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No. 1751| January 2012

Web: www.ifw-kiel.de

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Abstract:

Employing a unique dataset that covers almost 6000 informal enterprises from six West African urban centers, this paper examines the backward and forward linkages of these enterprises to the formal sector. We first provide a descriptive analysis of the existing formal-informal linkages. It turns out that formal backward linkages are much more prevalent than formal forward linkages, and that linkages vary with the degree of informality, occurring less frequently if firms have no ties to the formal sector at all or low capital stocks. In the second step, we employ a Probit approach to identify major factors associated with the observed backward linkages. The Probit analysis corroborates the importance of the degree of informality for the existence of linkages and shows various enterprise characteristics to be significant determinants as well. Finally, we analyze whether backward linkages matter for enterprise performance using both OLS and IV estimations. We find a positive and robust impact of backward linkages, whereas the degree of informality of the enterprises in our sample seems to affect firm performance only indirectly through their linkages to the formal sector.

Keywords: Informal sector, formal-informal linkages, enterprise performance, West Africa

JEL codes: D22, D40, O17

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1. Introduction

By far the largest part of urban employment in Sub-Saharan Africa (SSA) is generated by informal enterprises. These enterprises often lack the financial means or the managerial and technological skills required to expand their activities. One way of overcoming these constraints is to establish links with the formal sector. As emphasized by Hirschmann (1958, 1977), the interdependence of economic actors plays an important role in the dynamics of economic development. More recently, Ciccone (2002) and Rodriguez-Clare (1996) have shown theoretically that economic growth and industrialization relies on deep vertical linkages. The exchange between different economic actors can take the form of fiscal, consumptive and productive linkages. While the informal sector is per definition characterized by the absence of fiscal linkages, it remains unclear how well informal enterprises are connected with the formal sector in terms of consumptive and productive linkages.

Based on the dual economy literature (e.g. Lewis 1954, Todaro 1969), the urban informal sector was traditionally considered as the residual part of a segmented urban labor market, providing employment for the labor surplus that cannot be absorbed by the formal urban economy (e.g. Fields 1974). A growing urban informal labor force competing in the same market would then exert downward pressure on informal sector earnings (Mazumdar 1976). Linkages via product markets were also assumed to be largely absent (Harriss 1990). The formal and informal sector were modeled as supplying similar goods but serving different markets at different prices and qualities, with markets segmented by purchasers' income. According to this view, demand for informal products would predominantly come from poor informal customers (e.g. Fortin et al. 2000; La Porta and Shleifer 2011; Reilly et al. 2006), providing another reason for a weakly performing informal sector.

More recently, the pure informal and the pure formal sector have been described as constituting extremes on a continuum of production relationships (Chen 2006), and an alternative view has been emerging which describes formal and informal product markets as inter-linked. This view is backed by a few empirical studies for SSA. Covering a sample of 13 Sub-Saharan African countries, Xaba et al. (2002) detect substantial inter-linkages in the final product market, with each sector being a strong supply as well as demand base of the other sector. Böhme and Thiele (2011) corroborate this finding for six West African capitals. As concerns intermediate demand, the available evidence is less conclusive. Hugon (1990) and

Harriss (1990) point to an asymmetry, where the informal sector buys many of its inputs from the formal sector but purchases in the opposite direction are of little importance. By contrast, a case study for Burkina Faso by Grimm and Günther (2006) reveals only minor backward linkages between small informal production units and formal enterprises. In the same vein, De Paula and Scheinkman (2007) show that backward linkages of informal firms in Brazil tend to be directed towards the informal sector.

This paper aims to broaden the evidence on the formal-informal backward and forward linkages in African product markets, extending the existing empirical literature in various ways. First, our analysis employs a unique set of internationally comparable data covering informal enterprises from the commercial capitals of six West African Economic and Monetary Union (WAEMU) member states. Second, we at least tentatively account for the observation that the informal sector is characterized by a high degree of heterogeneity. While previous research (e.g. Grimm et al. 2011) has shown that a split of the informal sector into a high-return, upper-tier and a low-return, lower-tier segment along the lines of Ranis and Stewart (1999) does not adequately capture this heterogeneity, we simply assume that linkages to the formal sector vary along the continuum of production relationships. Accordingly, we divide the sample of informal enterprises using (i) registration with official entities such as having a tax number, paying trade tax, being in the trade register and holding a trade certificate, and (ii) capital endowments as alternative categorization criteria. These two criteria are meant to depict the extent to which the informal enterprises are "formalized". Third, while most of the previous literature has been descriptive, we additionally conduct regression analysis in order to identify possible correlates of the observed patterns of formal-informal linkages and to examine whether linkages help explain differences in enterprise performance.

The remainder of the paper is structured as follows. Chapter 2 introduces the dataset used in the empirical analysis and provides descriptive evidence on the linkages of the informal enterprises under consideration. Chapters 3 and 4 present estimates of the main determinants of formal-informal linkages and of their consequences for different indicators of enterprise performance, respectively. Chapter 5 summarizes our main results and draws some conclusions.

2. Nature of backward and forward linkages

a. Data and enterprise characteristics

We use data provided by the "Enquêtes 1-2-3". This survey was implemented between 2001 and 2003 in seven economic capitals of the WAEMU and consisted of three integrated phases for a representative set of households (Amegashie et al. 2005). It intended to capture a detailed picture of the main characteristics of the informal sector in the seven cities. Using an identical survey methodology in all sites renders the information comparable across the urban centers of the sample. The employment section of this survey (phase one), which was conducted between 2001 and 2002 with a sample size of 2500 households in each country (3000 in Cotonou), solicited information on the enterprises that employed or were managed by household members older than 10 years. In identifying informal activities, the 1-2-3 surveys follow international statistical guidelines, which suggest that informal sector employment should be defined in terms of characteristics of the enterprise or production unit such as size and different legislative criteria (Hussmans 2004). Specifically, the 1-2-3 surveys define informal enterprises as small production units that (a) do not have written formal accounts and/or (b) are not registered with the tax administration.

