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# Barriers of entry and capital returns in informal activities: Evidence from Sub‐Saharan Africa

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# Barriers of entry and capital returns in informal activities: Evidence from Sub-Saharan Africa[†]

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**Abstract**

This paper investigates the patterns of capital entry barriers into informal activities and capital returns in a number of Sub-Saharan African economies using a unique micro data set on informality covering seven West-African countries. Our assessment of initial investment of micro and small enterprises (MSEs) suggests that only few activities seem to exhibit considerable entry barriers. Our analysis of capital returns appears to confirm earlier findings of very high returns to capital in African MSEs of around 15 percent per month. An analysis of these returns at different levels of capital stock suggests that this also holds at very low levels of capital. Yet, returns are even higher at higher levels of capital.

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## 1. Introduction

Most urban dwellers in the poor developing world make their living from micro and small enterprises (MSEs) and the performance of those enterprises often decides upon livelihood success and failure. Successful entrepreneurs co-exist with the masses of petty traders or other menial workers who hardly can make a living from what they earn. It is widely assumed that the earnings potential of many of those entrepreneurs is not exploited, as they face important economic constraints, for example entry barriers and limited access to credit thus providing a rationale for policy interventions, such as micro-credit programs. The presence of entry barriers combined with capital market imperfections may indeed explain the heterogeneity amongst informal entrepreneurs in developing countries. In poverty trap models[1], returns to capital below a certain threshold of investment are often assumed to be very low or even zero, as entry of other poor individuals eats up potential returns. If entrepreneurs are wealthy enough or can obtain credit to overcome the barrier to entry, they can earn much higher returns. Returns to capital in MSEs can thus be regarded as a key indicator of the unexploited potential of informal entrepreneurship.

Microeconomic empirical evidence on the patterns of entry barriers into MSE activities in poor economies is scarce. Also, relatively few rigorous empirical studies have looked at the returns to capital of MSEs. Earlier studies on capital returns consistently find very high rates of more than 60 percent annual return (e.g. Banerjee and Duflo, 2004; de Mel et al., 2008). McKenzie and Woodruff (2006) also find high returns, yet little evidence for the existence of high entry costs for the case of informal Mexican enterprises. For Sub-Saharan Africa, one of the few contributions on capital entry barriers and returns is the paper by Udry and Anagol (2006) who find extremely high returns to investment into pineapple cultivation, which, however, exhibits considerable entry barriers. If confirmed for MSEs in general, such a finding would provide strong backing to the assumption that the potential of many of those entrepreneurs is indeed underexploited. And the potential would be huge, as a very large share of urban employment is generated by MSEs: Based on the same dataset used in this paper, Brilleau, Roubaud and Torelli (2005) find the share of informal sector employment[2] to uniformly exceed 70 percent in urban West-Africa.

This paper therefore estimates capital returns for West-African MSEs. By doing so, it also provides important feedback to economic theory. More specifically, it addresses the following two questions in the context of Sub-Saharan Africa: First, do high entry barriers (start-up costs) relative to the wealth level of an entrepreneur exist and if so, which magnitude do they have? Second, which are the patterns of capital returns as a function of capital stock; is it true that MSEs with a low capital stock earn low returns to capital while

[1] See, for example, Banerjee and Newman (1993), Aghion and Bolton (1997) or Lloyd-Ellis and Bernard (2000).

[2] Informal sector employment comprises employment in firms that neither have formal written accounts nor are registered with the tax administration. Employment or self-employment in those enterprises can be considered informal by almost any definition of informality one may want to apply. These enterprises typically operate without any formal registration. Most MSEs are run by self-employed individuals, an important share employs some family members, and a minor fraction has paid employees. These employees only rarely have work contracts, are not covered by formal legislation, for example taxation or social security schemes.

returns at higher levels of capital stock are much higher? To answer these questions, we use a unique, albeit cross-sectional, micro data set on informal enterprises covering the economic capitals of seven West-African countries.[3] We examine entry barriers into nine sectors and find little evidence for the existence of high entry barriers. We then estimate returns to capital at different levels of capital stock. Returns seem to be very high at low levels of capital stock, but even higher at higher levels of capital stock.

The remainder of the paper is organized as follows. Section 2 gives an overview of the existing literature on returns to capitals and entry costs in a developing country context. Section 3 outlines our analytical framework and formulates the hypotheses that are tested in the subsequent section. A final section concludes.

## 2. Literature review: Entry barriers and capital returns in the informal sector

Despite an abundant literature on the informal sector in developing countries (Moser, 1978; Peattie, 1987; Rakowsky, 1994; Maloney, 2004; Henley et al., 2006), the empirical literature on entry barriers and returns to capital in micro and small enterprises is fairly recent and surprisingly little extensive. This is all the more remarkable since a very early insight from the literature on the informal sector is that it comprises very heterogeneous activities or, more specifically, heterogeneous forms of production (Hart, 1973). Along these lines, some authors posit that the informal sector and the self-employment can be divided into different segments characterized by different entry barriers in terms of skill or capital requirements (Fields, 1990; Cunningham and Maloney, 2001). Fields (1990), for example, distinguishes between a lower and an upper tier of the informal sector.

Theoretically, such heterogeneity can be attributed to the existence of entry barriers and imperfect capital markets. At very low levels of capital – below the entry barrier – returns to capital should be low and can be very high in capital scarce economies once this threshold has been passed. Before we take up these ideas in the subsequent section where we elaborate our analytical framework in more detail, the following paragraphs review the existing evidence on returns to capital in MSEs and (their relationship to) entry barriers.

