

Identification of the Productivity Gap Between Formal and Informal Sectors in Three Western African Countries

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Abstract

This paper investigates the output gap between the formal and informal sectors in three Western African countries: Benin, Mali and Senegal. Using original matched employer-employee databases, we find evidence of low physical and human capital returns in these countries when considering the informal sector. There is also evidence that these economies are deeply cleaved between productive and non productive firms within the informal sector. Some informal sub-sectors are comparable to some formal ones. Estimating the production function, we find important differences between countries and across sectors: Malian formal sector is significantly more efficient than Beninese and Senegalese ones, while the Senegalese informal sector appears to be the most efficient one.

Keywords: formal and informal sectors; productivity; output gap; West Africa.

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1. Introduction

In developing countries, growth of the informal sector may result in a productivity slowdown and could induce a surge in inequality and poverty. Taking these issues into consideration, empirical studies have focused on the determinants of productivity or wage gaps between the formal and the informal sectors, with the idea that greater formalization may sustain economic development. For instance, De Soto (1989)'s works have pioneered the analysis of the informal sector and have forcefully advocated for the formalization of developing economies. He mainly described small informal firms as being led by entrepreneurs who wished to enter the formal sector but could not. In reaction to this segmented view of the economy, some authors have developed the idea that there might be some competition taking place between formal and informal economies: in that perspective, the pay gaps as regards production factors would mainly result from a selection process¹, with low-productivity firms being auto-selected in the informal sector. Comparing both views, some evidence derived from empirical tests reveal a low level of competition on the labor market (see Magnac (1991) and Gindling (1991)). In other words, these results support the view that informal work, or at least some segments of the informal sector, could be in a large extent disguised formal work.

The goal of this paper is to show that, at least in some extent, the latter view is accurate, namely that some segments of the informal sector display the same productive characteristics than the formal sector in terms of factors' elasticities. Therefore, the division between formal and informal sectors might not be that relevant, as "identical" production units co-exist in both sectors. We base our empirical study on three original matched employer-employees datasets on both the formal and the informal sectors from surveys conducted separately over the period 2001 to 2005 by Afristat and the World Bank, pertaining to Benin, Mali and Senegal.

Obviously, the informal sector is highly heterogeneous, and one needs to disentangle between highly productive informal firms, which we argue are comparable to formal firms, and low-productivity informal firms. For that purpose, we use a methodological approach recently developed by Cunningham and Maloney (2004), who use cluster analysis in order to make a distinction by level of productivity among informal firms. This approach is consistent with recent work by Fields (2005) and Maloney (2004), who proposed to categorize firms as voluntary or involuntary players in the informal sector, according to whether their situation in this sector results from a deliberate choice or not.

In practice, the paper first assesses the output gap between the formal and the informal sectors in the three countries. Then it refines the analysis by looking at the sub-sectors of the formal sector (agro-alimentary, metallurgy, textile) and those of the informal sector (industry, trade, services). Last, we find important differences between countries and across sectors: Malian formal sector is significantly more efficient than Beninese and Senegalese ones, while the Senegalese informal sector appears to be the most efficient one.

The paper is organized as follows. Section two presents the economic framework and the estimation strategy. Then we describe the data in section three and examine differences in productivity across sub-sectors and across clusters in section four. Section five presents and discusses estimation results. The last section summarizes our main findings and concludes.

2. Economic framework and estimation strategy

We assume a Cobb-Douglas production function of firm j in country c :

$$(1) \quad Y_{jc} = \theta_c A_{jc} K_{jc}^{\alpha_c} (h_{jc} N_{jc})^{\beta_c}$$

where Y_{jc} is output, θ_c is a country specific effect, A_{jc} is a firm specific effect, K_{jc} is physical capital, N_{jc} is labor and h_{jc} is human capital.

Following the recent developments in the macroeconomic literature², we specify human capital in firms with a Mincerian functional form. Formally, we define human capital for individual i in firm j and country c as

$$(2) \quad h_{ijc} = \exp(r_c S_{ijc} + \delta_c Z_{ijc})$$

where r_c is the return to schooling in country c , S_{ijc} years of schooling of worker i in firm j , and Z_{ijc} is a vector of other individual characteristics (age, gender, experience, etc.). Averaging over individuals from firm j and making the additional assumption that the mean of the exponential is the exponential of the mean³, one derives human capital in firm j

$$(3) \quad h_{jc} = \exp(r_c \bar{S}_{jc} + \delta_c \bar{Z}_{jc})$$

For firm j we obtain by adding an error term:

$$(4) \quad \ln Y_{jc} = \ln \theta_c + \ln A_{jc} + \alpha_c \ln K_{jc} + \beta_c \ln N_{jc} + \beta_c r_c \bar{S}_{jc} + \beta_c \delta_c \bar{Z}_{jc} + \varepsilon_{jc}$$

In next sections, this equation will be estimated alternatively by country, by sector (formal/informal), by sub-sector pertaining to the type of activity (industry, services...), and by clusters of productivity within the informal sector as derived from cluster analysis.

