. *Export* is a dummy which indicates firms with percentage of direct exports to total sales greater than 50. Standard errors are robust and t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Figure 1: Distribution of Nominal Interest Rate and Inflation



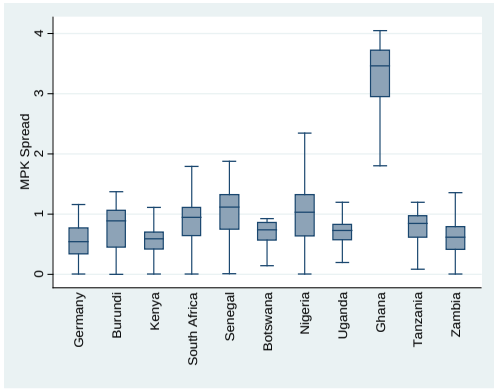
(a)



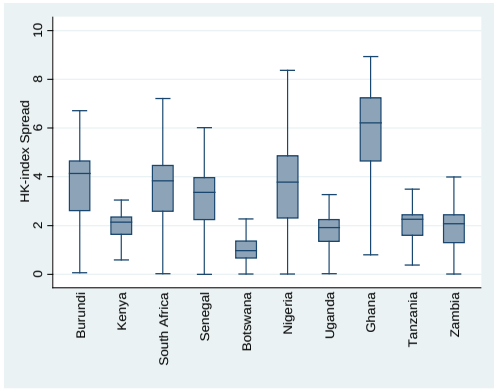
(b)

Notes: Panel (a) displays the mean and standard deviation of nominal interest rates and inflation. 2005 data for Botswana, Burundi, Tanzania, and Uganda, 2006 data for Kenya, South Africa, Ghana, Nigeria, Zambia, and Senegal, and 2004 data for Germany. 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 loan's annual cost (i.e., rate of interest)." In both panels, countries are ranked according to the standard deviation of nominal interest rates.

Figure 2: The Distribution of Misallocation Measures



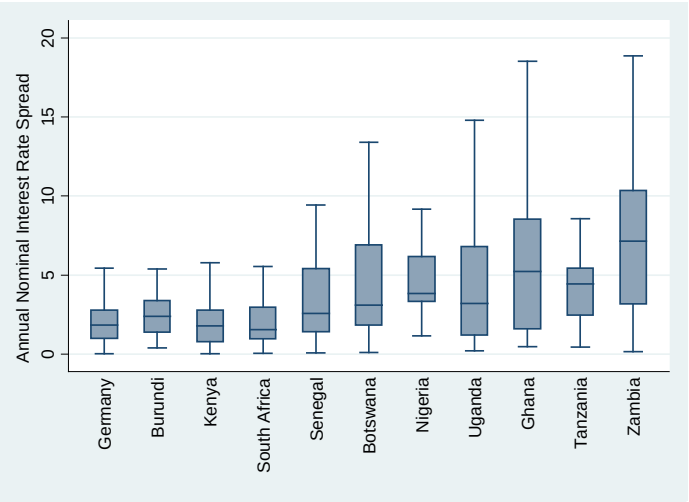
(a) MPK Spread



(b) HK-index Spread

Notes: Panels (a)-(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 mean. In Panel (a), the misallocation measure, MPK, is calculated as $\alpha\frac{Y}{K}$ where Y is value added and K is replacement cost value of capital stock. In Panel (b), the misallocation measure, HK-index, is calculated as $\frac{\alpha}{1-\alpha}\frac{(wL)}{RK}$. German firms don't provide information on total wage of labor, thus HK-index is not calculated for Germany. In both panels, countries are ranked according to the standard deviation of annual nominal interest rates.

