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Is the Informal Sector Constrained from the Demand Side? Evidence for Six West African Capitals *

Marcus Böhme, Rainer Thiele

Abstract:
Employing a unique dataset that covers households from six West African capitals, this paper provides new evidence on the demand for informal sector products and services. We first investigate whether demand linkages exist between formal and informal products and distribution channels, and whether there is an overlapping customer base, which would imply that both formal sector wage earners and informal workers buy both formal and informal products using both formal and informal distribution channels. In a second step, we estimate demand elasticities based on Engel curves. We find a strongly overlapping customer base and strong demand-side linkages between the formal and informal sector, with the exception that informal goods are hardly bought through formal distribution channels. The estimated demand elasticities tend to show that rising incomes are associated with a lower propensity to consume informal sector goods and to use informal distribution channels. We therefore conclude that the informal sector in West Africa is likely to be constrained from the demand side.

Keywords: Informal sector; formal-informal linkages; Engel curve estimates; West Africa

JEL classification: D12; 017

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1. Introduction

In urban Sub-Saharan Africa (SSA), formal employment covered by labor legislation and social protection schemes is the exception rather than the rule. By far the largest part of urban employment is generated by micro and small enterprises, and (self-) employment in those enterprises can be considered informal by almost any definition one might want to apply. The informal sector is characterized by a high degree of heterogeneity comprising both low and high return activities. This implies a sub-optimal allocation of production factors where poor urban households are prevented from escaping the lower tier of informal employment. Among the constraints that may bring about this heterogeneity, supply side factors such as capital market failures have received considerable attention in the literature (e.g. de Mel et al. 2008).

It has been less well recognized that the evolution of the informal sector is also shaped by the demand side, in particular by the structure of final demand as well as linkages to the formal sector. The literature on the structure of demand has mainly been descriptive. It has not only distinguished informal and formal products and services, but also formal and informal customers or households, typically identified by the (main) sector of occupation of the household head (formal or informal). A core proposition of this literature has been that informal and formal products will often have an overlapping customer base (Sethuraman 1997). Such overlaps may reflect complementary or competitive product markets. The most common example of a complementary market occurs when the informal sector sells formal sector products. In competitive markets, the two sectors compete within the same product market, and the informal sector may for example retain market shares by charging lower prices. The rather limited evidence for Sub-Saharan Africa tends to confirm the notion of an overlapping customer base. Covering a sample of 13 Sub-Saharan African countries, Xaba et al. (2002) find rather strong inter-linkages in the final product market, with each sector being a strong supply as well as demand base of the other sector. Similar results are obtained by Grimm and Günther (2006) for the case of Burkina Faso.

By contrast, Fortin et al. (2000) suggest various reasons why working in the informal sector will raise the probability of buying products in the informal market, thereby limiting the demand overlap. For instance, those working in the informal sector may have an informational advantage about how and where to obtain informal goods and services. In accordance with this reasoning, Livingstone (1991) finds that in Kenya informal goods target mainly low-income consumers, while Reilly et al. (2006) obtain an inverse relationship between purchases from informal markets and income.

Of crucial importance for the economic prospects of informal entrepreneurs is the elasticity of demand for their products, which in turn depends on the strength of formal-informal linkages. Again, evidence on this issue is scarce. The only exception in the African context is Lachaud (1990) who shows that rising wages lead to a lower propensity to consume informal sector goods. D'Haese and Van Huylenbroeck (2005) find evidence that supermarkets create fierce competition with local agricultural sales in South Africa. With rising income households tend to purchase their goods at supermarkets because they are able to offer a broader variety and a higher quality at lower prices. Even though this study does not address the informal sector directly it can be assumed that local agricultural sales are often informal.

This paper aims to broaden the evidence on the characteristics of demand for informal sector products and services in Africa. We extend the literature in various ways. First, by using fully comparable data for a sample of six West African countries, we provide a comprehensive set of demand elasticities based on Engel curves. Second, in contrast to previous papers, our dataset allows us to consider imports as an additional product category, and to account for informal and formal distribution channels. Third, we address methodological challenges such as the potential endogeneity of income and the nonlinearity of Engel curves. This has been done before, but not in the context of the informal sector.