Obviously, such estimates of production functions are subject to endogeneity and selection bias. Endogeneity would stem from the fact that unobserved variables might explain simultaneously levels of production, of physical and human capital intensity in some sectors, mechanically influencing factors' returns. Similarly, auto-selection effects would explain why, given some factors endowments, unobserved characteristics would determine their returns. These are the pervasive issues pertaining to most empirical studies, and shortcomings of our data prevent us from tackling them. Indeed, we only have at our disposal cross-sectional data.

Nevertheless, we believe that analyzing differences in factors' returns, whatever causes of those differences might be, do provide some useful piece of information. It is not clear at all whether

some firms from the informal sector display comparable productivity characteristics with their formal counterparts. Identifying, or not, some similarities across the informality border would be a valuable result with potential policy implications. Indeed, as the empirical literature on productivity in informal sectors is scarce, this kind of analysis is necessary in order to identify forces and weaknesses of developing economies.

As a matter of fact, we will mainly base our analysis on an original study by Echevin and Murtin (2008), who have documented the output gap between formal and informal sectors in Senegal. We extend this analysis to three Western African countries (Benin, Mali and Senegal), using matched employer-employee data in order to assess the output gap between the formal and informal sectors. The data are presented in next section and the subsequent section turns to cluster analysis and estimation results.

3. Data

3.1. The surveys on informal and formal sectors

Microeconomic information available concerning the labor market in western Africa is very incomplete. Data sources are scarce and often disparate. They hardly say anything about the dynamics of employment and, in principle, do not allow comparisons between the formal and informal sectors. These shortcomings of statistical systems in sub-saharan Africa have led Afristat and the World Bank to conduct separate surveys on employment and the labor market in these countries: that is namely, the 1-2-3 survey, conducted between 2001 and 2003, on employment and the informal sector in the capital of seven western African capital (Abidjan, Bamako, Cotonou, Dakar, Lomé, Niamey, Ouagadougou)⁴, and, on the other hand, surveys conducted in several African countries with firms from the formal sector in parallel with the Investment Climate Assessment (ICA).

The information collected during the second stage of the 1-2-3 surveys in Cotonou (Benin), Bamako (Mali) and Dakar (Senegal) is focused, on the one hand, on the firms, with a large number of characteristics filled in concerning their workforce, production, expenditure, clients/providers and competitors, investments/equipment and funding, problems and perspectives, and so forth. On the other hand, the employee-related information provided is about their demographic characteristics, education, salary, job seniority, and so forth.

The data collected in the ICA surveys in Benin (2005), Mali (2003) and Senegal (2003) deal with the firms' and their employees's characteristics, as well as with the opinion of entrepreneurs on the ways to improve the context for private firms and increase investment and employment. The data collected at firm level have to do with technology, trading activities, business environment, work force, capital, and so forth. The employee-related information provides such variables as occupation, education, salary, and so forth.

With these surveys, both the salaries and the mean levels of work productivity can be investigated in terms of the firms' and workers' features –keeping in mind, though, that they hardly cover any area beyond the capital area. The advantage of these data is that they provide a wide range of information concerning both the firms and their employees.

3.2.Descriptive statistics

Informal firms are those not officially registered with the administration. Those firms appear to be by far the first work providers in Africa, including in urban areas and during periods of more sustained economic growth. Table 1 presents the characteristics of firms. Median wages are 4.2 times higher in the formal sector in Benin (resp. 4.3 in Mali and 3.0 in Senegal), while years of schooling are on average 2.1 times as high in the formal sector when compared with the informal one (resp. 3.4 in Mali and 3.3 in Senegal). Firms employ on average 38.5 workers in the formal sector (resp. 50.9 in Mali and 122.4 in Senegal) and only 1.9 in the informal one (resp. 1.5 in

Mali and 1.7 in Senegal). In the informal sector the vast majority of firms employ one single worker/entrepreneur. As a consequence of their smaller size –and of their great number– informal firms use permanent workers more intensively than formal ones in two countries, Mali and Senegal, though not in Benin. Then, in formal firms, the capital per worker is on average 24 times as high as in informal ones in Benin (resp. 16 in Mali and 47 in Senegal). The ratio of the median capital per worker is 11 in Benin (resp. 55 in Mali and 60 in Senegal). Those gaps logically bring about significant disparities in terms of productivity, when proxied by the ratio of output per hour worked. This ratio is on average 10.6 in Benin (resp. 10.3 in Mali and 6.8 in Senegal). The ratio of average output per worker across both sectors amounts to 8.8 in Benin, 8.6 in Mali and 6.1 in Senegal. Finally, we find a comparable proportion of women (around 13%) in the formal sector of the three countries. The proportion of women in the informal sector is respectively: 53 per cent in Benin, 45 per cent in Mali and 48 per cent in Senegal, which are also comparable values.

4. Assessing the output gap between formal and informal sectors

In this section, we examine how the production function varies across the formal and informal sectors, as well as within those sectors, and then assess the output gap between sectors and across countries.