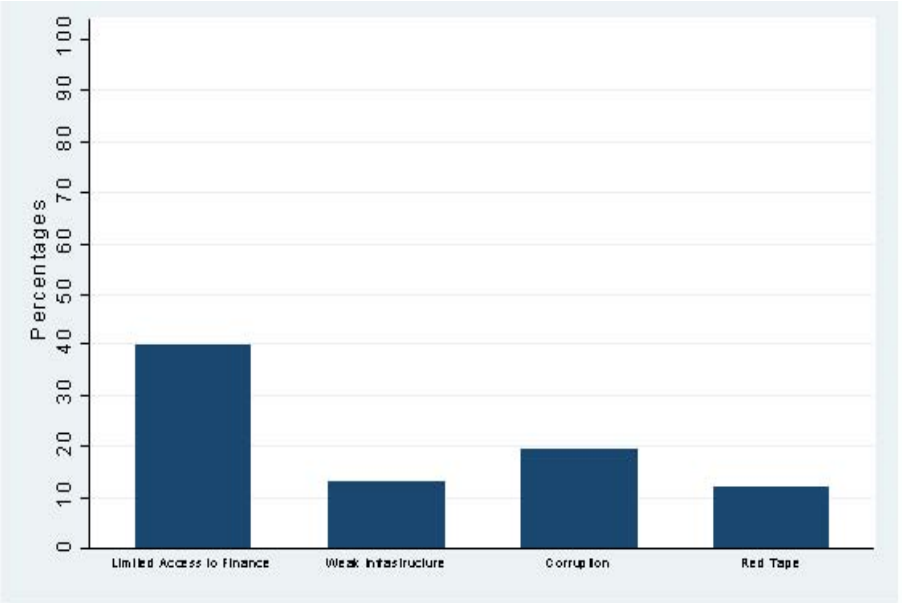
Figure 2: The Distribution of Interest Rate Spread



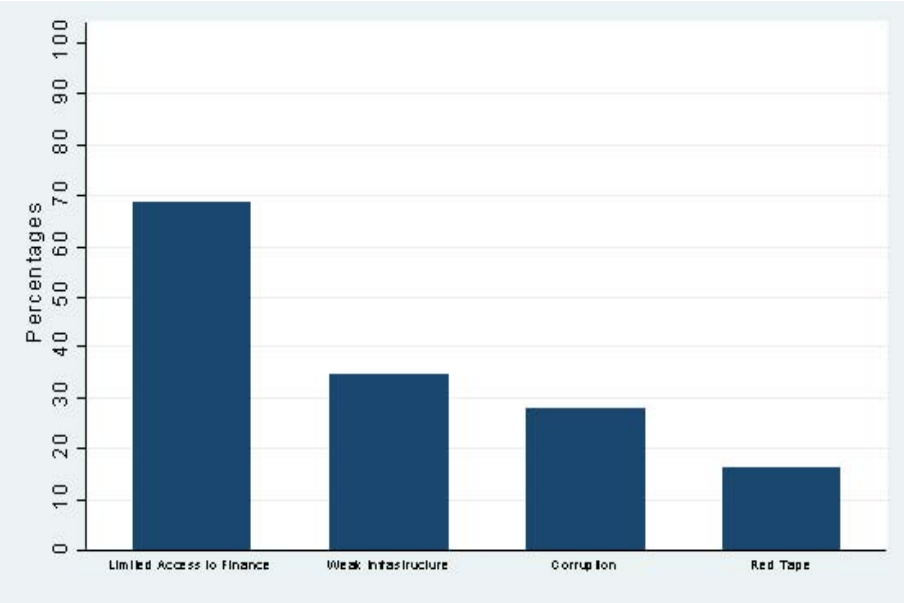
(c) Nominal Interest Rate

Notes: Panel (c) of Figure 2 displays Box-plots for the distribution of the annual nominal interest rate spreads. The spread is the absolute value of the difference between the firm-level value of the corresponding variable and its country-level mean. The annual nominal interest rate is response to the question "What is annual cost of loans (i.e., rate of interest)". The countries are ranked according to the standard deviation of annual nominal interest rates.