The remainder of the paper is structured as follows. Chapter 2 introduces the dataset employed in the empirical analysis and presents descriptive evidence on whether there are demand-side linkages between the formal and informal sector. Chapter 3 derives some hypotheses concerning the demand elasticities, describes the Engel curve methodology and discusses the estimated elasticities. Chapter 4 summarizes our main results.

2. Data and Descriptive Analysis

The Dataset

We use data provided by the “Enquêtes 1-2-3”. This survey was carried out between 2001 and 2003 in seven economic capitals of the West African Economic and Monetary Union (WAEMU). It consisted of three integrated phases for a representative set of households. The first phase of the survey was constructed as a general labor force survey, interviewing formal and informal workers

and entrepreneurs. It provides detailed information about individual socio-demographic characteristics and employment. 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).[1] 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.

The second phase of the survey interviewed a sub-sample of the informal production units identified in phase one. The focus of this phase was on characteristics of the entrepreneurs and their production units. It also contains information on input use, investment, sales, profit as well as the unit's forward and backward linkages.

The third phase, on which the subsequent analysis will mainly rely, collected data on household expenditure including the point of sale. Expenditures were recorded based on a classification of 315 different products and services. The technique of registration varied according to the periodicity of the purchase. While food expenditures were registered on a daily basis for 15 days, for other types of expenditure such as clothing, housing, health, transport and education a retrospective module was used. All expenditure aggregates are recorded at the household level, annualized and given in local currency units. A two-stage random sample design was applied based on an updated general population census of each country (Amegashie et al. 2005). Area codes were used as the primary sampling unit, of which 125 were selected for each city. Households were the secondary sampling unit, of which 20 (24 in Benin) were drawn from each primary unit. Data was then collected for each household member. The 4200 households included in phase three constitute a representative subsample drawn from the 15300 households of phase one.

The data collected in phase one permitted an additional stratification based on income and sector of activity of the household head in phase three. This constitutes one major advantage of using the integrated 1-2-3 survey, because it allows us to distinguish formal and informal households and thus to test whether these two groups differ in their demand patterns as suggested by Fortin et al. (2000). A further strength of the 1-2-3-surveys is that they used exactly the same questionnaire and were conducted more or less simultaneously in the seven economic capitals of the WAEMU, rendering the datasets fully comparable. Finally, being coordinated by AFRISTAT and DIAL and financially supported by the European Commission, the French Ministry of Foreign Affairs and the World

[1] For a survey of different definitions of the informal sector, see Gërxhani (2004).

Bank, the surveys were elevated into the status of official data, which should add to the credibility of the results based on them.

Table 1 shows summary statistics of selected socio-demographic household characteristics for the six West African capitals under consideration.[2] Most interestingly in the context of this paper, between 40% and 60% of the household heads receive their primary income from informal sector activities, classifying the respective households as informal. The share is lowest in Dakar, the capital of Senegal, the richest country in the sample. Regarding the sectoral distribution of informal activities we find that about one quarter is located in the manufacturing sector and between 2% and 12% in the primary sector. Between 62% and 76% of informal activities are dedicated to trade and services. Only 7.8% to 11.2% of informal employment is remunerated by a fixed salary.

The other major household characteristics listed in Table 1 also exhibit a considerable degree of variation across countries. Average household size is by far highest in Dakar due to a strikingly large number of adult members. In addition, household heads in Dakar are markedly older on average than those in the other five capitals. The mainly Christian capitals of Togo and Benin are characterized by high rates of primary school completion among household heads and a rather high share of female-headed households, whereas the opposite is true for the mainly Muslim capitals of Burkina Faso, Mali and Niger.