4.1. Regression results by sector and subsectors

Table 2 reports regressions across both sectors. We regress the logarithm of value added on the logarithm of capital, the logarithm of the number of workers, the percentage of female workers, the average age of workers and its square as well as their average level of education. We find that capital elasticity amounts to 0.42 (resp. 0.13) in the formal (resp. informal) sector in Benin, to 0.43 (resp. 0.24) in the formal (resp. informal) sector in Mali, and to 0.18 (resp. 0.14) in the formal (resp. informal) sector in Senegal. Labor elasticity amounts to 1.04 (resp. 0.96) in Benin,

to 0.61 (resp. 0.72) in Mali, and to 1.00 (resp. 0.65) in Senegal. This regression thus shows increasing or constant returns to scale for the formal sector (the sum of the coefficients on capital and labor being 1.46 in Benin, 1.04 in Mali and 1.34 in Senegal) and constant or decreasing returns to scale for the informal sector (the sum of the coefficients on capital and labor being 1.09 in Benin, 0.96 in Mali and 0.82 in Senegal). Interestingly, the estimated coefficient for the average schooling within formal firm is not significant in Benin and Mali and is equal to 0.07 in Senegal (in tune with usual values for private returns in the formal sector), and is not significant in the informal sector.

Tables 3A to 3C report differences across sub-sectors. In the formal sector, we have built three sub-sectors of comparable size: the agro-industry, the ‘Metal sub-sector’ –made up of the sub-sectors ‘Metallic products’, ‘Materials for construction’, ‘Chemicals’, ‘Plastic’– and the ‘Textile sub-sector’ –made up of the sub-sectors ‘Textile’, ‘Industry of paper’, ‘Furniture’, ‘Wood’. In the informal sector, we have built a classification ‘Primary and Others’, ‘Industry’, ‘Trade’ and ‘Services’ following the original features.

We first consider the formal sector. In Benin, it turns out that the relatively high elasticity of capital in Table 2 (0.42) can be explained by the high elasticity in both the ‘Metal’ and the agro sub-sectors (0.66 and 0.59 respectively). In the ‘Textile’ sub-sector, capital elasticity is 0.29. In Mali, capital elasticity is high in the agro sub-sector (0.54). In Senegal, it is the agro sub-sector that has the lower elasticity of capital (0.15). In both the ‘Metal’ and the ‘Textile’ sub-sectors, capital elasticity is close to 0.3 (though not significant for the latter sub-sector). Moreover, labor elasticity is large in all sub-sectors, especially in the ‘Textile’ sub-sector.

Turning to the informal sector, it is striking that capital elasticity differs largely across sub-sectors: capital does not matter in the ‘Industry’ sub-sector (capital elasticity is 0.10 in Benin, 0.13 in Mali and 0.12 in Senegal), while it has an elasticity of respectively 0.21 (resp. 0.25 in

Mali and 0.18 in Senegal) and 0.17 (resp. 0.34 in Mali and 0.24 in Senegal) in the ‘Trade’ and ‘Services’ sub-sectors. These results show that the informal sector is therefore not uniformly low-productive.

However, those findings constitute an apparent paradox: although several informal sub-sectors display constant or increasing returns to scale, the average size of firms is low and so are their mean levels of productivity, education and capital per capita when compared with the various sub-sectors of the formal economy. One potential explanation could stem from the approach of Jovanovic (1982) who argues that myopic agents may not anticipate the optimal size of the firm. In his view, older firms are considered to have reached their optimal size and factors composition, while younger firms may not. In this perspective, year of creation can be interpreted as a proxy for the unobserved ability of the owner, since a firm's survival depends on the latter ability⁵.

4.2. Cluster analysis of informal firms

The type of industry or activity might not be the only source of heterogeneity. Subsectors might well be themselves heterogeneous. In order to probe further in the analysis of heterogeneity in the informal sector, we use a descriptive approach similar to Cunningham and Maloney (2001). We analyze ‘upper’ and ‘lower’ tiers of informal firms using cluster analysis. For this classification-based analysis, we adopted the variables of equation in table 2, on top of the firm's length of existence. Two distinct clusters were retained as a result of this process. In order to characterize these clusters, table 4 presents each cluster with mean values and standard deviation for the active variables in the analysis: cluster 2 is more productive and capitalistic than cluster 1 which comprises about 84 per cent of the informal firms in Benin (resp. 63% in Mali and 82% in Senegal). The latter firms, which do not perform as well, also appear to be younger and smaller than those in the other cluster and are less capital intensive.

In order to show how close firms from the formal and informal sectors are, we describe in tables 5A to 5C the various clusters according to their degree of formalization and official registration: a greater proportion of firms from cluster 2 are commercially registered (4.5% in Benin, 7.5% in Mali and 11.0% in Senegal against respectively 1.0%, 0.7% and 2.7% in cluster 1), display a professional card (1.5% in Benin, 11.1% in Mali and 7.2% in Senegal against respectively 0.3%, 2.5% and 1.2% in cluster 1) or have a license (12.7% in Benin, 25.6% in Mali and 13.2% in Senegal against respectively 7.5%, 5.1% and 2.0% in cluster 1). Moreover, the firms in cluster 2 tend to be more often ready to register with the administration (41.0% in Benin, 48.7% in Mali and 67.4% in Senegal against respectively 31.2%, 24.7% and 38.5% in cluster 1), or in favor of taxes in connection with their business (53.0% in Benin, 63.2% in Mali and 71.8% in Senegal against respectively 44.2%, 34.6% and 42.9% in cluster 1). The firms are also described according to the size of their main clients, providers or competitors: in cluster 2, the proportion of firms dealing with larger or public firms from the formal sector appears to be greater than in cluster 1.