Figure 3: Major Obstacle Figures



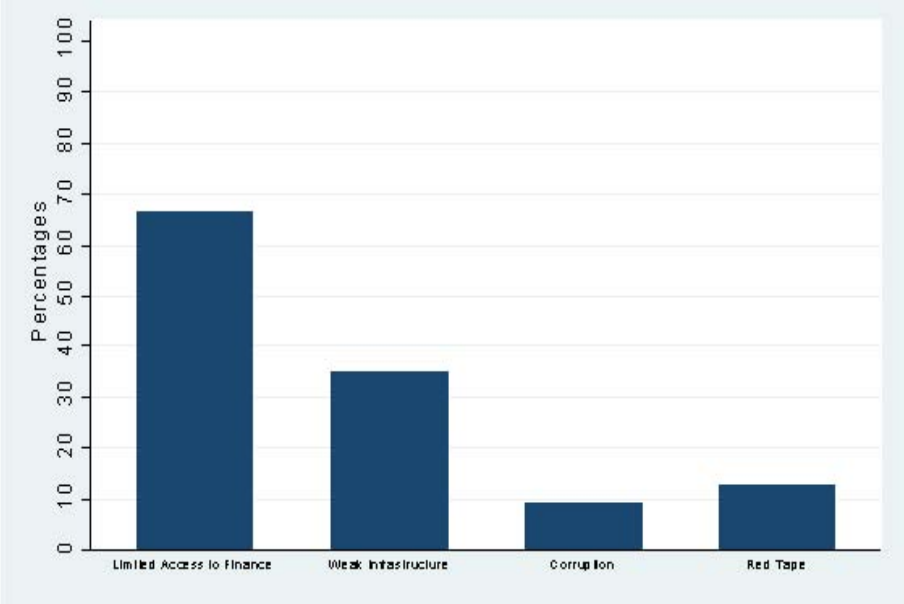
(a) Botswana



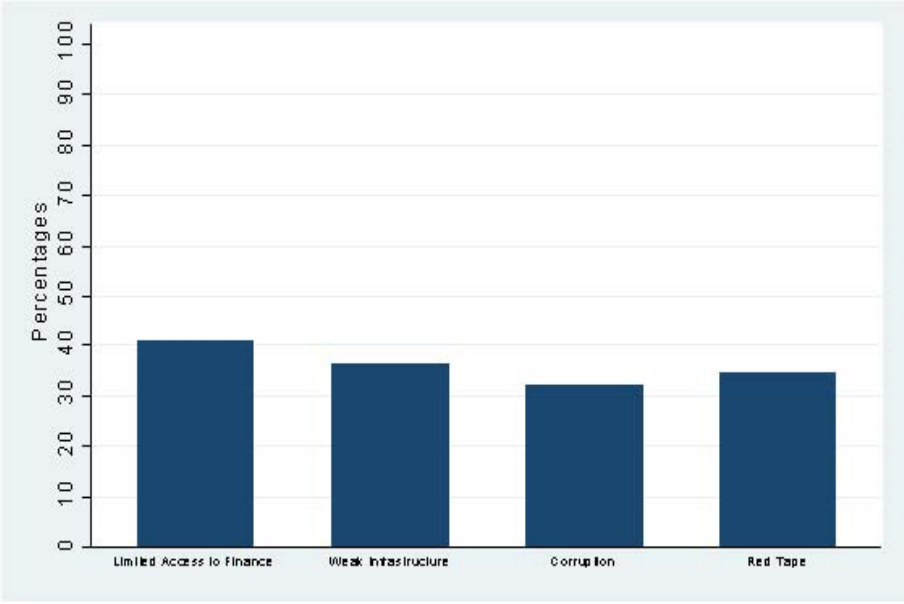
(b) Burundi

Notes: Limited Access to Finance, Weak Infrastructure, Corruption 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 present 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 1,2,3,4,5 respectively. The way we construct our measure of limited access to finance is as follows. We take the number of establishments who answered the question "Do you think that limited access to finance present any obstacle to the current operation of your establishment?" as "major obstacle and severe obstacle" and divide this by the number of total establishments who answered the questions. Hence our measures represent the percentage of establishments who think limited access to finance is a very important obstacle for their operations. In the case of Weak Infrastructure, the questions we used are "Do you think that Electricity, Telecommunications, Transportation, Access to land present major/severe obstacle to the current operations of your establishment?" In case of Red Tape, the questions we used are " Do you think that Tax rates, Tax administration, Customs and Trade regulations, Labor regulations and Business licensing and Permits present major/severe obstacle to the current operations of your establishment?". In case of Corruption, the questions we used are " Do you think that Functioning of the Courts, Inadequately educated workforce, Political instability, Corruption, Macroeconomic instability, Crime, theft and disorder and Practices of competitors in the informal sector represent major/severe obstacle to the current operations of your establishment?"