De Mel et al. (2008), for instance, use data from randomised experiment to estimate returns to capital of Sri Lankan microenterprises. In this experiment, the authors randomly give cash or in-kind transfers, which represent 55 to 110 percent of the median investment, to microenterprises. In a first step, the authors examine the impact of the transfers on capital stocks, profits and hours worked by the owner of the enterprise. They find a significant and positive correlation between transfers and real profits of the enterprises. Afterwards, they use the random treatment as an instrument for changes in the capital stock. By doing this and also correcting for the potential change in working hours as a consequence of the cash/in-kind transfer the authors compute returns to capital in a range from 70 to 55 percent per year. Furthermore, by analysing the heterogeneity in treatment effects, they are able to show that the high marginal returns are likely to be caused by credit constraints rather than insurance market failure.

[3] Abidjan, Bamako, Cotonou, Dakar, Niamey, Lomé and Ouagadougou.

Banerjee and Duflo (2004) use policy changes in a directed lending program as a natural experiment to compute returns to capital. The lending program under consideration came into effect in 1998 and was withdrawn only 2 years later. The authors assume that credit constrained firms will use the additional available funds for expansion while unconstrained firms will substitute other borrowing with this cheaper source of credit. Using a firm level panel dataset of Indian MSEs the authors provide evidence that some MSEs in India are indeed severely credit constrained. Furthermore, Banerjee and Duflo (2004) estimate returns to capital that are similar to the estimates of De Mel et. al (2008).

Udry and Anagol (2006) analyse both agricultural and non-agricultural investment in Ghana. They compare the returns earned in a new technology (pineapple cultivation) and traditional crops. The authors find average returns to investment in pineapple cultivation to be extremely high, up to 250 percent. However, this activity requires considerable initial investment: Exporters require farmers to plant a minimum of 0.135 hectares with pineapples, which implies an initial investment of at least 135 USD. Although entry costs are much lower, non-pineapple (traditional) plots returns also turn out to yield fairly high returns between 30 and 50 percent. Udry and Anagol (2006) concede that their estimates may only be taken as an upper limit of the returns to capital, as it is not possible to distinguish between returns to capital and those to entrepreneurship. The high returns may hence be partly explained by the unobserved returns to taking entrepreneurial risk of a new technology. Therefore, in order to estimate a lower bound for returns to capital the authors use data on pairs of durable goods (i.e. fan blade motors for taxis) that are equal in all respects but the life expectancy of the goods. Assuming that nothing else but higher opportunity costs of capital are the reason for the price differences the authors compute returns to capital of 60 percent.

To our knowledge, Udry and Anagol (2006) is the only study from the SSA context that tries to quantify the returns to capital in the informal sector. There is however, empirical evidence of African manufacturing firms based on panel data of manufacturing firms from Cameroon, Ghana, Kenya, Zambia and Zimbabwe. Using a production function approach Bigsten *et al.* (2000) they compute mean returns to physical capital between 10 (Zambia) and 35 (Zimbabwe) percent.

McKenzie and Woodruff (2006) estimate returns to capital for microenterprises in Mexico using data from Mexico's National Survey of mirco enterprises (ENAMIN). This study is closest to ours and looks at the heterogeneity of returns to capital at different sizes of capital stock as well as entry barriers for entrepreneurs into different economic activities. Using semi-parametric estimation techniques the authors detect high returns to investment at low levels of capital (20 percent per month). When looking at capital levels of 400 to 800 USD these returns fall by 5 percent per month. McKenzie and Woodruff (2006) also examine the start-up costs of micro enterprises that can be interpreted as entry barriers. Although start-up costs vary considerably by sector (i.e. the transport sector shows relatively high start-up costs) they do not find that business start-up costs are high relative to income levels of the entrepreneurs.

To sum up, the existing empirical evidence suggests that in certain fields entry barriers to business activities exist for MSEs in poor countries. The reviewed literature on returns to capital of firms in developing countries shows that these enterprises show a great heterogeneity in returns to capital that range from 60 to 250 percent. However, there is very scarce (and somewhat inconclusive) evidence from SSA. Therefore, this paper intends to close the knowledge gap on returns to capital and entry barriers into various economic activities of informal enterprises in the context of informal enterprises in Sub-Saharan Africa.

## 3. Analytical framework and hypotheses

The evidence presented above is partly consistent with a view of a technology with fixed costs and the presence of capital or insurance market imperfections. Incomplete capital markets have long been stressed as a major economic constraint on entrepreneurial activity in developing countries (e.g. Tybout, 1983; Bigsten *et al*., 2003). If capital markets function poorly because credit contracts cannot be easily enforced, capital fails to flow to its most productive uses and marginal returns across entrepreneurial activities are not equalized. Faced with different costs of capital, borrowers/entrepreneurs, e.g. because of differences in wealth and their capacity to provide collateral, may choose (or be forced) to invest in different technologies (Banerjee and Duflo, 2005).