For the second phase of the survey, a randomized sub-sample of approximately 1000 enterprises in each country was drawn from the production units identified as informal in phase one (Brilleau et al. 2005). The focus of this phase was on characteristics of the entrepreneurs and their production units. It also contains information on input use, capital stocks, sales, profit as well as the unit's forward and backward linkages and therefore provides the basis for the subsequent analysis. Since disaggregated data are not available for Niamey (Niger), we work with a total sample of 5785 enterprises from Cotonou, Ouagadougou, Abidjan, Bamako, Dakar and Lomé.

Based on Chen's (2006) notion of a continuum of production relationships, we account for the heterogeneity of the informal sector by dividing it into different segments. First, we lump together those enterprises that have any kind of formal link with the public sector, calling them registered informal enterprises as opposed to unregistered informal enterprises. Specifically, we define registered units of production as those who hold a tax number, have an entry in the commercial register or pay business tax or some kind of license tax.[1] The second

[1] Note that while these production units do not fulfill part (b) of the above definition of informality they still count as informal enterprises because part (a) applies to them.

approach we apply is to leave registration aside and to use the mean capital stock of the whole sample (240 000 CFA) as a threshold to divide the sample into low capital informal enterprises (<240 000 CFA) and high capital informal enterprises (>240 000 CFA).

Table 1 shows the distribution of the 5785 enterprises across the six cities and the sub-groups defined above. Applying registration or higher-than-average capital stocks as cut-off criteria leads to roughly the same size of the segments of the informal sector. The share of registered and high capital enterprises in the overall sample amounts to 18.5 and 17.2 percent, respectively. The most notable difference between the distributions implied by the two definitions occurs in the trade sector: while about 17 percent of the enterprises involved in trading activities are registered, less than 10 percent own a capital stock exceeding the average value of 240000 CFA. This reflects a general pattern of markedly lower capital endowments in the trade sector as compared to the industry and services sector.

Taking a closer look at the sectoral distribution of informal activities (Table 2) reveals that petty trade is the predominant activity in the trade sector. This is particularly true at the lower end of the continuum. About 30 percent of all unregistered and low capital informal enterprises in the sample are classified as petty traders. Construction is another sector where these two groups are more strongly represented than registered and high capital enterprises. The latter, in turn, have a much higher probability of offering repair and transport services than the former. Overall, the sectoral pattern of activities across sub-groups turns out to be fairly similar for the two classifications we apply.

Table 3 reports further characteristics of the different groups of informal enterprises. Starting with production factors, the number of employees is only moderately higher in the high capital/registered segment of the informal sector, whereas differences in capital stocks and the use of electricity and telephones are much more pronounced. Enterprise owners were also asked if they were members of professional associations or received help from professional associations. Membership is generally low but more common among registered and high capital informal enterprises. Assistance is granted more frequently and only slightly biased in favor of these two groups. The last three rows of Table 3 display characteristics of the owners or managers of the enterprises. Most notably, registered and high capital enterprises are much less likely to be managed by women than unregistered and low capital enterprises, which is mainly driven by a very strong presence of women in petty trade. Furthermore, owners or managers of enterprises belonging to the upper end of the informal sector have more years of

schooling and a somewhat higher age than their lower-end counterparts. Again, the pattern that emerges applies irrespective of whether enterprises are sorted with respect to capital stocks or registration.

A final aspect that substantiates our typology is the kind of business setup. Enterprises were asked about the locality of their activities. As can be seen from Table 4, more than 60 percent of registered and high capital informal businesses have either access to permanent business setups (permanent booths on markets, workshops, shops, or restaurants) or use vehicles. Unregistered and low capital enterprises, by contrast, most frequently work at home without equipment or as ambulant traders and street vendors.

Taken together, the analysis so far has shown that our classification captures important aspects of the heterogeneity of the informal enterprises in the sample. In the following, it will be used to test whether the segments of the informal sector differ with respect to their linkages to the formal sector.

b. Linkages

Following Hirschmann (1958), we differentiate consumption and production linkages. While the former only concerns sales to final demand, the latter can be split up into forward and backward linkages. Forward linkages refer to the use of an enterprise's output as an input in other productive activities, while backward linkages comprise the enterprise's purchases of intermediate inputs. Our analysis focuses on the existence rather than the size or the share of specific linkages. The reason is that only 168 enterprises have both formal and informal backward linkages and only 16 have both formal and informal forward linkages, which would render a comparison of shares meaningless.

The questionnaire gathered detailed information about the inputs and outputs of all enterprises with respect to the type of services or products involved as well as their destination and origin. Possible destinations and origins include the public sector, big private enterprises, small enterprises, households, imports and exports. This allows us to define the formal sector as being represented by the public sector and big enterprises and the informal sector as being composed of small enterprises. Additionally, we use the type of service or product purchased by the enterprises to define the sector they maintain backward linkages with. In doing so, we distinguish four different sectors: agriculture, industry, trade and services. As concerns

forward linkages, the data does not allow us to determine the destination sector given that the type of product sold only characterizes the production unit itself. Even though we can differentiate exports and imports, it is important to recognize that out of the 5785 enterprises only 60 report imports and 13 report exports.