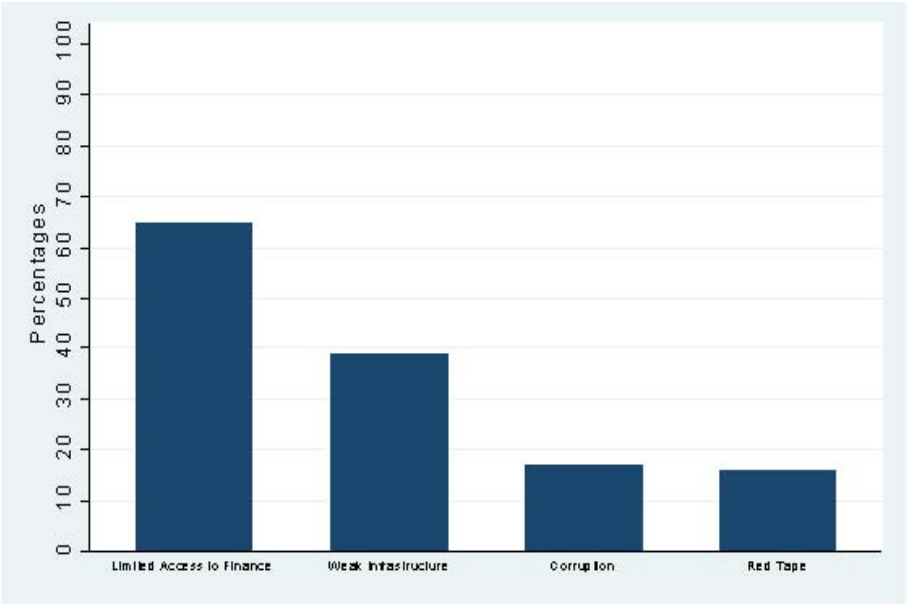
Figure 3: Major Obstacle Figures



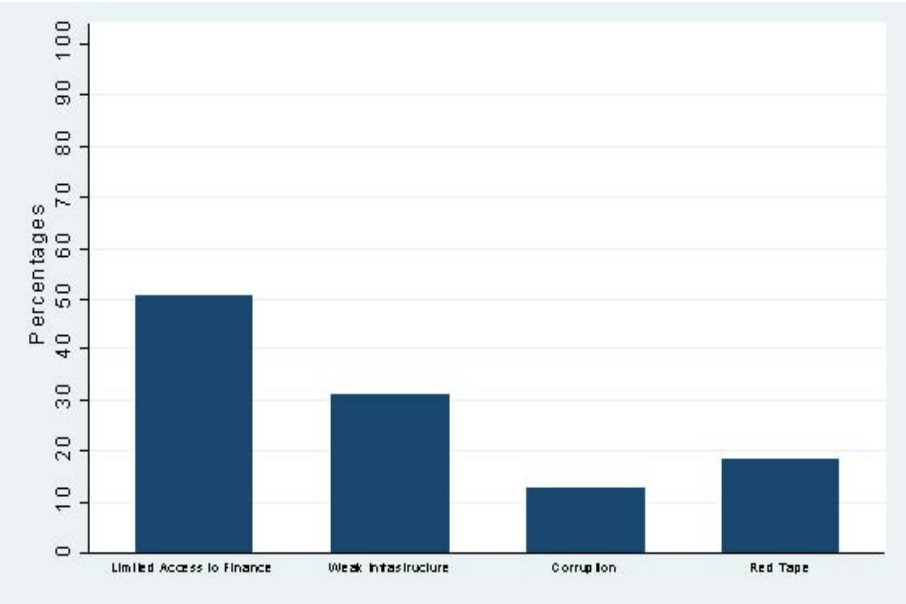
(c) Ghana



(d) Kenya