Other variables are used in order to study whether their situation in this sector results from a deliberate choice or otherwise. Tables 5A to 5C thus chart the reasons of informal work by firms and clusters. To some extent, this enables us to answer a fundamental question: why entrepreneurs form small firms rather than work as employees in larger ones? The reasons usually given in cluster 2 are: a better income (44.8% in Benin, 52.4% in Mali and 31.8% in Senegal, against respectively 28.3%, 38.6% and 20.1% in cluster 1) or self-employment (32.1% in Benin, 26.5% in Mali and 38.7% in Senegal against respectively 43.9%, 26.7% and 31.9% in cluster 1); less often, the lack of jobs (11.9% in Benin, 10.8% in Mali and 18.2% in Senegal against respectively 13.0%, 17.9% and 31.0% in cluster 1).

All in all, these results show that the overall performance of some sub-sectors should be put into perspective. If some firms perform well in each sector, it cannot be argued that this is because they belong to one sector rather than to the other. This is evidence that inter-firm heterogeneity is more important than inter-sector heterogeneity to characterize performance disparities in the informal sector. For lack of instruments to predict the choice of factors or sectors, we are unable to test this hypothesis in a more formal way, but the cluster analysis yields interesting results: the capitalistic intensity and productivity being higher in cluster 2 than in cluster 1 coincides with their closeness to the firms in the formal sector. For those firms, the choice of informality appears to be more often a voluntary one.

4.3. Estimating the production function across clusters and countries

In table 6, we add sector dummies to the regression of log value added on human and physical capital variables. We present the estimates for each of the countries for the formal and the informal sectors separately. In table 7, we present the data pooled across countries. For all countries, the return on physical capital is significant, while the return on education is not (it is significant only in Senegal with a rate of 0.08 in the formal sector and 0.01 in the informal one). When comparing the formal and the informal sectors in Mali and Benin, the elasticity of capital is around two times higher in the formal sector than in the informal sector (0.4 in the formal sector against 0.2 in the informal one). In Senegal, capital elasticity is lower in the formal sector and more comparable to the informal sector (around 0.15). Overall, the differences in human and physical capital account for 86.8 per cent of the output gap in Benin (71.4% in Mali and 57.5% in Senegal) and 82.9 per cent of the productivity gap (63.0% in Mali and 41.0% in Senegal). As the data in table 4 show, average output in the more productive sub-sector (informal II) is 8.4 times average output in the less productive sub-sector (informal I) in Benin (resp. 12.4 in Mali and 6.6 in Senegal). In table 6 (column (3)), we estimate that all but 14.6 per cent of this difference is

explained by differences in physical and human capital endowments in Benin (resp. 15.2% in Mali and 25.9% in Senegal).

Table 7 presents estimates across countries. The elasticity of human capital still appears to be not significant. Furthermore, Malian formal sector appears to be 70 per cent more productive than Beninese and Senegalese ones. Malian and Senegalese informal sectors are about 50 per cent more efficient than Beninese informal sector. Senegalese informal II sector appears to be the most efficient one.

5. Conclusion

In this paper we have exhibited dramatic heterogeneity within sectors and even within sub-sectors in terms of productivity. We have shown that the output gap across both sectors could mostly be accounted for by differences in labor and physical capital. Differences in inputs and differences in inputs' returns explain 82.9 per cent of the productivity gap in Benin, 63.0 per cent in Mali and 41.0 per cent in Senegal. Hence, differences in technology play a small part in determining the productivity gap in Benin, and a big part in Senegal. One step further, using cluster analysis we find that the informal sector may well be split into a low productive cluster and a high productive cluster. This decomposition leads to the conclusion that, while the Malian and the Senegalese informal sector are comparable in terms of productivity, the Senegalese high productivity informal sector appears to be the most efficient one.

NOTES

¹ For example, Heckman and Hotz (1986) and Magnac (1991).

² See for instance Hall and Jones (1999) or Cohen and Soto (2007).

³ This assumption is implicitly made in all macroeconomic studies that use the Mincer functional form to proxy human capital; this approximation is valid given that the product $rS_{i,j}$ spans over a small interval over which second-order terms are negligible.

⁴ See Kuepie et al. (2008) for a complete utilisation of the datasets.

⁵ Ability encompasses here information on the market, networks, managerial practices and so forth.