The use of informal enterprises' output is clearly dominated by final demand, i.e. sales to households. Only 683 enterprises do not sell any of their goods or services to households. As shown in Table 5, the share of sales directed towards final demand generally exceeds 80 percent. The only exceptions are trade-related activities by registered enterprises (Table 5a) and by high capital informal enterprises (Table 5b). Mostly as wholesalers, these enterprises cater more strongly to other enterprises, in particular small ones in the informal sector.

The structure of formal-informal linkages exhibits two interesting regularities. First, even for registered and high capital informal enterprises, sales to the formal sector are less important than those to the informal sector. Second, with a share of slightly above 2 percent, the formal sector plays a negligible role as a buyer of goods and services from unregistered and low capital informal enterprises, which is in accordance with Ranis and Stewart's (1999) assumption that enterprises belonging to the lower tier of the informal sector have no production links with the formal sector. As shown in the lower panels of Tables 5a and 5b, respectively, the formal forward linkages of these enterprises in the industrial and trade sector are significantly lower than those of their registered and high capital counterparts. The most important formal forward linkage (with a share of 7.5 percent) exists for registered enterprises towards the industrial sector (Table 5a). This may at least partly reflect subcontracting agreements with large domestic firms and the government.[2]

According to the self-stated business perspectives of the entrepreneurs contained in the questionnaire, the dominance of consumption linkages over (formal) forward linkages tends to be viewed as a constraint for informal enterprises. While finding customers in general is viewed as a problem by the majority of the informal enterprises in the sample (more than 60 percent), a sizeable minority emphasizes the specific importance of forward links to big enterprises. In the industrial sector, the share of entrepreneurs who stress that formalization would allow them to sell to big enterprises (15 percent) is almost as large as the share of entrepreneurs who point to the availability of credit as the main advantage of formalization (19 percent).

[2] In a case study for Nigeria, Arimah (2001) shows that subcontracting accounts for a substantial share of existing forward linkages.

When comparing the backward linkages shown in Table 6 to the forward linkages, it turns out that informal enterprises are much more likely to buy intermediate goods and services from the formal sector than vice versa, which corroborates the notion of an asymmetric formal-informal relationship in intermediate product markets (Hugon 1990). The frequency of formal backward linkages is by far highest in the trade sector. About 19 percent of the high capital trading companies in our sample, for instance, purchase goods from the formal industrial sector (Table 6b).

The pattern of backward linkages is in several respects similar to that of forward linkages. Again, linkages to the informal sector are considerably more frequent than linkages to the formal sector for all sub-groups of enterprises, and again formal linkages are of minor significance for unregistered and low capital informal enterprises. The latter is particularly pronounced for purchases of formal services, which only account for around 2 percent of overall expenditures. Irrespective of how we define them, informal enterprises at the higher end of the continuum are more than twice as likely as those at the lower end to buy goods and services originating from the formal sector, the difference being significant at the one percent level for purchases from the industrial, trade and services sector alike (Tables 6a and 6b). Unregistered and low capital informal enterprises, and especially the traders among them, have fairly strong backward linkages to the agricultural sector, from which they mainly buy food items.

3. Correlates of backward linkages

Based on the descriptive statistics presented above, we construct a simple Probit model to investigate whether it is possible to identify some of the major factors associated with the choice of informal enterprises to enter formal-informal linkages.[3] In doing so, we focus on backward linkages which in our descriptive analysis above have been shown to be quantitatively much more important than forward linkages. We distinguish six different types of correlates:

[3] Since consumptive linkages, i.e. final demand, allow no formal-informal categorization we exclude them from the analysis in the following sections.

(i) Primary production factors (capital stocks, employees), infrastructure (electricity, telephone), and credit. The expectation is that enterprises with higher endowments are in a better position to establish formal linkages.

(ii) Experience as measured by the age of the enterprise. The expectation is that it takes time to build up business relationships.

(iii) Characteristics of the owner/manager of the enterprise (age, schooling, sex). We expect that male as well as older and more educated owners are more likely to establish formal linkages.

(iv) Membership of or help from professional associations. Contact with associations may facilitate networking and thereby raise the likelihood of formal business relationships.

(v) Dummies indicating whether the enterprise is registered or has higher-than-average capital. The evidence in Tables 5 and 6 clearly suggests that registered and high capital enterprises exhibit stronger formal backward linkages.

(vi) Dummies indicating whether a formal forward linkage exists. This is to test whether an enterprise with formal forward linkages is more likely to engage in formal backward linkages.

In addition to these control variables, the estimations include a set of country and industry dummies.

The results of the Probit analysis are reported in Table 7. We start with a baseline specification that only includes enterprise characteristics as explanatory variables (column 1). It turns out that several of these characteristics are statistically significant and have the expected sign. Backward linkages to the formal sector are more likely to exist for enterprises with a higher number of employees as well as better access to credit and telephone services, and where the owner is male and has more years of schooling. The existence of backward linkages to the formal sector is also positively related to the size of the capital stock. For two other firm characteristics, expectations are not corroborated by the empirical evidence: a higher age of the enterprise as well as membership in (or help from) professional associations are not associated with more frequent linkages to the formal sector. Membership in

associations rather appears to be favorable for the establishment of informal forward linkages, suggesting that networks may be more easily built among similar firms.[4]

In the next two regressions, we additionally include the registration dummy (column 2) and the lower-than-average capital dummy (column 3). The dummies (UNREG and LOWCAP) are both significant at the one percent level, suggesting that the probability of engaging with the formal sector is higher for registered and high capital informal enterprises. The impact of all other control variables remains the same as before, with one exception: when entering the regression jointly with the high capital dummy, the capital stock variable is still positive but turns insignificant as the former captures part of its impact. Finally, as indicated by the respective dummy variable, which is significant at the one percent level, formal forward and backward linkages are positively associated with each other. By contrast, our regression results do not point to a similar relationship between informal forward linkages and formal backward linkages.