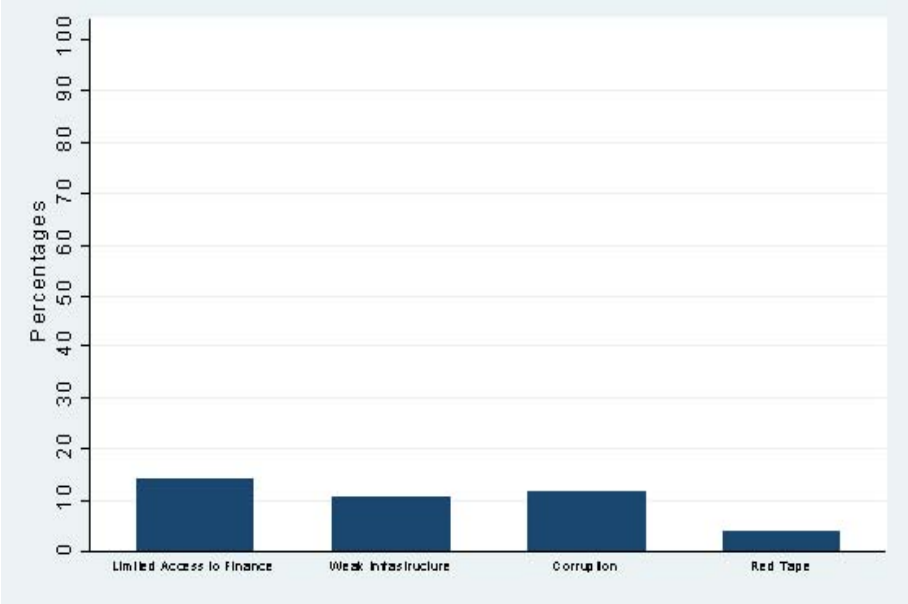
(e) Nigeria



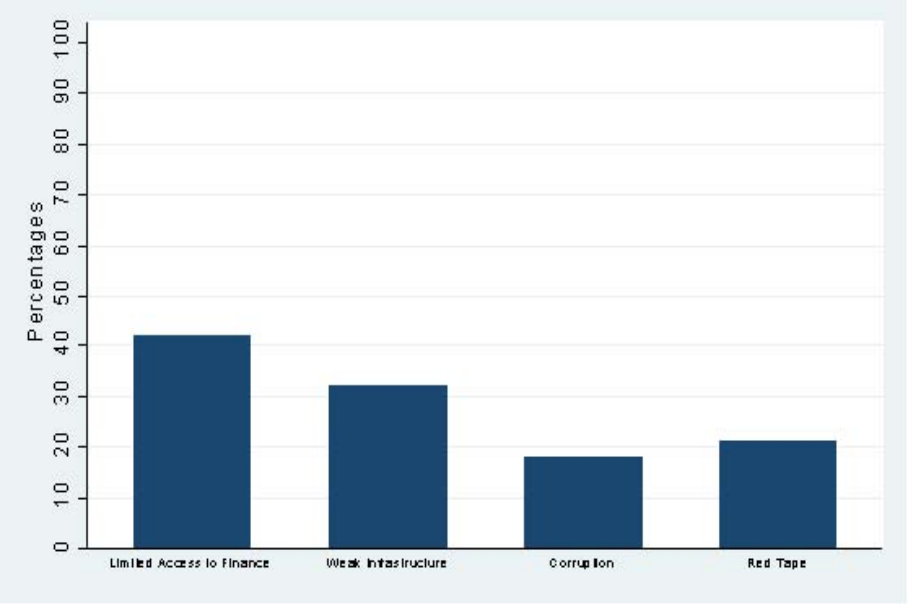
(f) Senegal

Notes: See notes to the previous figure.