Structure of Demand

To analyze the structure of demand, we aggregate annual expenditures in two different ways. First, we apply a conventional sectoral classification, where expenditures are allocated to eleven different categories: (1) Food and Non-Alcoholic Beverages, (2) Alcoholic Beverages and Tobacco, (3) Clothing and Shoes, (4) Housing, (5) Gas, Electricity and Water, (6) Furniture and Household Maintenance, (7) Health and Education, (8) Transport and Communication, (9) Leisure and Culture, (10) Hotels and Restaurants and (11) Diverse Goods and Services. While the first two categories consist only of consumption goods, all other categories are composed of a variety of consumption goods, durables as well as services. Being a residual the last category is the most heterogeneous. This classification has the advantage that it can directly be matched with the survey information and closely resembles what has been done in previous studies. This has to be weighed against one important disadvantage, namely that the sectors only roughly correspond with the distinction

[2] Political tensions in Côte d'Ivoire prevented the execution of the third phase in Abidjan. Hence, Abidjan is not included in the present analysis.

between formal and informal goods we are interested in. One can argue, for example, that Food and Non-Alcoholic Beverages includes mainly informal products, whereas Furniture and Maintenance, Health and Education, and Transportation and Communication supply mainly formal goods.

Second, we distinguish four types of expenditures: on formal goods, informal goods, imported goods and services. In principle, this option is superior to the sectoral classification, but in a number of cases the survey does not state whether a product is formal or informal. We therefore had to sort products into the two different categories. Agricultural, artisan and traditional products were assumed to be informally produced, which concerns mainly but not exclusively food products. Capital intensive, technologically advanced and industrial products were assumed to be produced formally. This category consists mainly of electricity, fuel, construction materials, household articles, clothing and footwear, as well as certain food products. It has to be noted that this classification is rather crude given that technologically advanced goods for example might not exclusively be produced formally. In contrast to domestically produced goods, demand for imports and services can readily be identified from the survey. Households can with an acceptable margin of error name the country of origin of goods purchased due to the packing and labeling. One central characteristic of services is the quasi-concurrence of production and purchase. For this reason the distribution channel will be sufficient to distinguish between formal and informal services. This concerns mainly reparation, transportation and communication, health and education, hotels and restaurants as well as cultural services and entertainment.

The questionnaire asked consumers about the location of their purchases such as explicitly formal enterprises, supermarkets and the public sector, which are assumed to be formal, and household production, ambulant retailers and public markets, which are assumed to be informal. This allows us to distinguish formal and informal distribution channels irrespective of which of the two classifications we apply.

As can be seen in Table 2, food products and non-alcoholic beverages account for roughly 30% of annual household expenditures throughout the sample. If non-frequent purchases are excluded, i.e. only monthly expenditures are used this share rises to over 70% for all West African capitals. Housing and Transport and Communication constitute the next-biggest positions, accounting for 10-18% and 10-16% of total expenditures respectively. The structure of demand does not seem to vary in a systematic way across the sample countries. We do, for example, not find higher shares of food expenditures in poorer countries such as Mali and Niger than in richer countries such as Senegal and Benin.

Analyzed along quintiles, it turns out that in accordance with Engel's law the fraction spent on Food and Non-Alcoholic Beverages is falling considerably with rising expenditure, Lomé being the only exception (see Table 3). The same is true for Hotels and Restaurants. By contrast, in all capitals the share of expenditures on Housing[3], Health and Education as well as Transport and Communication increases substantially with growing household expenditure.

From Table 4 it appears that the informal sector is the dominant point of sale.[4] The only notable exception is Health and Education where services are almost exclusively distributed through formal channels. For Gas, Electricity and Water and Transport and Communication we see a rather balanced relationship between formal and informal expenditure shares. Households turn to the formal sector for purchases of capital intensive products such as cars and for the use of public transportation, and to the informal sector for rather inexpensive transportation-related goods such as bicycles and spare parts. In the food and beverages sector, formal outlets such as supermarkets appear to be virtually non-existent.