4. Backward linkages and enterprise performance

Having established that formal backward linkages are correlated with various enterprise characteristics and that their existence varies with the different classifications of informal enterprises, we now examine whether the linkages matter for enterprise performance. There has been extensive theoretical work on the question of whether inputs should be produced by the firm itself or whether they should be procured by independent suppliers (e.g. Williamson 1971). Market failures and the associated transaction costs bring about internalization, i.e. the decision to produce inputs that could be provided more efficiently by suppliers in the absence of transaction costs. Focusing on vertical linkages, Lall (1980) and Mead (1984) argue that this internalization can lead to lower productivity because independent suppliers would benefit from economies of scale for a particular intermediate good and because the internalization limits the gains from specialization. In addition, if enterprises are not able to procure intermediate goods from an independent supplier and lack the physical or human capital to produce the goods themselves, they will be restricted in their ability to introduce innovations to their production. More generally, it can be assumed that linkages facilitate the dispersion of technical innovation. Based on these considerations we expect backward

[4] Results for informal linkages are not shown here given that our focus is on the links of informal enterprises with the formal sector, but they are available from the authors on request.

linkages and especially formal backward linkages to exert a positive influence on the productivity of enterprises in the informal sector.

When estimating the effects of backward linkages on firm performance, the main problem that may arise is endogeneity (e.g. Griliches and Maitresse 1995). First, it is very likely that linkages and other potential right-hand-side variables such as primary inputs are determined simultaneously. Second, it is not clear a priori whether an exceptional performance would allow firms to engage in the formal intermediate input market or whether it rather is improved access to formal supply channels that would trigger higher performance. Hence, reverse causality could also be a serious issue.

Before turning to a strategy of how to deal with endogeneity, we first present OLS regressions as a baseline. Our performance indicators are sales per worker and profit per worker. We also employ return on capital as a proxy for profitability and asset turnover as a proxy for the degree of activity of the informal enterprises, defining the return on capital as the ratio of profit to capital and asset turnover as the ratio of sales to capital. As shown in Table 3 above, all indicators differ markedly between the different categories. Registered and high capital informal enterprises tend to have higher sales per worker and also generate higher profits per worker compared to their counterparts. Their returns to capital are lower and they turn less of their capital over. Control variables include the same enterprise characteristics as before as well as the registration and high capital dummy, the latter being employed alternatively.

The OLS results are reported in Table 8. The most important finding is the significantly positive effect of formal backward linkages on all indicators under consideration. Even though there are few enterprises in the sample with imports we find that these import linkages also tend to be associated with higher performance. Most of the enterprise characteristics (capital, employment, firm age, sex and schooling of the owner, telephones, membership of associations in the full sample) are significant and have the expected sign. Somewhat surprisingly, we find no robust positive effect of credit availability on firm performance and in some cases even a negative impact of professional support from associations. The latter may well reflect reverse causality in the sense that underperforming firms are more likely to be eligible for professional support. Finally, there is evidence that the degree of informality is important for the performance of enterprises. While the registration dummy is always negative and significant at least at the 5 percent level (Table 8), a low capital endowment is

shown to decrease sales per worker and profit per worker but to have no discernable impact on return on capital and asset turnover.

While being suggestive, the OLS estimates are likely to be biased: the Durban-Wu-Hausman test points to the endogeneity of formal backward linkages in almost all specifications. As an attempt to overcome the endogeneity problem, we depart from the theoretical argument made by Hirschmann that firms will only engage in backward linkages if markets exist to which they can sell their products, reflecting a demand-led growth perspective. Accordingly, we assume that forward linkages come logically before backward linkages. Furthermore, firms in the informal sector consider a lack of demand from big enterprises in the formal sector as one of their major constraints. This leads us to use the existence of formal forward and export linkages as instrumental variables for incurring formal backward linkages.

Causality could also run from backward to forward linkages, or both could be jointly determined by third factors, which would render the theory-based instrument invalid. We therefore employ the informal share of a given sector of origin as a second instrument to evaluate the robustness of our findings. The underlying idea is that the bigger the informal share the less likely it is that (informal) enterprises will have formal linkages to this sector. The first phase of the 1-2-3 survey asked household members about their employment status as well as the sector, size and legal status of the company they worked for. This allowed us to derive the informal share of the sectors listed in Table 2 for each city in the survey.[5] Since the second phase of the questionnaire comprises a random sub-sample of the first phase we can be confident that the calculated shares are not systematically biased and that they serve as exogenous instruments.

The fact that our theory-based instrumental variables are binary would call for a local average treatment approach (Imbens and Angrist 1994). Yet, given that this Maximum Likelihood method does not allow us to assess the quality of the instruments we opt for a 2SLS approach instead.[6] The 2SLS is less efficient but consistent in the present setting (Wooldridge 2002). A disadvantage of the 2SLS procedure is that the size of the coefficients of the fitted values in the second stage cannot be interpreted in a meaningful way. Hence, we have to rely on the sign and the statistical significance of the coefficients when comparing IV and OLS estimates.

[5] Since company size is only reported on a scale with non-linear intervals, the calculated shares are not valid point estimates. Nevertheless, they do represent the relative size of the informal sector in each city.

[6] Our overall results are not affected by this choice as they point in the same direction under a local average treatment approach. The results of the local average treatment regressions are available from the authors upon request.