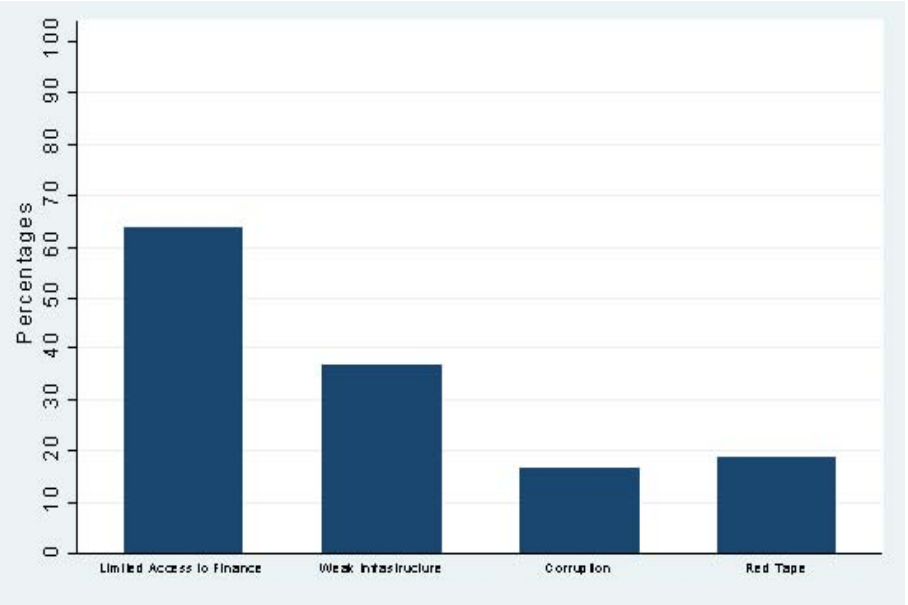
Figure 3: Major Obstacle Figures



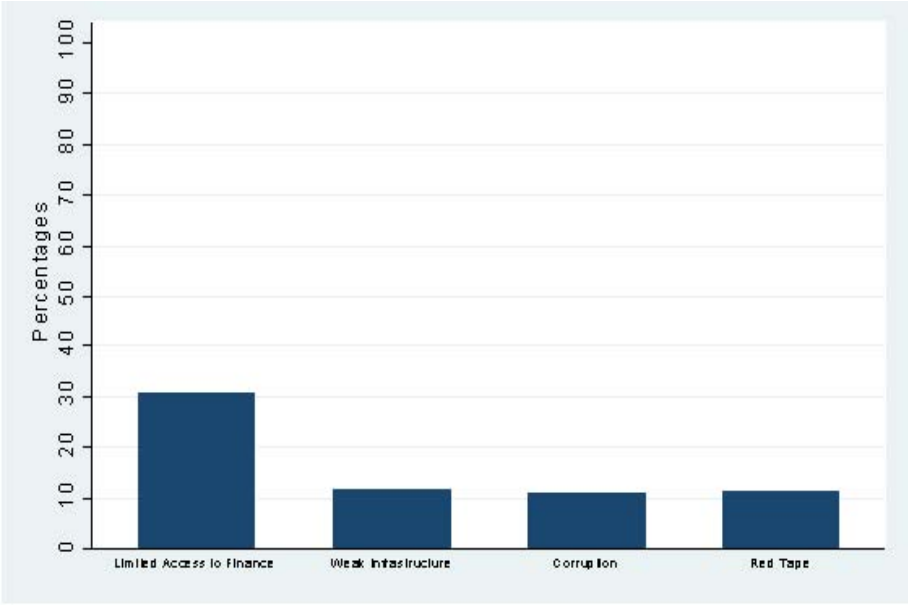
(g) South Africa



(h) Tanzania



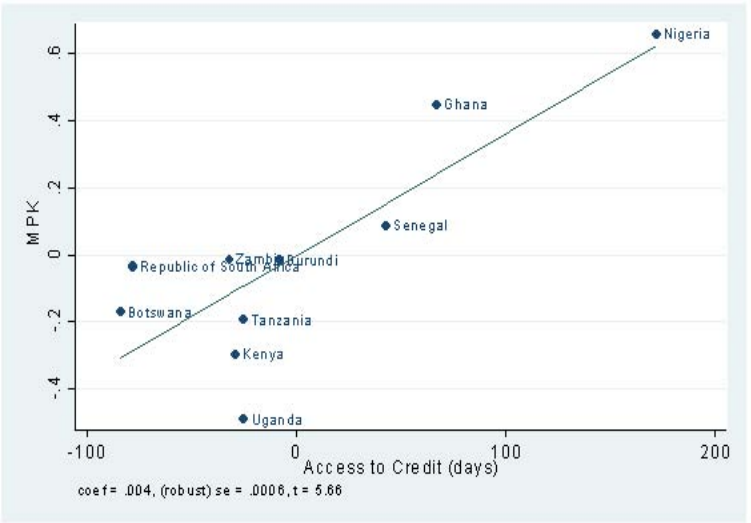
(i) Uganda



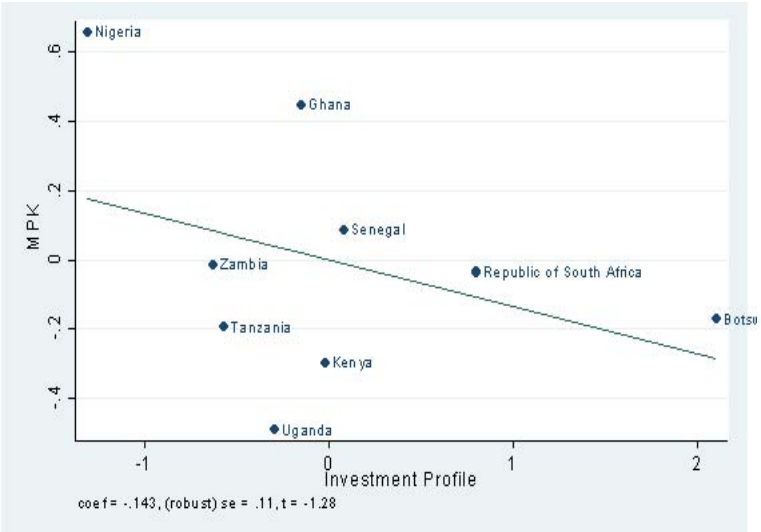
(j) Zambia

Notes: See notes to the previous figure.

Figure 4: The Relationship Between Misallocation and Institutional Variables



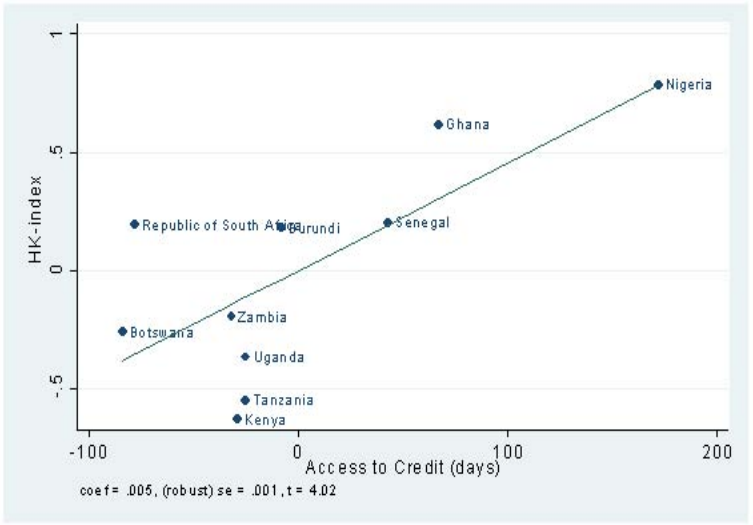
(a) Access to Credit (days)



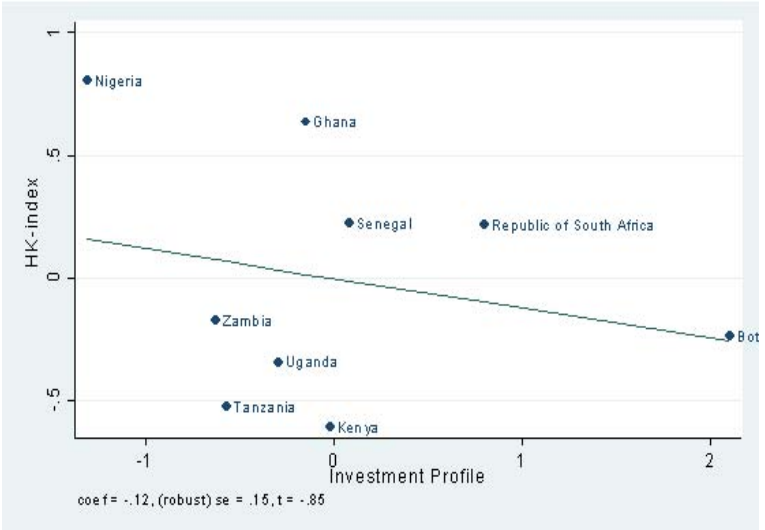
(b) Investment Profile

Notes: Panels (a)-(b) display the cross-country correlation plots of (country) average log(MPK) against Access to Credit (days) and Investment Profile, respectively. See the data section for definitions. Access to credit is the number of days that the establishments spent getting a loan. Investment profile evaluates investment climate in which establishments are operating, as the index increases, risk of expropriation is getting smaller.

Figure 5: The Relationship Between Misallocation and Institutional Variables



(a) Access to Credit (days)



(b) Investment Profile

Notes: Panels (a)-(b) display cross-country correlation plots of the (country) average log(HK-index) against Access to Credit (days) and Investment Profile, respectively. See the data section for definitions. Access to credit is the number of days that establishments spent before getting a loan. Investment profile evaluates investment climate in which establishments are operating, as the index increases, risk of expropriation is getting smaller.