The informal sector may then be divided into different segments characterized by different entry barriers in terms of skill or capital requirements (e.g. Fields, 1990; Cunningham and Maloney, 2001). These entry barriers of course only pose a constraint to the entrepreneur if capital markets do not function properly, which is likely to be the case in the SSA context. This basic idea is reflected and formalized in a number of models of economic development and poverty traps, which put forward the role of the distribution of wealth (e.g. Banerjee and Newman, 1993; Galor and Zeira, 1993). In these models, the segmentation of economic activities and the co-existence of high and low returns is caused by the interaction of non-convex production technologies and capital market imperfections. If gainful entrepreneurial activities require a certain level of start-up capital that cannot be obtained from capital markets, poorly endowed individuals will be prevented from entry. This implies that poor individuals get stuck in low-productivity activities and hence the whole economy may end up in a poverty trap; the higher the share of initially poor people, the higher the share of those in low-productivity sectors.[4]

These models typically hence assume very low levels of returns, or subsistence returns, at very low levels of capital and higher returns once a certain threshold has been passed. In the simplest of worlds, the entrepreneur maximises the difference between output y and the costs of capital, i.e. profit $\pi$ subject to his borrowing constraint $\overline{B}$. He can only produce a non-zero output using neoclassical technology $f$ if is able to raise at least $\overline{K}$. Otherwise his production will be eaten entirely by the costs of capital and his profit will be zero.

Max. $\pi = y - rK$ (1)

[4] Uncertainty can also create such poverty traps.

s.t. $y = f(K)$ if $K > \overline{K}$ (2)

$y = rK$ if $K \leq \overline{K}$ (3)

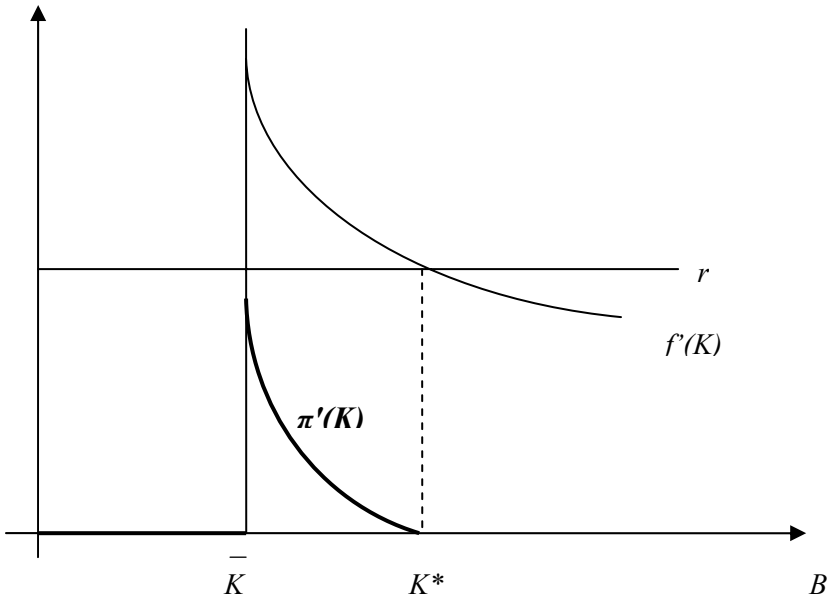
$K \leq \overline{B}$ (4)

The entrepreneur will chose his capital stock such that

$f'(K) = r$ if $\overline{B} > \overline{K}$ (5)

If his borrowing constraint is binding, i.e. $\overline{B} \leq \overline{K}$, then the entrepreneur will be indifferent between different sizes of capital stock, as he earns zero profits anywhere between $0 \leq K \leq \overline{K}$. Returns to an additional unit of capital, i.e. $\pi'(K)$, will hence be 0 between $0 \leq K \leq \overline{K}$. Once his borrowing capacity allows the entrepreneur to pass the threshold $\overline{K}$, he earns very high marginal returns that fall to zero when he reaches the optimal level of capital $K$*. The resulting patterns of marginal returns to capital as a function of the borrowing constraint $B$ are presented in the graph below.

**Figure 1: Borrowing constraints and marginal returns to capital**




Source: Authors' compilation.

This small exposition allows us to formulate two basic hypotheses to be tested subsequently: First, the existence of a threshold $\overline{K}$ should be observable in the distribution of initial investment undertaken by MSEs. Second, returns to capital should be low at low levels of capital, and high, but decreasing in $K$ at higher levels.

## 4. Entry costs and capital returns in African MSEs

### *3. Data*

We test these hypotheses by using data that stems from a set of surveys called 1-2-3 surveys (Enquêtes 1-2-3) in seven economic capitals of the West-African Monetary and Economic Union (WAEMU) in the early 2000s.[5] A 1-2-3 survey is a multi-layer survey organised in three phases and specially designed to study the informal sector Phase 1 is a representative labour force survey collecting detailed information on individual socio-demographic characteristics and employment. Phase 2 is a survey which interviews a sub-sample of informal production units identified in Phase 1. The focus of the second phase is on the characteristics of the entrepreneurs and their production unit, including the characteristics of employed workers. It also contains detailed information on input use, investment, sales, profits and the unit's forward and backward linkages. Phase 3 is a household expenditure survey interviewing (again) a representative sub-sample of Phase 1. The data of all three phases is organized in a way so that it can be linked. For this paper we use data form Phase 2 which hence is a representative sub-sample of informal entrepreneurs in seven West-African capitals (Brilleau et al., 2005).

### *3.1 Entry barriers*

Although our dataset is cross-sectional, it allows us to identify investment paths since, for each enterprise asset, we know the date of purchase. Furthermore, we know when an enterprise has been established. We use the detailed information on investment to examine entry barriers related to different MSE activities, which we proxy by accumulated investment undertaken during the first two years of operation.