As for the quality of our instruments, we have already shown in Table 7 that formal forward linkages are closely related to the formal backward linkages of informal enterprises. As a formal test of the strength of the instruments we report the Cragg-Donald F-statistics. Their critical value for the present IV estimations is 7.25 for the theory-based instrument and 5.53 for the informal sector share instrument according to Stock and Yogo (2002). Both instruments appear to be strong in the two performance equations, whereas values of the Cragg-Donald test are close to the thresholds in the profitability and activity equation. Furthermore, we test the orthogonality assumption of the 2SLS approach, employing the standard Sargan statistic of overidentifying restrictions. This can only be done for the theory-based instruments as there is only one informal sector share instrument. Results are mixed: in half of the cases the null of endogeneity is clearly rejected, pointing to the validity of the instruments, whereas in the other half Sargan p-values between 0.3 and 0.4 suggest the opposite.

The IV results are displayed in Table 9 for the theory-based instrument and in Table 10 for the informal sector share instrument. In accordance with our OLS results, we find that - irrespective of the instrumentation strategy - formal backward linkages have a positive and significant impact on the performance, profitability and activity variables. The only exception is the profitability equation in Table 10, where the respective coefficient is only marginally significant but still positive. The negative effect of being unregistered and having a lower-than average capital stock we found in the OLS estimations vanishes in most cases. This suggests that the degree of informality of the enterprises in our sample mainly affects firm performance through their linkages to the formal sector. By contrast, several other control variables (capital stocks, employees, firm age, and membership in associations) retain their independent impact on most of the indicators under the IV specification.

5. Summary and Conclusions

Along the lines of Hirschmann's linkage methodology, this paper has analyzed to what extent informal enterprises in six West African urban centers are engaged with the formal sector. We have shown that formal-informal linkages do exist, that backward linkages to the formal sector are much more prevalent than forward linkages, and that linkages vary with the degree of informality, occurring less frequently if firms are unregistered or have low capital stocks. Another important finding is that various measures of firm performance are strongly

improved by the existence of formal backward linkages, whereas the degree of informality of the enterprises seems to affect firm performance only indirectly through their linkages to the formal sector.

Taken together these results lead us to conclude that the pessimistic view on the prospects of the informal sector implied by standard dual economy models is not justified. Yet, it has to be recognized that the unregistered and low-capital enterprises of our sample are rather weakly integrated with the formal sector, which in turn impairs their development prospects. These enterprises are most likely in need of public support, be it in the form of microcredit, investments in infrastructure or legal reforms that facilitate transactions among firms.

As concerns future research, the important role that linkages play according to our findings would call for a more detailed analysis of how business relationships between enterprises come about and are sustained. Such an analysis could, for example, build on the growing literature on social networks in developing countries, or it could take a closer look at the spatial distribution of formal and informal activities. A deeper knowledge of the conditions under which formal-informal linkages are successfully established might enable governments to provide support that more effectively removes existing bottlenecks.

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Table 1: Distribution of Sample

	Industry	Trade	Services	Total
Benin - Cotonou	14.33	15.54	19.15	937
Burkina Faso - Ouaga	19.35	16.92	13.89	974
Côte d'Ivoire - Abidjan	15.32	16.74	19.98	996
Mali - Bamako	19.56	16.46	14.89	985
Sénégal - Dakar	18.04	18.02	15.72	1,004
Togo - Lomé	13.39	16.32	16.37	889
REGISTERED	16.74	17.06	22.46	1,072
UNREGISTERED	83.26	82.94	77.54	4,713
Low Capital	82.64	90.33	73.23	4,789
High Capital	17.36	9.67	26.77	996
Total	1,912	2,181	1,692	

Source: Authors' calculation based on 1-2-3 survey.

Table 2: Sectoral Distribution of UPIs

	REG	UNREG	Low Capital	High Capital	Industry	Trade	Services
Clothing and apparel	11.85	10.95	10.54	13.86	33.63	–	–
Other manufacturing	14.09	14.22	14.12	14.56	42.94	–	–
Construction	3.92	8.61	8.33	4.92	23.43	–	–
Wholesale/retail shops	19.78	8.47	10.19	12.35	–	28.01	–
Petty trading	14.93	29.92	30.95	8.84	–	71.99	–
Hotels and restaurants	6.06	7.09	6.89	6.93	–	–	23.58
Repair services	10.07	4.86	5.22	8.73	–	–	19.92
Transport	10.26	3.46	1.98	17.87	–	–	16.13
Other services	9.05	12.43	11.78	11.95	–	–	40.37
Total	1,072	4,713	4,789	996	1,912	2,181	1,692

Source: Authors' calculation based on 1-2-3 survey.

Table 3: Characteristics of UPIs

	REG	UNREG	Low Capital	High Capital	Industry	Trade	Services
Age of Company in Years	10.81	9.72	9.95	9.81	10.47	9.73	9.55
Capital in 1000CFA	692.15	139.46	37.36	1223.59	243.25	124.05	390.54
Number of Employees	2.44	1.52	1.49	2.63	1.97	1.31	1.86
Water	0.10	0.08	0.07	0.17	0.08	0.06	0.12
Electricity	0.46	0.18	0.17	0.51	0.27	0.16	0.26
Telephone	0.17	0.07	0.06	0.22	0.09	0.06	0.12
Member of Association	0.13	0.03	0.04	0.10	0.06	0.04	0.05
Support from Association	0.46	0.35	0.36	0.44	0.39	0.36	0.37
Sales per worker	260.35	129.68	136.46	237.37	106.40	204.15	143.03
Profit per worker	87.67	47.44	47.99	88.46	56.08	48.41	62.05
Return to capital	343.00	490.28	567.01	22.71	367.45	632.88	363.48
Asset turnover	10.23	13.51	15.86	0.68	7.18	23.78	6.53
Sex (male = 1)	0.75	0.44	0.45	0.74	0.62	0.30	0.61
Age	37.72	35.6	35.70	37.39	35.74	36.63	35.47
Years of Schooling	4.84	3.71	3.57	5.60	3.97	3.27	4.69

Source: Authors' calculation based on 1-2-3 survey.