Turning to the classification by expenditure categories, a clear pattern emerges where the informal distribution channel predominates for all four types of expenditures (Table 5). This is most obviously the case for informal goods, which are hardly ever sold via formal distribution channels. Comparing the six capitals, demand for formal goods is found to be highest in Dakar, but even there the bulk of products are distributed informally. Put more generally, the capitals do not appear to differ systematically regarding formal-informal demand relationships, which may reflect that cross-country differences in per capita income are not sufficiently pronounced. Import shares vary considerably across countries, ranging from 15% in Dakar to 38% in Niamey. Around 30% of all imported goods in Cotonou, Ouagadougou and Bamako are produced in other (mainly neighboring) African countries, while this figure is substantially higher in Niamey (46%) and substantially lower in Dakar (9%).

Table 6 reveals that expenditures by informal households as defined above are by no means restricted to informal goods and informal distribution channels. In Cotonou, for example, these households account for more than a third of total expenditures on formally distributed formal goods (36.8%) and formally distributed imports (34.6%). Irrespective of product category, distribution

[3] Housing expenditures include imputed rents for owner-occupied housing.
[4] The results of Table 4 remain comparable or become even more pronounced when we focus on the frequency of purchases.

channel and city, their expenditure share is in no case lower than 20%. Conversely, the fact that the expenditure share of informal households in no case exceeds 60% implies that formal households are important buyers of informal goods and goods distributed through informal channels, which points to a strong overlapping customer base.

Overall, this section has shown that significant formal-informal linkages exist in the six West African capitals. They may well be strong enough to affect the pattern of estimated demand elasticities, to which we will turn in the next section, in a way that eludes the notion of a simple formal-informal sector dichotomy.

3. Estimation of Engel Curves

Hypotheses

While demand estimation is often primarily concerned with quantities, consumers also face a quality choice (Deaton 1988, Blundell and Stoker 2005). Consequently the observed expenditure patterns will be conditioned by price, quantity and quality of the available products. Merella (2006) has shown that Engel Curves depend on the assumption of constant quality. With increasing quality of a product the marginal utility of this same product would not decline. Based on this assumption the author asserts that increasing income will first affect the quantity of products bought and only thereafter the shift between products due to quality differences. More generally, poor households will be concerned primarily with subsistence and therefore quantity while rich households' consumption is driven by quality differences in goods. This theory has implicitly been corroborated in prior studies (e.g. Wan 1996) where food and shelter – which are necessities and are expected to show an elasticity coefficient that is greater than zero but less then unity – have been found to be treated as a luxury by extremely poor households.

Recently, Banerji & Jain (2007) introduced a new perspective by arguing that the dynamics of the informal sector are also driven by changes in consumer demand. At the core of their argument stands the observation that there is a marked quality difference between formal and informal goods and services. Accordingly, the informal sector caters to a consumer base that is not able to pay high prices for high quality.

From these theoretical considerations two testable hypotheses can be derived. First, if Banerji & Jain (2007) are correct and formal and informal goods and services differ markedly in their quality, we have to expect significantly different income elasticities for the same goods produced or sold by formal and informal enterprises. If Merella (2006) is right then we should observe smaller income elasticities for low quality products, i.e. informal sector products.

Methodology

To answer the question of whether customers behave differently vis-á-vis formal and informal products and distribution channels we estimate demand elasticities for different aggregated production sectors and different types of expenditures as defined above. As predicted by neoclassical consumer theory private demand for goods and services is a function of disposable income and prices. Since the data we work with is cross-sectional, estimations have to be simplified assuming prices to be constant across observations. The corresponding specifications, known as Engel curves, represent Marshallian demand functions for a particular good or service category holding the prices for all goods constant.

From a theoretical point of view, the Engel curves should preferably be estimated using a simultaneous equation approach to account for the restrictions required by utility-based demand theory such as the adding-up criterion. Furthermore, the Breusch and Pagan test of independence in all cases rejects the null hypothesis of no correlation among the error terms of different equations. We nonetheless decided to present equation-by-equation estimates of the system.[5] This approach has the disadvantage that our results are less efficient then they would be when using simultaneous estimation methods, but they remain consistent. It has the advantage that mis-specified equations do not affect overall results, which is especially relevant considering the possible differences of functional forms between countries and categories (see below).