Our original sample comprises 6,584 informal enterprises. A majority of around 80% of these enterprises employ less than 3 permanent workers. The average owner of an enterprise in our sample is 34 years old, has 4 years of education and works around 6 hours per day for his enterprise.

As we expect measurement error in the investment history of MSEs in our data to be severe for investments undertaken a long time ago, the subsequent analysis of entry barriers only considers enterprises have been established three years before the survey or later. This leaves us with a subsample of 1,992 informal enterprises that form the basis for the statistics reported below.

We first examine entry barriers by industry. Table 1 shows entry barriers (accumulated investment in the first 2 years) of informal enterprises at certain quantiles of the initial-investment distribution based on the pooled data from all 7 countries in the dataset.

[5] These economic capitals are Abidjan, Bamako, Cotonou, Dakar, Niamey, Lomé and Ouagadougou. For a more detailed description of the data see Brilleau et al. (2005).

**Table 1: Entry barriers to informal enterprises**

| | | Percentile of initial investment in 2001 Euros | | | | |
|---|---|---|---|---|---|---|
| | No. of obs. | 10th | 25th | median | 75th | 99th |
| Clothing and apparel | 178 | 5.8 | 52.38 | 146.77 | 371.48 | 3622.68 |
| Other manufacturing & food | 280 | 5.8 | 12.18 | 38.29 | 183.93 | 7141.16 |
| Construction | 88 | 10.15 | 15.37 | 37.14 | 121.87 | 3156.47 |
| Wholesale/retail shops | 178 | 6.95 | 15.84 | 69.19 | 286.54 | 7339.83 |
| Petty traders | 457 | 2.84 | 4.4 | 11.61 | 35.71 | 856.94 |
| Hotels and restaurants | 128 | 11.58 | 22.87 | 50.33 | 204.66 | 3520.6 |
| Repair services | 99 | 11.59 | 36.18 | 107.12 | 382.65 | 14797.02 |
| Transport | 83 | 52.46 | 235.89 | 624.84 | 1643.57 | 35705.8 |
| Other services | 186 | 4.34 | 12.5 | 60.71 | 356.55 | 12630.26 |
| Total | 1677 | 4.34 | 11.43 | 43.69 | 226.86 | 5924.06 |

Source: Authors' computation.

Notes: Consumer Price Indices for computing real values are obtained from the International Financial Statistics and the World Development Indicators. Values are in 2001 Euros.

Overall, initial investment levels are fairly low: The median entrepreneur invests around 40 Euros in the first 2 years after establishing the enterprise. Moreover, Table 1 reveals substantial heterogeneity of entry barriers across sectors. While the median petty trader, as one would expect, only faces low initial costs of around 10 Euro to start an enterprise, the median entrepreneur in the transport business has to invest around 600 EUR initially.[6] The latter sector is also the only sector with considerable entry costs at the $10^{th}$ percentile. All other sectors exhibit at least some activities with low entry costs.

To test whether entry barriers are high relative to the income of informal entrepreneurs we divide the required initial investment by the monthly earnings of an entrepreneur.[7] Table 2 thus shows the number of months necessary to earn the amount equivalent to the entry barriers shown in Table 1. The figure illustrate that entry barriers can indeed be substantial.

[6] In Appendix 1, we also provide these figures by country. It turns out that the distributions of start-up costs across sectors in the different countries are fairly similar to those reported in Table 1.

[7] Data on income are also included in our data. To compute monthly earnings we multiply the average hourly wage of informal enterprises by the average number of hours worked by an owner of an informal enterprise.

**Table 2: Entry barriers relative to income levels**

| | Months of earnings entry barrier represents | | | |
|---|---|---|---|---|
| | 10th earnings percentile | | median earnings | |
| | 10th | 25th | 10th | 25th |
| Clothing and apparel | 1.35 | 12.19 | 0.29 | 2.63 |
| Other manufacturing & food | 1.35 | 2.83 | 0.29 | 0.61 |
| Construction | 2.36 | 3.58 | 0.51 | 0.77 |
| Wholesale/retail shops | 1.62 | 3.69 | 0.35 | 0.8 |
| Petty traders | 0.66 | 1.02 | 0.14 | 0.22 |
| Hotels and restaurants | 2.7 | 5.32 | 0.58 | 1.15 |
| Repair services | 2.7 | 8.42 | 0.58 | 1.82 |
| Transport | 12.21 | 54.9 | 2.64 | 11.85 |
| Other services | 1.01 | 2.91 | 0.22 | 0.63 |
| Total | 1.01 | 2.66 | 0.22 | 0.57 |

Source: Authors' computation.

### *3.2 Returns to capital*

We now turn to the estimation of the returns to capital. In our empirical model, profits $\pi_{ihj}$ of MSE *i* in household h residing in country *j* are not only a function of capital $K_{ihj}$, but also of a vector of exogenous variables $X_{ihj}$ and two unobserved factors, one at the household level $\vartheta_{ihj}$, for example household wealth, and one at the individual level $\vartheta_{ihj}$, which we primarily think of as entrepreneurial ability. These factors do not only influence profit directly, but simultaneously determine the size of the capital stock.

$$\pi_{ihj} = f(K_{ihj}(\vartheta_{hj}, \vartheta_{ihj}), X_{ihj}, \vartheta_{hj}, \vartheta_{ihj}) \tag{6}$$

In log-linearized form and with $u_{ij}$, a random error, the equation can be expressed as

$$\ln(\pi_{ihj}) = \alpha + \beta_K \ln K_{ihj} + X'_{ihj}\delta + \beta_{\vartheta 1}\vartheta_{hj} + \beta_{\vartheta 2}\vartheta_{ihj} + u_{ihj}. \tag{7}$$

The observable exogenous characteristics of the entrepreneur in the models estimated below are years of schooling, experience, gender, and labor input. Further "exogenous" variables include sectoral dummies and country dummies. A central problem we face in estimating this equation is the 'classical' omitted variable bias, in particular ability bias, which typically contaminates the estimates of capital returns from a cross-section.