REFERENCES

- Angrist, J.D. and A.B. Krueger (1999). Empirical strategies in labor economics. Handbook of Labor Economics, O.C. Ashenfelter and D.E. Card (eds), vol. 3A, 1277-1397, Amsterdam, North-Holland.
- Cohen, D. and M. Soto (2007). Growth and human capital: Good data, good results. Journal of Economic Growth 12(1), 51–76.
- Cunningham, W. and W. Maloney (2001). Heterogeneity among Mexico's microenterprises: An application of factor and cluster analysis. Economic Development and Cultural Change 50(1), 131–156.
- De Soto, H. (1989). The Other Path. The Invisible Revolution in the ThirdWorld. New York, Harper and Row.
- Echevin, D. and F. Murtin (2008). What determines productivity in Senegal? Sectoral disparities and the dual labor market. Journal of Development Studies, forthcoming.
- Fields, G. (2005). A guide to multisector labor market models. Social Protection Discussion paper 0505, World Bank.
- Gindling, T. (1991). Labor market segmentation and the determination of wages in the public, private-formal and informal sectors in San-Jose, Costa-Rica. Economic Development and Cultural Change 39(3), 584–605.
- Hall, R. E. and C. I. Jones (1999). Why do some countries produce so much more output per worker than others? Quarterly Journal of Economics 114(1), 83–116.
- Heckman, J. J. and V. Hotz (1986). An investigation of the labor market earnings of Panamian males. Journal of Human Resources 21, 507–542.
- Jovanovic, B. (1982). Selection and evolution of industry. Econometrica 50(3), 649–670.
- Kuepie, M., Nordman, C. J. and F. Roubaud (2008). Education and earnings in urban West Africa. Journal of Comparative Economics, forthcoming.
- Magnac, T. (1991). Segmented or competitive labor markets? Econometrica 59(1), 165–187.
- Maloney, W. (2004). Informality revisited. World Development 32(7), 1159–1178.

Table 1: Characteristics of firms in formal and informal sectors

		Output									Number of observations
		Firm Size	Permanent workers (in %)	worked per hour ('000 CFAF)	Output per worker ('000 CFAF)	Capital per worker ('000 CFAF)	Wages per worker ('000 CFAF)	Average years of schooling	Age of workers	Female (in %)	
Benin formal sector	Mean	38.5	72.2	9.5	15300	70100	809.1	9.8	33.7	12.9	197
	Median	14	80	1.8	2970.7	7071.4	429.9	10	32.0	9.1	
Benin informal sector	Mean	1.9	50	0.9	1747.7	2965.9	272.3	4.7	29.2	52.7	1023
	Median	1	0	0.3	600	639	102	4.5	37.0	1	
Mali formal sector	Mean	50.9	84.6	11.3	18900	20600	13500	9.3	34.3	13.9	155
	Median	17	100	4.5	7812.5	8585.7	700	9.7	32.0	5.9	
Mali informal sector	Mean	1.5	91.1	1.1	2201.5	1259.6	406	2.7	32.4	44.5	994
	Median	1	100	0.4	687	156	163	0	30.0	0	
Senegal formal sector	Mean	122.4	69.0	6.1	10500	70900	1996	9.3	37.6	12.6	250
	Median	30	73.4	2.9	4835	9310	1207	9.4	37.0	7.7	
Senegal informal sector	Mean	1.7	86.8	0.9	1723	1497	740	2.8	35.3	48.4	1024
	Median	1	100.0	0.5	884	156	396	0.8	33.0	0	

Sources: Authors' computations using 123 and ICA surveys.

Table 2: OLS estimates of the production function in formal and informal sectors

	Formal			Informal		
	Benin	Mali	Senegal	Benin	Mali	Senegal
ln K	0.42** <i>0.07</i>	0.43** <i>0.09</i>	0.18** <i>0.07</i>	0.13** <i>0.02</i>	0.24** <i>0.03</i>	0.14** <i>0.02</i>
ln N	1.04** <i>0.14</i>	0.61** <i>0.13</i>	1.16** <i>0.12</i>	0.96** <i>0.09</i>	0.72** <i>0.10</i>	0.71** <i>0.07</i>
% of Females	-0.62 <i>0.56</i>	-1.32** <i>0.66</i>	-1.35** <i>0.68</i>	0.09 <i>0.10</i>	-0.005 <i>0.10</i>	-0.22** <i>0.07</i>
Age	0.36* <i>0.22</i>	0.32* <i>0.19</i>	0.44** <i>0.18</i>	0.13** <i>0.02</i>	0.05** <i>0.02</i>	0.06** <i>0.01</i>
Age^2	-0.005* <i>0.003</i>	-0.005* <i>0.003</i>	-0.005** <i>0.002</i>	-0.001** <i>0.0003</i>	-0.001** <i>0.0002</i>	-0.001** <i>0.000</i>
Schooling	-0.03 <i>0.03</i>	0.004 <i>0.04</i>	0.07** <i>0.04</i>	0.02* <i>0.01</i>	-0.01 <i>0.01</i>	0.01 <i>0.01</i>
Adjusted R^2	0.62	0.60	0.67	0.24	0.27	0.27
N	174	110	111	870	746	926

Sources: Authors' computations using 123 and ICA surveys.