Explorative non-parametric estimations led us to adopt a simple linear double-logarithmic model as our base specification. The equation fitted takes the following form:

$$x_{ij} = \beta_{0j} + \beta_{1ij} x_i + \beta_{2ij} H_i + \beta_{3ij} D_i + \sum_{k=1}^{L} \gamma_{kij}(m_i) + u_{ij} \qquad i = 1, \dots M \ \ and \ j = 1, \dots N$$

[5] We also estimated demand systems for both sectors and expenditure categories. Since these estimates do not change the main conclusions of the paper, we decided not to report them. They are of course available from the authors upon request.

with:

$$x_i = \sum_{j=1}^{N} x_{ij}$$

where x_{ij} is the log of expenditure of household i on product category j, x_i is the log of household income, H_i is the log of household size, m_i are L different household characteristics including age, sex and religion of the household head, an indicator of primary schooling of the household head, and sector of employment of the household head, and D_i are district dummies.

While we include the additional control variables primarily to account for household heterogeneity, the occupation variable also allows us to test the hypothesis (e.g. Fortin et al. 2000) that being employed in the informal sector raises the likelihood of consuming informal goods and services. Concerning household size, we performed robustness checks using equivalence scales and squared household size as predictor variables, which hardly affected our results.

When estimating the Engel curves two main challenges occur: omitted variables and measurement error. First, observed income might not be the main driver of expenditure behavior. More specifically, we have to consider the possible seasonal volatility of employment and earnings which casts doubt on the appropriateness of monthly income as a representation of disposable annual income. Thus, we use total expenditure as a proxy of income, even though our data contains information about declared monthly income from primary and secondary employment as well as income from other sources such as remittances and assets for all household members. The basic justification for using total expenditure instead of total income is based on the permanent-income hypothesis. Accordingly, expenditure will be conditional upon long-run income rather than transitory income, even though it has to be conceded that consumption smoothing in West Africa is likely to be far from perfect as a result of liquidity constraints. [6] While it has been argued that the use of total expenditure can lead to biased or even inconsistent estimation results given that it is only a proxy of income, various authors (e.g. Lewbel 1996; Gibson 2002) have argued that this bias tends to be small compared to the bias introduced by using transitory income. Nevertheless, using total expenditure introduces a possible burden, namely the possible correlation of the independent variable with the error term since by definition our dependent variable, the expenditure on different

[6] For a general discussion of whether income or expenditure constitutes the preferred welfare indicator in the context of developing countries, see for example Deaton (1997).

product categories and types, will always be part of the explanatory variable. This possible simultaneity bias motivates the use of instrumental variables.

Second, the problem of measurement error in household survey data, which is well-known in demand estimation (Liviatan 1961, Griliches 1974, Theil 1979, Keen 1986, Lewbel 1996, Hausman 2001) can also be mitigated by using instrumental variables. Based on the classical errors-in variables assumption that presumes a correlation between the observed variable and the error term one would expect the OLS estimator to be closer to zero than the true estimator represented by a valid IV coefficient. Several authors have pointed to exceptions to this rule in the context of demand analysis. Keen (1986) has shown that the inconsistent estimator one observes in OLS estimations must not necessarily be downward biased but will depend on the probability of purchases in the case of infrequent expenditures. Liviatan (1961) has shown that if expenditure changes are not caused by income changes but are for instance financed by savings one would also observe upward biased OLS estimations as compared to the IV results. More recently Gibson and Bonggeun (2007:479) have asserted that "[…] only some form of correlated error could cause" the coefficient "to be biased downwards".

In the context of consumer behavior most of the previous studies have instrumented total expenditure by monthly income (e.g. Lewbel 1996, Kedir and Girma 2007). We also did so, but additionally employed a wealth index, given that it seems plausible to assume that household wealth will also influence the observed expenditure patterns, perhaps even more so than current income. We constructed a wealth index, using a principal components analysis along the lines of, for example, McKenzie (2003) and Filmer and Pritchett (2001). One of the main advantages of such an index is that the measurement error is reduced since the elements used to construct it can be observed directly. We converted our qualitative categorical variables into binary ones and employed the full household sample of phase 1 to construct this index including housing characteristics, access to infrastructure and durable asset ownership (see Table A1). The index achieves to explain more than a quarter of variation in the household data in all countries. We did not adjust for household size considering that the data has been collected on the household level and because our wealth and asset variables have been converted into binary values except for the number of rooms in each household.