A test for heterogeneity in returns, i.e. in $\beta_K$ as a function of K, can be introduced in various ways. A very simple approach would just split the sample into entrepreneurs with low and high levels of capital stock. Because of the omitted variables biases, it is clear that the comparison of the returns across cannot provide more than a first rough approximation to variations in the data. The same holds for quantile regressions, which in principle also allow us to test whether $\beta_K$ is different in different parts of the distribution of K. Without the intention to ignore these crucial caveats, Table reports the results from an OLS regression for all enterprises and for sub-samples of lower (than 80 000 CFA Franc) and higher capital stock as well as those of a quintile regression. The regressions exclude enterprises that report to

operate without any capital (and/or zero profits), which leaves us with 5380 observations (of 6,584).

**Table 1: Returns to capital – results from OLS and quantile regressions**

| | Dependent variable: Log monthly profits | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ordinary least squares | | | Quantile regression | | | |
| | all | low capital | high capital | q20 | q40 | q60 | q80 |
| Log capital | 0.150*** | 0.194*** | 0.252*** | 0.108*** | 0.138*** | 0.156*** | 0.191*** |
| | (0.011) | (0.019) | (0.032) | (0.014) | (0.015) | (0.012) | (0.017) |
| Owner's education | 0.026*** | 0.020*** | 0.034*** | 0.014* | 0.018** | 0.026*** | 0.038*** |
| | (0.004) | (0.005) | (0.008) | (0.006) | (0.007) | (0.006) | (0.007) |
| Owner's experience | 0.014*** | 0.010*** | 0.022*** | 0.012*** | 0.014*** | 0.017*** | 0.018*** |
| | (0.002) | (0.003) | (0.005) | (0.003) | (0.003) | (0.003) | (0.004) |
| Owner female | -0.350*** | -0.313*** | -0.417*** | -0.415*** | -0.342*** | -0.321*** | -0.312*** |
| | (0.043) | (0.050) | (0.079) | (0.064) | (0.057) | (0.049) | (0.059) |
| Log labour | 0.275*** | 0.308*** | 0.242*** | 0.277*** | 0.290*** | 0.308*** | 0.303*** |
| | (0.016) | (0.020) | (0.028) | (0.024) | (0.023) | (0.021) | (0.021) |
| Cotonou | -0.750*** | -0.819*** | -0.650*** | -0.888*** | -0.221** | -0.419*** | -0.480*** |
| | (0.064) | (0.079) | (0.113) | (0.099) | (0.072) | (0.067) | (0.094) |
| Ouaga | -0.558*** | -0.696*** | -0.358** | -0.671*** | 0.084 | 0.004 | -0.129 |
| | (0.062) | (0.071) | (0.123) | (0.093) | (0.076) | (0.068) | (0.071) |
| Abijan | 0.017 | 0.057 | -0.023 | -0.166 | 0.681*** | 0.362*** | 0.271* |
| | (0.060) | (0.069) | (0.115) | (0.093) | (0.087) | (0.070) | (0.109) |
| Bamako | -0.057 | -0.028 | -0.134 | -0.174 | 0.066 | 0.039 | 0.082 |
| | (0.063) | (0.070) | (0.134) | (0.090) | (0.106) | (0.089) | (0.115) |
| Niamey | -0.616*** | -0.646*** | -0.623*** | -0.956*** | 0.479*** | 0.401*** | 0.283** |
| | (0.067) | (0.074) | (0.145) | (0.123) | (0.108) | (0.110) | (0.095) |
| Lome | -1.086*** | -1.102*** | -1.022*** | -1.037*** | -0.232* | -0.409*** | -0.544*** |
| | (0.064) | (0.072) | (0.126) | (0.088) | (0.098) | (0.100) | (0.105) |
| Clothing and apparel | -0.365*** | -0.381*** | -0.316* | -0.196 | 0.499*** | 0.322** | 0.044 |
| | (0.063) | (0.077) | (0.126) | (0.104) | (0.138) | (0.109) | (0.121) |
| Other manufacturing & food | -0.014 | 0.115 | -0.291* | 0.087 | 0.181* | -0.027 | -0.155* |
| | (0.055) | (0.061) | (0.127) | (0.086) | (0.090) | (0.073) | (0.077) |
| Construction | 0.507*** | 0.437*** | 0.675*** | 0.785*** | -0.797*** | -0.728*** | -0.711*** |
| | (0.075) | (0.084) | (0.166) | (0.098) | (0.082) | (0.074) | (0.102) |
| Wholesale/retail shops | 0.105 | 0.043 | 0.131 | 0.120 | -0.709*** | -0.556*** | -0.579*** |
| | (0.069) | (0.080) | (0.140) | (0.111) | (0.071) | (0.067) | (0.095) |
| Hotels and restaurants | 0.341*** | 0.200* | 0.542*** | 0.425** | -0.074 | 0.060 | 0.141 |
| | (0.075) | (0.087) | (0.155) | (0.132) | (0.078) | (0.083) | (0.099) |
| Repair services | -0.314*** | -0.210* | -0.425** | -0.107 | -0.143* | -0.080 | -0.090 |
| | (0.084) | (0.106) | (0.152) | (0.114) | (0.065) | (0.062) | (0.097) |
| Transport | 0.308** | 0.253 | 0.240 | 0.603*** | -0.663*** | -0.470*** | -0.429*** |
| | (0.095) | (0.206) | (0.144) | (0.135) | (0.087) | (0.093) | (0.106) |
| Other services | 0.007 | 0.083 | -0.132 | 0.190 | -1.061*** | -1.044*** | -1.199*** |
| | (0.066) | (0.074) | (0.140) | (0.108) | (0.067) | (0.070) | (0.094) |
| Constant | 1.602*** | 1.390*** | 1.083*** | 0.855*** | 1.295*** | 1.706*** | 2.301*** |
| | (0.109) | (0.135) | (0.261) | (0.165) | (0.164) | (0.148) | (0.163) |
| R-squared | 0.283 | 0.266 | 0.228 | | | | |
| N | 5380 | 3582 | 1798 | | 5380 | | |