Table 3A: Regression of log value added on human and physical capital across sectors (Benin)

	Formal			Informal		
	(Agro)	(Metal)	(Text)	(Indus)	(Trade)	(Services)
ln K	0.59** <i>0.15</i>	0.66** <i>0.20</i>	0.29** <i>0.09</i>	0.10** <i>0.04</i>	0.21** <i>0.04</i>	0.17** <i>0.05</i>
ln N	0.90** <i>0.27</i>	0.81* <i>0.41</i>	0.96** <i>0.20</i>	1.21** <i>0.13</i>	0.95** <i>0.19</i>	0.84** <i>0.13</i>
% of Females	-2.08* <i>1.05</i>	1.09 <i>2.83</i>	0.50 <i>1.01</i>	-0.69** <i>0.17</i>	-0.72** <i>0.24</i>	0.45** <i>0.16</i>
Age	0.33 <i>0.74</i>	-0.34 <i>0.83</i>	0.39 <i>0.30</i>	0.15** <i>0.05</i>	0.04 <i>0.04</i>	0.12** <i>0.03</i>
Age^2	-0.005 <i>0.010</i>	0.005 <i>0.013</i>	-0.005 <i>0.004</i>	-0.001** <i>0.0006</i>	-0.001 <i>0.0004</i>	-0.001** <i>0.0004</i>
Schooling	-0.20** <i>0.08</i>	-0.04 <i>0.12</i>	0.01 <i>0.05</i>	0.02 <i>0.02</i>	0.03 <i>0.02</i>	0.02 <i>0.02</i>
Adjusted R^2	0.76	0.61	0.49	0.41	0.34	0.23
N	31	31	111	261	310	298

Sources: Authors' computations using 123 and ICA surveys.

Table 3B: Regression of log value added on human and physical capital across sectors (Mali)

	Formal			Informal		
	(Agro)	(Metal)	(Text)	(Indus)	(Trade)	(Services)
ln K	0.54** <i>0.13</i>	0.20 <i>0.25</i>	0.38** <i>0.18</i>	0.13** <i>0.04</i>	0.25** <i>0.06</i>	0.34** <i>0.04</i>
ln N	0.62** <i>0.19</i>	0.94** <i>0.33</i>	0.50** <i>0.22</i>	0.98** <i>0.13</i>	0.76** <i>0.24</i>	0.72** <i>0.16</i>
% of Females	-0.89 <i>0.78</i>	0.53 <i>2.89</i>	-0.10 <i>1.84</i>	-0.37** <i>0.16</i>	-0.59** <i>0.21</i>	0.55** <i>0.16</i>
Age	0.71** <i>0.24</i>	-0.24 <i>0.71</i>	0.40 <i>0.64</i>	0.03 <i>0.03</i>	0.06* <i>0.04</i>	0.06** <i>0.02</i>
Age^2	-0.01** <i>0.003</i>	0.002 <i>0.01</i>	-0.006 <i>0.009</i>	-0.0002 <i>0.0003</i>	-0.001* <i>0.0004</i>	-0.0006 <i>0.0003</i>
Schooling	-0.00 <i>0.06</i>	0.03 <i>0.07</i>	-0.04 <i>0.07</i>	0.01 <i>0.02</i>	-0.01 <i>0.02</i>	-0.05 <i>0.02</i>
Adjusted R^2	0.71	0.51	0.52	0.29	0.30	0.52
N	40	36	34	310	244	192

Sources: Authors' computations using 123 and ICA surveys.

Table 3C: Regression of log value added on human and physical capital across sectors (Senegal)

	Formal			Informal			
	(Agro)	(Metal)	(Text)	(Others)	(Indus)	(Trade)	(Services)
ln K	0.15 <i>0.10</i>	0.28** <i>0.11</i>	0.26 <i>0.18</i>	0.12** <i>0.03</i>	0.05 <i>0.05</i>	0.18** <i>0.04</i>	0.24** <i>0.03</i>
ln N	0.95** <i>0.13</i>	0.84** <i>0.21</i>	1.78** <i>0.29</i>	0.66** <i>0.11</i>	0.83** <i>0.12</i>	0.73** <i>0.22</i>	0.89** <i>0.13</i>
% of Females	-1.35** <i>0.68</i>	-3.47* <i>1.92</i>	-1.46 <i>1.52</i>	-0.26** <i>0.13</i>	-0.47** <i>0.17</i>	-0.36** <i>0.15</i>	0.18 <i>0.15</i>
Age	0.29 <i>0.19</i>	-0.30 <i>0.37</i>	0.93** <i>0.39</i>	0.07** <i>0.03</i>	0.07** <i>0.03</i>	0.06** <i>0.03</i>	0.10** <i>0.04</i>
Age^2	-0.003 <i>0.003</i>	0.004 <i>0.005</i>	-0.012** <i>0.005</i>	-0.001** <i>0.000</i>	-0.001** <i>0.000</i>	-0.001** <i>0.000</i>	-0.001** <i>0.000</i>
Schooling	0.08** <i>0.04</i>	0.08 <i>0.06</i>	0.05 <i>0.08</i>	-0.01 <i>0.02</i>	0.01 <i>0.02</i>	0.01 <i>0.02</i>	0.03** <i>0.01</i>
Adjusted R^2	0.82	0.69	0.65	0.25	0.30	0.21	0.48
N	40	36	35	308	170	263	185

Sources: Authors' computations using 123 and ICA surveys.