Table 4: Business Setup of UPIs

	REG	UNREG	Low Capital	High Capital	Industry	Trade	Services
Ambulant	3.73	15.17	14.49	6.12	9.31	18.84	9.81
Improvised booth on street	5.32	11.18	11.13	5.12	8.21	10.77	11.35
Permanent booth on street	8.77	10.76	10.96	7.63	6.85	11.23	13.3
Vehicle	5.22	1.27	0.33	10.04	0.1	0.18	6.5
At customers' home	2.89	9.99	9.79	3.31	16	3.21	7.45
At home without equip.	2.15	20.52	19.52	5.52	22.49	13.53	15.66
At home with equip.	4.38	6.54	5.7	8.23	7.95	4.68	5.97
Improvised booth on market	7.18	9.76	10.77	2.11	4.92	16.74	4.61
Permanent booth on market	25.56	6.05	8.29	16.27	7.58	12.93	7.8
Workshop, shop, restaurant	33.3	7.89	8.14	34.04	16.16	6.97	15.84
Other	1.4	0.87	0.86	1.51	0.42	0.87	1.71
Total	1,072	4,713	4789	996	1,912	2,181	1,692

Source: Authors' calculation based on 1-2-3 survey.

Table 5a: Forward Linkages of UPIs, Registered vs Unregistered

		TO …				
		FOR	INF	HH	EXP	N
FROM (UPI) …	Registered					
	IND	7.53	8.44	82.47	0.31	320
	TRA	3.38	18.02	77.79	0.27	372
	SER	2.82	9.58	86.10	0.45	380
	ALL	4.42	12.17	82.13	0.35	1072
	Unregistered					
	IND	2.82	9.60	86.77	0.25	1592
	TRA	1.22	9.93	88.29	0.06	1809
	SER	3.71	7.38	88.00	0.23	1312
	ALL	2.45	9.11	87.70	0.17	4713

Pr(|T|>|t|)					
	IND	0.00	0.50	0.04	0.84
	TRA	0.00	0.00	0.00	0.22
	SER	0.39	0.15	0.31	0.46
	ALL	0.00	0.00	0.00	0.23

Source: Authors' calculation based on 1-2-3 survey.

Table 5b: Forward Linkages of UPIs, Low Capital Informal vs High Capital Informal

		TO …				
		FOR	INF	HH	EXP	N
FROM (UPI) …	Informal– low capital					
	IND	2.97	9.48	86.65	0.20	1580
	TRA	1.43	10.41	87.50	0.10	1970
	SER	2.90	7.67	88.64	0.14	1239
	ALL	2.32	9.39	87.52	0.14	4789
	Informal – high cpital					
	IND	6.58	9.06	83.22	0.54	332
	TRA	3.07	19.80	77.13	0.00	211
	SER	5.16	7.43	84.65	0.66	453
	ALL	5.19	11.05	82.58	0.48	996

Pr(|T|>|t|)					
	IND	0.00	0.81	0.92	0.26
	TRA	0.06	0.00	0.00	0.64
	SER	0.21	0.60	0.02	0.06
	ALL	0.00	0.10	0.00	0.03

Source: Authors' calculation based on 1-2-3 survey.

Table 6a: Backward Linkages of UPIs, Registered vs Unregistered

		FROM (SECTOR) …						
		AG	FOR		INF		IMP	
			IND	SER	IND	SER		N
TO (UPI) …	Registered							
	IND	1.77	8.81	2.69	52.37	9.36	0.00	320
	TRA	8.58	13.20	7.74	26.53	24.64	5.38	372
	SER	3.62	7.30	4.93	24.15	12.10	0.26	380
	ALL	4.79	11.19	5.24	33.40	15.63	1.96	1072
	Unregistered							
	IND	5.28	3.57	1.16	39.43	11.14	0.22	1592
	TRA	23.58	8.54	3.32	36.44	16.47	1.70	1809
	SER	8.33	3.25	1.91	25.53	9.31	0.08	1312
	ALL	13.16	5.39	2.20	34.41	12.68	0.75	4713
	Pr(|T|>|t|)							
	IND	0.00	0.00	0.03	0.00	0.34	0.38	
	TRA	0.00	0.00	0.00	0.00	0.00	0.00	
	SER	0.00	0.00	0.00	0.55	0.10	0.35	
	ALL	0.00	0.00	0.00	0.50	0.01	0.00	

Source: Authors' calculation based on 1-2-3 survey.

Table 6b: Backward Linkages of UPIs, Low Capital Informal vs High Capital Informal

		FROM (SECTOR) …						
		AG	FOR		INF		IMP	
			IND	SER	IND	SER		N
TO (UPI) …	Informal – low capital							
	IND	5.26	3.08	1.30	40.29	11.19	0.22	1580
	TRA	22.34	9.09	3.11	35.04	18.35	1.76	1970
	SER	8.64	2.53	1.86	27.25	10.15	0.08	1239
	ALL	13.16	5.41	2.19	34.76	13.87	0.82	4789
	Informal – high capital							
	IND	2.01	10.98	1.95	47.84	9.21	0.00	332
	TRA	8.76	18.69	13.0	32.00	13.28	7.58	211
	SER	3.51	8.61	4.57	19.66	9.35	0.22	453
	ALL	4.12	11.54	5.49	31.67	10.13	1.71	996
	Pr(|T|>|t|)							
	IND	0.00	0.00	0.34	0.01	0.28	0.37	
	TRA	0.00	0.00	0.00	0.35	0.06	0.00	
	SER	0.00	0.00	0.00	0.00	0.61	0.46	
	ALL	0.00	0.00	0.00	0.05	0.00	0.01	

Source:Authors' calculation based on 1-2-3 survey.