Source: Authors' computation

Note: * p<0.05, ** p<0.01, *** p<0.001

As in earlier studies, capital returns in MSEs seem to be extremely high; the OLS estimate for the entire sample yields a monthly (annual) return of 15 (180) percent. Returns also appear to be heterogeneous: At lower levels of capital returns are lower in both the OLS estimates based on a split sample as well as in the quintile regression. The differences are very pronounced. The quintile regression yields a monthly return estimate of about 20 percent for the highest capital quintile while this return stands at only 10 percent at the lowest. These results are not strictly in line with the hypothesis on capital returns derived above. The estimates, despite there shortcoming, do not suggest the existence of a dichotomous informal sector where activities with very low capital returns co-exist with others with higher capital stock and much higher capital returns. It does hence seem unlikely that there is a uniform entry barrier that some are able to overcome and others not. However, the finding of higher returns at higher levels of capital stock is in principle consistent with a scenario of fixed costs in the presence of capital market imperfections (or some other form of increasing returns to capital). Accordingly, MSEs do not seem to move on a neoclassical production function.

Our estimations explain an acceptable portion of the variation in profits, and the coefficients of the control variables turn out to be reasonable and yield some interesting additional insights. The estimated returns to schooling – albeit also certainly contaminated by ability bias – are fairly high, at least for higher levels of capital. While returns are hardly significant in the lowest capital quintile, they reach almost 4 percent. This might indicate the existence of complementarities between human and physical capital, an issue that will be explored in future work. Similarly, the returns to experience seem somewhat higher at higher levels of capital although the differences between quantiles are much less important. Interestingly and it light of the former findings somewhat unexpected, labour returns do not vary much with the capital stock. The gender coefficient is also fairly stable both across the different OLS specifications and at different quantiles. The coefficients of the country dummies have to be interpreted against Dakar (Senegal), one of the richest cities in the sample, as reference category. The OLS results yield the expected pattern across countries. Returns are lower in the poorest cities Cotonou, Ouagadogou, Niamey, and lowest in Lomé. In the quantile regressions, some differences between the country effects arise, which might merit further investigation. The reference group for the sectoral dummies are the petty traders, presumably one of the groups in the informal sector with lowest earnings. The regression results indicate that this is only partly true. It seems to hold for petty traders in the lowest capital quantile, but overall, the coefficients do not yield a consistent picture. It may also be the case that petty traders are not a suitable comparison group at higher capital levels, something we need to explore further.

The omitted variable biases that contaminate the above results are cannot be easily removed. Yet, as quite a number of households own more than one enterprise, we are able to estimate the above equation with a household fixed effect, thus removing the omitted household-level variables from the estimated equation. This procedure may also mitigate ability bias if entrepreneurs in the same household may be more similar to each other in term of ability than they are compared to entrepreneurs outside the household. Clearly, the implied reduction of the sample to only those MSEs in households with more than one is

prone to selection bias that will be addressed in future work. The results of both fixed and random effects models are presented in Table below.

**Table 2: Returns to capital using fixed and random effects**

| | Dependent variable: Log monthly profits | | | | | |
|---|---|---|---|---|---|---|
| | all | | low capital | | high capital | |
| | fixed | random | fixed | random | fixed | random |
| Log capital | 0.163*** | 0.151*** | 0.156** | 0.184*** | 0.408** | 0.269*** |
| | (0.025) | (0.018) | (0.048) | (0.032) | (0.151) | (0.055) |
| Owner's education | 0.017 | 0.015 | 0.027 | 0.020 | -0.016 | 0.004 |
| | (0.013) | (0.008) | (0.017) | (0.010) | (0.034) | (0.014) |
| Owner's experience | 0.012* | 0.016*** | 0.012* | 0.016*** | 0.091** | 0.017* |
| | (0.005) | (0.004) | (0.006) | (0.005) | (0.030) | (0.009) |
| Owner female | -0.474*** | -0.461*** | -0.365** | -0.436*** | -0.857** | -0.486*** |
| | (0.092) | (0.067) | (0.113) | (0.077) | (0.278) | (0.140) |
| Log labour | 0.289*** | 0.292*** | 0.288*** | 0.312*** | 0.183 | 0.256*** |
| | (0.038) | (0.028) | (0.051) | (0.034) | (0.108) | (0.050) |
| Constant | 1.268*** | 1.251*** | 1.253*** | 1.073*** | 0.041 | 0.733 |
| | (0.239) | (0.176) | (0.316) | (0.213) | (1.053) | (0.431) |
| Number of observations | 1727 | 1727 | 1210 | 1210 | 517 | 517 |
| Number of groups | 908 | 908 | 767 | 767 | 417 | 417 |
| R-squared within | 0.2953 | 0.2946 | 0.1959 | 0.1949 | 0.3125 | 0.2629 |
| R-squared between | 0.1690 | 0.1703 | 0.1842 | 0.1873 | 0.0724 | 0.1247 |
| R-squared overall | 0.2179 | 0.2192 | 0.1840 | 0.1857 | 0.1128 | 0.1589 |
| Hausman | no differences | | no differences | | significant differences (at 10 percent level) | |