Table 4: Human and physical capital across informal sectors

		Output ('000 CFAF)	Capital per worker ('000 CFAF)	Firm Size	Firm Life	Age	Schooling	Number of Firms
	Std	8415	2311	1.4	7.2	10.7	3,6	
Benin informal I	Mean	1288	789	1.8	8.7	32.0	4.2	722
	Std	1516	985	1.4	7.3	11.1	3.4	
Benin informal II	Mean	10813	5175	1.9	8.6	32.8	6.4	133
	Std	19194	3680	1.5	6.6	8.5	4.1	
Mali informal	Mean	2979	590	1.5	10.3	33.8	2.7	963
	Std	7341	1269	1.1	8.4	11.5	3.7	
Mali informal I	Mean	566	263	1.2	9.8	33.7	2.3	604
	Std	403	408	0.6	8.2	12.4	3.4	
Mali informal II	Mean	7038	1135	1.9	11.2	33.9	3.2	359
	Std	10871	1886	1.4	8.8	10.0	3.9	
Senegal informal	Mean	2463	852	1.6	9.4	35.7	2.8	992
	Std	3646	1941	1.4	8.8	12.1	3.6	
Senegal informal I	Mean	1218	505	1.5	8.9	36.0	2.7	811
	Std	949	950	1.2	8.6	12.5	3.6	
Senegal informal II	Mean	8033	2355	2.5	11.2	34.3	3.1	181
	Std	5555	3673	2.1	9.4	9.7	3.8	

Sources: Authors' computations using 123 and ICA surveys.

Table 5A: Degree of formalization and motivations for entering the informal sector (Benin)

	Informal		Informal I		Informal II	
	Mean	Std	Mean	Std	Mean	Std
Administrative registration						
Being commercially registered	0.015	0.122	0.010	0.098	0.045	0.208
Displaying a professional card	0.005	0.068	0.003	0.053	0.015	0.122
Having a license	0.083	0.276	0.075	0.263	0.127	0.334
Ready to be registered	0.327	0.469	0.312	0.463	0.410	0.494
In favor of taxes	0.456	0.498	0.442	0.497	0.530	0.501
Proportion of big firms and public firms of the formal sector among						
Clients	0.062	0.241	0.057	0.232	0.090	0.287
Competitors	0.119	0.324	0.116	0.321	0.134	0.342
Providers	0.250	0.433	0.223	0.417	0.396	0.491
Why entrepreneurs form small firms rather than work as employees in larger ones?						
No job in big firms	0.053	0.223	0.055	0.229	0.037	0.190
No job in small firms	0.076	0.265	0.075	0.263	0.082	0.276
Higher income	0.308	0.462	0.283	0.451	0.448	0.499
Being an independant worker	0.421	0.494	0.439	0.497	0.321	0.469
Family tradition	0.074	0.261	0.078	0.268	0.052	0.223
Other reason	0.069	0.253	0.071	0.256	0.060	0.238
Number of firms	855		722		133	

Sources: Authors' computations using 123 and ICA surveys.

Table 5B: Degree of formalization and motivations for entering the informal sector (Mali)

	Informal		Informal I		Informal II	
	Mean	Std	Mean	Std	Mean	Std
Administrative registration						
Being commercially registered	0.032	0.177	0.007	0.081	0.075	0.264
Displaying a professional card	0.057	0.232	0.025	0.156	0.111	0.315
Having a license	0.128	0.334	0.051	0.221	0.256	0.437
Ready to be registered	0.336	0.473	0.247	0.431	0.487	0.501
In favor of taxes	0.453	0.498	0.346	0.476	0.632	0.483
Proportion of big firms and public firms of the formal sector among						
Clients	0.067	0.251	0.043	0.203	0.109	0.312
Competitors	0.155	0.362	0.111	0.314	0.228	0.420
Providers	0.163	0.370	0.093	0.290	0.281	0.450
Why entrepreneurs form small firms rather than work as employees in larger ones?						
No job in big firms	0.063	0.244	0.073	0.260	0.047	0.213
No job in small firms	0.089	0.285	0.106	0.308	0.061	0.240
Higher income	0.437	0.496	0.386	0.487	0.524	0.500
Being an independant worker	0.266	0.442	0.267	0.443	0.265	0.442
Family tradition	0.079	0.270	0.093	0.290	0.056	0.230
Other reason	0.047	0.211	0.058	0.234	0.028	0.165
Number of firms	963		604		359	

Sources: Authors' computations using 123 and ICA surveys.