Table 7: Correlates of Backward Linkages, Probit

	(1)	(2)	(3)	(4)	(5)
	Formal Backward Linkage				
formFORW				0.0819***	0.0789***
				(0.03)	(0.03)
informFORW				0.0022	0.0022
				(0.01)	(0.01)
EXP				0.0231	0.0373
				(0.07)	(0.08)
UNREG		-0.0464***		-0.0453***	
		(0.01)		(0.01)	
LOWCAP			-0.0589***		-0.0564***
			(0.02)		(0.02)
logVAL	0.0035***	0.0027**	0.0012	0.0028**	0.0013
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
totalemployees	0.0104***	0.0084***	0.0079***	0.0077***	0.0073***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
credit	0.0328*	0.0324*	0.0308*	0.0299*	0.0285*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
sex	0.0650***	0.0583***	0.0605***	0.0564***	0.0585***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
age	0.0002	0.0001	0.0001	0.0001	0.0001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
scol	0.0047***	0.0045***	0.0043***	0.0041***	0.0039***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
firmage	-0.0014**	-0.0014**	-0.0013**	-0.0014**	-0.0014**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
telephone	0.0474***	0.0416**	0.0419**	0.0366**	0.0368**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
association	-0.0109	-0.0179	-0.0117	-0.0157	-0.0096
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
support	0.0059	0.0040	0.0054	0.0045	0.0058
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Obs	5717	5717	5717	5717	5717
χ^2	337.03	349.88	345.84	358.18	356.28

Notes: The dependent variable equals one if the enterprise has formal backward linkages. Included country and sector dummies are not reported. Coefficients are reported as marginal effects. Figures in parenthesis are cluster robust standard error; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimations based on 1-2-3 survey.

Table 8: Effects of Linkages on UPI Performance, OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PERFORMANCE				PROFITABILITY		ACTIVITY RATIO	
	log sales per worker		log profit per worker		log return on capital		log asset turnover	
formBACKW	0.75***	0.76***	0.21***	0.21***	0.20***	0.21***	0.67***	0.70***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
informBACKW	0.25***	0.27***	-0.20***	-0.19***	-0.19***	-0.18***	0.24***	0.25***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
IMP	1.13***	1.17***	0.58***	0.59***	0.57**	0.59**	1.12***	1.16***
	(0.16)	(0.17)	(0.22)	(0.22)	(0.25)	(0.25)	(0.18)	(0.17)
UNREG	-0.34***		-0.15***		-0.13**		-0.27***	
	(0.05)		(0.06)		(0.06)		(0.05)	
LOWCAP		-0.30***		-0.20***		0.04		0.05
		(0.05)		(0.06)		(0.07)		(0.06)
logVAL	0.05***	0.04***	0.04***	0.03***	-0.87***	-0.85***	-0.83***	-0.81***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
totalemployees	-0.10***	-0.10***	-0.15***	-0.15***	0.20***	0.20***	0.24***	0.25***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
credit	0.28***	0.27***	0.08	0.07	0.02	0.01	0.19***	0.18***
	(0.06)	(0.06)	(0.07)	(0.07)	(0.08)	(0.08)	(0.06)	(0.06)
sex	0.32***	0.35***	0.46***	0.47***	0.35***	0.36***	0.16***	0.19***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)
age	0.00***	0.00***	0.00	0.00	-0.00	-0.00	0.00*	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
scol	0.02***	0.02***	0.03***	0.03***	0.02***	0.02***	0.01**	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
firmage	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
telephone	0.41***	0.42***	0.30***	0.30***	0.26***	0.28***	0.35***	0.37***
	(0.07)	(0.07)	(0.09)	(0.09)	(0.09)	(0.09)	(0.07)	(0.07)
association	0.23***	0.28***	0.27***	0.29***	0.20*	0.22**	0.16**	0.22***
	(0.08)	(0.08)	(0.10)	(0.10)	(0.10)	(0.10)	(0.08)	(0.08)
support	-0.08**	-0.07*	-0.11***	-0.11***	-0.10***	-0.10**	-0.06*	-0.05
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Constant	3.06***	2.99***	2.39***	2.43***	6.45***	6.24***	2.42***	2.02***
	(0.10)	(0.10)	(0.11)	(0.11)	(0.13)	(0.14)	(0.11)	(0.12)
Observations	5717	5717	5317	5317	4649	4649	4983	4983
R^2	0.25	0.25	0.20	0.20	0.64	0.64	0.69	0.69

Notes: Included country and sector dummies are not reported. Figures in parenthesis are cluster robust standard error; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimations based on 1-2-3 survey.