Source: Author's computation

Note: * p<0.05, ** p<0.01, *** p<0.001

The estimates that rely only on the differences between MSEs within the same households yield a very similar picture as the above OLS and quantile regressions. Capital returns are of similar magnitude of about 15 percent at lower and more than 20 percent at higher levels of capital. An outlier result is the very high return in the fixed-effects equation of returns at higher levels. Yet, the standard error for this estimated coefficient is also very large. The fact that owner's years of schooling never turns out to be significant may well be due to little variation in this variable within households. In the interpretation of the fixed and random effects estimates it should also be taken into account that the two key variables under consideration, profits and capital stock, are likely to be measured with error. This problem is reinforced when only within-household variation is being used. Such measurement error would bias the returns to capital against zero; an effect that would be opposite to the ability bias, which we may have mitigated but certainly not eliminated by estimating a household-level fixed-effect model.

To sum up, the above estimates suggest very high returns to capital in African MSEs of around 15 percent per month. This also seems to hold at very low levels of capital. Yet, returns are indeed even higher at higher levels of capital.

## 4. Conclusions

This paper has analyzed the patterns of capital entry barriers into informal activities and capital returns in a number of Sub-Saharan African economies using a unique micro data set on informality covering seven West-African countries. Our assessment of initial investment of micro and small enterprises (MSEs) suggests that only few activities seem to exhibit considerable entry barriers. Our analysis of capital returns appears to confirm earlier findings of very high returns to capital in African MSEs of around 15 percent per month. An analysis of these returns at different levels of capital stock suggests that this also holds at very low levels of capital. Yet, returns are even higher at higher levels of capital.

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## Appendices

**Appendix 1: Entry Barriers by country**

| Benin (Cotonou) | | | | | | |
|---|---|---|---|---|---|---|
| | N | 10th | 25th | median | 75th | 90th |
| Clothing and apparel | 24 | 71.02 | 89.43 | 378.32 | 990.99 | 3622.68 |
| Other manufacturing & food | 25 | 17.59 | 79.17 | 174.46 | 615.75 | 8570.69 |
| Construction | 10 | 9.5 | 26.39 | 80.14 | 165.67 | 2006.18 |
| Wholesale/retail shops | 29 | 9.76 | 17.59 | 223.96 | 826.87 | 14134.45 |
| Petty traders | 36 | 2.93 | 7.98 | 19.06 | 86.73 | 545.97 |
| Hotels and restaurants | 26 | 21.59 | 27.97 | 94.47 | 555.84 | 15698.76 |
| Repair services | 14 | 67.44 | 183.26 | 418.57 | 606.96 | 5320.95 |
| Transport | 22 | 293.22 | 439.82 | 588.54 | 659.73 | 1759.29 |
| Other services | 26 | 10.56 | 142.21 | 515.33 | 1695.96 | 12630.26 |
| Total | 212 | 10.26 | 32.17 | 193.52 | 652.87 | 12630.26 |
| **Burkina Faso (Ouaga)** | | | | | | |
| | N | 10th | 25th | median | 75th | 90th |
| Clothing and apparel | 11 | 20.33 | 23.23 | 121.95 | 239.55 | 1231.12 |
| Other manufacturing & food | 37 | 5.81 | 10.74 | 24.95 | 36.29 | 1444.53 |
| Construction | 8 | 14.52 | 20.18 | 31.3 | 162.98 | 1044.42 |
| Wholesale/retail shops | 24 | 7.26 | 19.19 | 88.56 | 1041.66 | 5830.4 |
| Petty traders | 56 | 1.45 | 2.9 | 7.98 | 24.68 | 505.8 |
| Hotels and restaurants | 23 | 29.04 | 39.37 | 85.66 | 1379.2 | 3520.6 |
| Repair services | 10 | 2.5 | 11.29 | 36.29 | 58.07 | 842.04 |
| Transport | 2 | 1472.12 | 1472.12 | 2187.85 | 2903.59 | 2903.59 |
| Other services | 17 | 14.98 | 37.63 | 94.59 | 1335.65 | 13015.32 |
| Total | 188 | 2.9 | 10.05 | 31.21 | 146.63 | 5830.4 |
| **Côte d'Ivoir (Abidjan)** | | | | | | |
| | N | 10th | 25th | median | 75th | 90th |
| Clothing and apparel | 43 | 9.92 | 77.19 | 164.47 | 314.76 | 5924.06 |
| Other manufacturing & food | 42 | 18.43 | 55.86 | 131.86 | 608.26 | 4106.6 |
| Construction | 18 | 12.76 | 19.65 | 38.54 | 177.03 | 3156.47 |
| Wholesale/retail shops | 29 | 7.09 | 14.18 | 59.55 | 122.5 | 292.26 |
| Petty traders | 100 | 4.25 | 7.14 | 21.21 | 92.16 | 1290.24 |
| Hotels and restaurants | 27 | 19.85 | 46.79 | 110.68 | 235.36 | 704.1 |
| Repair services | 23 | 41.12 | 60.74 | 178.65 | 900.33 | 2902.3 |
| Transport | 19 | 33.8 | 67.38 | 1027.94 | 2835.7 | 9924.95 |
| Other services | 47 | 4.88 | 14.29 | 49.62 | 177.23 | 4820.69 |
| Total | 348 | 7.09 | 18.43 | 80.02 | 250.73 | 4253.55 |
| **Mali (Bamako)** | | | | | | |
| | N | 10th | 25th | median | 75th | 90th |
| Clothing and apparel | 22 | 1.45 | 2.9 | 37.43 | 229.57 | 1495.78 |
| Other manufacturing & food | 10 | 1.77 | 2.9 | 12.04 | 43.71 | 684.08 |
| Construction | 10 | 5.22 | 10.15 | 15.07 | 66.78 | 1042.07 |
| Wholesale/retail shops | 12 | 5.22 | 16.26 | 94.88 | 431.66 | 1043.51 |
| Petty traders | 45 | 2.9 | 5.01 | 12.52 | 44.93 | 478.27 |
| Hotels and restaurants | 5 | 7.25 | 8.7 | 15.71 | 49.1 | 89.74 |
| Repair services | 7 | 11.59 | 20.29 | 98.55 | 113.15 | 116.52 |
| Transport | 3 | 24.84 | 24.84 | 231.89 | 14261.25 | 14261.25 |
| Other services | 15 | 1.66 | 2.9 | 8.7 | 26.49 | 3927.64 |
| Total | 129 | 2.09 | 5.22 | 18.84 | 98.55 | 3927.64 |