Table 5C: Degree of formalization and motivations for entering the informal sector (Senegal)

	Informal		Informal I		Informal II	
	Mean	Std	Mean	Std	Mean	Std
Administrative registration						
Being commercially registered	0.042	0.201	0.027	0.163	0.110	0.314
Displaying a professional card	0.023	0.151	0.012	0.110	0.072	0.259
Having a license	0.043	0.204	0.020	0.139	0.149	0.357
Ready to be registered	0.438	0.496	0.385	0.487	0.674	0.470
In favor of taxes	0.482	0.500	0.429	0.495	0.718	0.451
Proportion of big firms and public firms of the formal sector among						
Clients	0.035	0.185	0.028	0.166	0.066	0.249
Competitors	0.596	0.491	0.571	0.495	0.707	0.456
Providers	0.194	0.395	0.147	0.354	0.403	0.488
Why entrepreneurs form small firms rather than work as employees in larger ones?						
No job in big firms	0.114	0.318	0.121	0.326	0.083	0.277
No job in small firms	0.172	0.378	0.189	0.391	0.099	0.298
Higher income	0.213	0.409	0.201	0.401	0.265	0.444
Being an independant worker	0.332	0.471	0.319	0.467	0.387	0.488
Family tradition	0.090	0.286	0.085	0.279	0.110	0.315
Other reason	0.069	0.253	0.072	0.258	0.056	0.216
Number of firms	992		811		181	

Sources: Authors' computations using 123 and ICA surveys.

Table 6: Regression of log value added on human and physical capital across countries

	Benin			Mali			Senegal		
	Formal (1)	Informal (2)	Informal (3)	Formal (1)	Informal (2)	Informal (3)	Formal (1)	Informal (2)	Informal (3)
ln K	0.44** <i>0.00</i>	0.15** <i>0.03</i>	0.02 <i>0.03</i>	0.43** <i>0.09</i>	0.23** <i>0.03</i>	0.02 <i>0.02</i>	0.19** <i>0.08</i>	0.14** <i>0.02</i>	0.03* <i>0.02</i>
ln N	0.99** <i>0.00</i>	0.98** <i>0.09</i>	1.07** <i>0.09</i>	0.61** <i>0.13</i>	0.84** <i>0.10</i>	0.41** <i>0.07</i>	1.14** <i>0.12</i>	0.78** <i>0.07</i>	0.53** <i>0.06</i>
% of Females	-0.76** <i>0.20</i>	-0.30** <i>0.01</i>	-0.20* <i>0.11</i>	-1.08 <i>0.68</i>	-0.26** <i>0.10</i>	-0.28** <i>0.07</i>	-1.26** <i>0.69</i>	-0.26 <i>0.07</i>	-0.17** <i>0.06</i>
Age	0.38* <i>0.23</i>	0.11** <i>0.02</i>	0.09 <i>0.02</i>	0.30 <i>0.19</i>	0.05** <i>0.02</i>	0.02* <i>0.01</i>	0.41** <i>0.18</i>	0.06** <i>0.01</i>	0.04** <i>0.01</i>
Age^2	-0.006* <i>0.003</i>	-0.001** <i>0.0003</i>	-0.001 <i>0.0003</i>	-0.005* <i>0.003</i>	-0.0005* <i>0.0002</i>	-0.0002* <i>0.0001</i>	-0.005** <i>0.002</i>	-0.001** <i>0.0002</i>	-0.0004 <i>0.0001</i>
Schooling	-0.03 <i>0.03</i>	0.02 <i>0.01</i>	0.01 <i>0.01</i>	0.001 <i>0.04</i>	-0.01 <i>0.01</i>	-0.004 <i>0.009</i>	0.08** <i>0.04</i>	0.01** <i>0.01</i>	0.01* <i>0.01</i>
Informal II			1.23** <i>0.14</i>			1.89** <i>0.07</i>			1.71** <i>0.07</i>
Adjusted R^2	0.62	0.24	0.31	0.61	0.30	0.63	0.67	0.27	0.55
N	174	787	787	110	723	723	113	894	894

Sources: Authors' computations using 123 and ICA surveys.

Note: sector dummies are added to each regression.

Table 7: Pooled regression of log value added on human and physical capital

	Formal	Informal	
	(1)	(2)	(3)
ln K	0.36** <i>0.04</i>	0.17** <i>0.01</i>	0.03** <i>0.01</i>
ln N	0.91** <i>0.08</i>	0.86** <i>0.05</i>	0.70** <i>0.04</i>
% of Females	-1.12** <i>0.36</i>	-0.27** <i>0.05</i>	-0.19** <i>0.04</i>
Age	0.33** <i>0.11</i>	0.07** <i>0.01</i>	0.04** <i>0.01</i>
Age^2	-0.004** <i>0.001</i>	-0.001** <i>0.000</i>	-0.0004** <i>0.0001</i>
Schooling	0.003 <i>0.02</i>	0.01 <i>0.01</i>	0.007 <i>0.006</i>
Benin*Informal II			1.29** <i>0.10</i>
Mali	0.70** <i>0.15</i>	0.51** <i>0.06</i>	
Mali*Informal I			-0.16** <i>0.06</i>
Mali*Informal II			1.63** <i>0.07</i>
Senegal	-0.06 <i>0.16</i>	0.54** <i>0.06</i>	
Senegal*Informal I			0.34** <i>0.06</i>
Senegal*Informal II			1.97** <i>0.09</i>
Adjusted R^2	0.27	0.27	0.25
N	2404	2404	787

Sources: Authors' computations using I23 and ICA surveys.

Note: sector dummies are added to each regression.