Table 9: Effects of Linkages on UPI Performance, IV Using Forward Linkages as Instrument

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PERFORMANCE				PROFITABILITY		ACTIVITY RATIO	
	log sales per worker		log profit per worker		log return on capital		log asset turnover	
formBACKW	6.34***	6.42***	6.91***	6.94***	7.09**	7.14**	5.62***	5.73***
	(2.03)	(2.09)	(2.43)	(2.47)	(2.95)	(2.98)	(2.14)	(2.19)
UNREG	0.01		0.24		0.14		-0.05	
	(0.16)		(0.17)		(0.16)		(0.13)	
LOWCAP		0.10		0.20		0.22		0.24*
		(0.17)		(0.19)		(0.16)		(0.13)
logVAL	0.03***	0.03***	0.02*	0.02**	-0.97***	-0.95***	-0.91***	-0.87***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)	(0.04)	(0.04)
totalemployees	-0.16***	-0.16***	-0.23***	-0.23***	0.14***	0.14***	0.20***	0.20***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)
credit	-0.00	-0.00	-0.31	-0.30	-0.42*	-0.42*	-0.08	-0.09
	(0.17)	(0.17)	(0.21)	(0.21)	(0.25)	(0.25)	(0.17)	(0.18)
sex	-0.00	-0.00	0.20	0.18	0.15	0.13	-0.09	-0.09
	(0.12)	(0.12)	(0.14)	(0.14)	(0.14)	(0.15)	(0.11)	(0.11)
age	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
scol	-0.00	-0.00	-0.00	-0.00	-0.01	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
firmage	0.02***	0.02***	0.02***	0.02***	0.03***	0.03***	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
telephone	0.13	0.13	0.02	0.01	0.05	0.04	0.15	0.16
	(0.17)	(0.17)	(0.18)	(0.18)	(0.19)	(0.19)	(0.15)	(0.15)
association	0.42***	0.43***	0.41**	0.37**	0.39*	0.37*	0.37**	0.39**
	(0.16)	(0.15)	(0.19)	(0.18)	(0.20)	(0.20)	(0.16)	(0.15)
support	-0.08	-0.09	-0.11	-0.11	-0.06	-0.06	-0.04	-0.04
	(0.07)	(0.07)	(0.08)	(0.08)	(0.09)	(0.08)	(0.06)	(0.06)
Constant	3.06***	2.97***	2.10***	2.15***	6.51***	6.39***	2.71***	2.34***
	(0.18)	(0.18)	(0.21)	(0.21)	(0.26)	(0.29)	(0.19)	(0.22)
Observations	5717	5717	5317	5317	4649	4649	4983	4983
F-statistic	26.34	25.25	23.38	23.05	109.06	107.93	190.33	184.37
CD F-statistic	9.62	9.25	10.47	10.08	6.01	5.99	6.80	6.68
Sargan p-value	0.05	0.06	0.28	0.30	0.40	0.41	0.04	0.04

Notes: Included country and sector dummies are not reported. Figures in parenthesis are cluster robust standard error; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimations based on 1-2-3 survey.

Table 10: Effects of Linkages on UPI Performance, IV Using Informal Market Share as Instrument

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PERFORMANCE				PROFITABILITY		ACTIVITY RATIO	
	log sales per worker		log profit per worker		log return on capital		log asset turnover	
formBACKW	9.71***	10.00***	5.94**	5.87**	3.37	3.56	8.15**	8.49**
	(3.71)	(3.84)	(2.58)	(2.62)	(2.27)	(2.19)	(3.67)	(3.52)
UNREG	0.24		0.18		-0.00		0.07	
	(0.28)		(0.18)		(0.12)		(0.21)	
LOWCAP		0.35		0.14		0.12		0.33*
		(0.30)		(0.19)		(0.11)		(0.19)
logVAL	0.02	0.03*	0.02**	0.03***	-0.91***	-0.90***	-0.95***	-0.91***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)	(0.06)	(0.06)
totalemployees	-0.19***	-0.19***	-0.22***	-0.22***	0.17***	0.17***	0.18***	0.18***
	(0.05)	(0.06)	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)
credit	-0.18	-0.19	-0.25	-0.25	-0.19	-0.20	-0.23	-0.25
	(0.28)	(0.29)	(0.20)	(0.20)	(0.17)	(0.17)	(0.27)	(0.26)
sex	-0.16	-0.18	0.25*	0.24	0.29***	0.28***	-0.18	-0.21
	(0.19)	(0.21)	(0.14)	(0.15)	(0.10)	(0.10)	(0.15)	(0.16)
age	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
scol	-0.02	-0.02	0.00	0.00	0.01	0.00	-0.02	-0.02
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
firmage	0.03***	0.03***	0.02***	0.02***	0.02***	0.02***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
telephone	-0.04	-0.05	0.06	0.06	0.18	0.17	0.05	0.04
	(0.26)	(0.27)	(0.17)	(0.17)	(0.13)	(0.13)	(0.22)	(0.22)
association	0.53**	0.51**	0.39**	0.36**	0.28**	0.29**	0.47**	0.47**
	(0.24)	(0.23)	(0.17)	(0.16)	(0.14)	(0.14)	(0.24)	(0.22)
support	-0.09	-0.10	-0.11	-0.11	-0.08	-0.08	-0.03	-0.03
	(0.09)	(0.10)	(0.07)	(0.07)	(0.06)	(0.05)	(0.08)	(0.09)
Constant	2.97***	2.87***	2.12***	2.17***	6.40***	6.25***	2.78***	2.45***
	(0.28)	(0.27)	(0.19)	(0.19)	(0.17)	(0.20)	(0.27)	(0.32)
Observations	5717	5717	5317	5317	4649	4649	4983	4983
F-statistic	12.69	11.77	26.02	25.82	264.29	252.42	103.86	96.29
CD F-statistic	8.767	8.524	9.216	8.643	5.684	6.353	6.221	7.210

Notes: Included country and sector dummies are not reported. Figures in parenthesis are cluster robust standard error; *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' estimations based on 1-2-3 survey.