| Senegal ( Dakar) | | | | | | |
|---|---|---|---|---|---|---|
| | N | 10th | 25th | median | 75th | 90th |
| Clothing and apparel | 10 | 2.86 | 44.28 | 85.84 | 171.39 | 188.53 |
| Other manufacturing & food | 58 | 4.28 | 8.57 | 18.68 | 79.35 | 7141.16 |
| Construction | 2 | 10.28 | 10.28 | 362.2 | 714.12 | 714.12 |
| Wholesale/retail shops | 13 | 21.42 | 38.96 | 92.84 | 142.82 | 3799.1 |
| Petty traders | 35 | 2.06 | 4.28 | 10 | 22.21 | 856.94 |
| Hotels and restaurants | 1 | 68.56 | 68.56 | 68.56 | 68.56 | 68.56 |
| Repair services | 10 | 8.88 | 13.71 | 30.6 | 107.12 | 654.13 |
| Transport | 7 | 29.99 | 65.7 | 1142.59 | 8672.22 | 35705.8 |
| Other services | 8 | 6 | 12.14 | 23.26 | 45.42 | 275.65 |
| Total | 144 | 4.28 | 8.73 | 21.42 | 101.8 | 8672.22 |
| **Niger (Niamey)** | | | | | | |
| | N | 10th | 25th | median | 75th | 90th |
| Clothing and apparel | 27 | 8.68 | 43.42 | 241.97 | 694.65 | 2591.9 |
| Other manufacturing & food | 67 | 5.79 | 11.58 | 33.27 | 212.74 | 3232.59 |
| Construction | 30 | 10.71 | 15.05 | 39.54 | 114.62 | 612.21 |
| Wholesale/retail shops | 42 | 4.34 | 14.47 | 86.16 | 286.54 | 1485.5 |
| Petty traders | 101 | 2.89 | 4.34 | 8.79 | 34.73 | 420.61 |
| Hotels and restaurants | 20 | 15.09 | 22.87 | 39.94 | 84.98 | 556.01 |
| Repair services | 9 | 10.2 | 63.02 | 86.83 | 222.87 | 939.22 |
| Transport | 14 | 12 | 178 | 552.53 | 2170.77 | 5239.85 |
| Other services | 29 | 3 | 8.68 | 26.05 | 281.33 | 3394.5 |
| Total | 339 | 4.34 | 9 | 32.79 | 169.22 | 3232.59 |
| **Togo (Lomé)** | | | | | | |
| | N | 10th | 25th | median | 75th | 90th |
| Clothing and apparel | 41 | 30.81 | 70.42 | 122.18 | 290.49 | 717.31 |
| Other manufacturing & food | 41 | 2.93 | 14.08 | 45.13 | 165.79 | 909.62 |
| Construction | 10 | 8.8 | 24.94 | 81.4 | 112.97 | 214.2 |
| Wholesale/retail shops | 29 | 3.52 | 8.8 | 26.41 | 183.39 | 6971.77 |
| Petty traders | 84 | 1.76 | 4.4 | 8.95 | 18.34 | 1031.39 |
| Hotels and restaurants | 26 | 8.8 | 14.08 | 21.57 | 36.09 | 347 |
| Repair services | 26 | 12.32 | 32.28 | 137.91 | 361.03 | 14797.02 |
| Transport | 16 | 191.9 | 557.51 | 682.21 | 1249.99 | 12936.98 |
| Other services | 44 | 5.28 | 12.82 | 72.62 | 245.74 | 6971.77 |
| Total | 317 | 4.4 | 10.27 | 36.68 | 183.39 | 6971.77 |

Source: Authors' computation