We started by employing ordinary least-squares (OLS) estimation techniques. The explanatory power of this simple model is rather good; in almost all cases up to one half of the observed variation can be explained. A non-parametric analysis of the data pointed to a non-linear

relationship in some cases[7]. These findings were confirmed by a Ramsey RESET test. Specifically, we had to reject the null hypothesis of no omitted variables and therefore our linear specification for food and non-alcoholic beverages at the 1% level and for transport and communication at the 5% level for all countries in favour of a more flexible specification. To take account of these results we included a quadratic term of the log of total expenditure for these categories.

Using a Hausman test we can reject the null hypothesis of endogeneity of the log of total expenditure for all sectors apart from Food and Non-alcoholic Beverages and Electricity, Gas and Water. By contrast, the Hausman test points to potential endogeneity for all four expenditure categories at least in some of the countries. Accordingly, we proceeded with a two-stage least-squares (2SLS) estimation for our linear specifications. We found no evidence of endogeneity in our non-linear specifications and therefore did not employ 2SLS for this setup.

To evaluate the strength of our proposed instruments we applied the test suggested by Staiger and Stock (1997) and Stock and Yogo (2003). These tests confirmed the relevance of total income as well as the wealth index as instrumental variables even though the wealth index consistently showed signs of somewhat higher relevance throughout all countries.

Estimation Results

Our OLS estimates at the sectoral level displayed in Table 7 are in line with the findings of prior studies for East Africa (Massel and Heyer 1969, Ostby and Gulilat 1969, Humphrey and Oxley 1976, Okunade 1985, Teklu 1996) and for other developing coumtries such as India and China (e.g. Tiwari and Goel 2002, Chern and Wang 1994). In particular, we find Food and Non-alcoholic Beverages as well as Alcoholic Beverages and Tobacco to be inferior goods as suggested by Engel's law. An increase of one percent in disposable income would on average lead to an increase of expenditure on food and non-alcoholic beverages of 0.77% in the six countries.[8] Clothing and Shoes, Furniture, Health and Education, Transport and Communication as well as Leisure and Culture turn out to be luxury goods in all countries under consideration. The low demand elasticities for hotels and restaurants may appear somewhat surprising, but the previous literature is inconclusive as to whether recreation constitutes an inferior or superior good.

[7] See Blundell and Duncan (1998) for a detailed discussion of household expenditure and non-parametric kernel regressions.

[8] We get virtually the same result when pooling the data from the six capitals (see last column of Table 7).

In the lower part of Table 7 we report selected results for the linear 2SLS estimations using the wealth index as an instrumental variable. According to the tests performed, Food and Non-alcoholic Beverages, as well as Electricity, Gas and Water are the only sectors where we are advised to perform an instrumental variable estimation. For these sectors, differences between OLS and 2SLS estimates turn out to be substantial. Food and Non-alcoholic Beverages are shown to follow Engel's law even more clearly when using 2SLS as indicated by lower budget elasticities in all countries under consideration, while Electricity, Gas and Water switches from being inferior to being superior.

Among the additional control variables, household size uniformly has a positive and significant influence on food expenditures. Its impact on expenditures is significantly negative throughout for Transport and Communication and in some countries also for Shoes and Clothing as well as Furniture and Household Maintenance. These findings are in line with economies of scale concerning these commodities. In several cases, the gender of the household head turns out to be another important determinant of expenditures, pointing to gender-specific preferences and intra-household bargaining. All else being equal, households headed by a male tend to spend less on Food as well as Health and Education, and more on Transport and Communication as well as Leisure and Culture.

As for the distinction between formal and informal goods and distribution channels shown in Table 8, a very clear pattern emerges for formal goods and services: In all countries the demand elasticity is substantially above unity for formal provision and substantially below unity for informal provision. Imported goods are also uniformly seen as luxury goods when distributed via formal retailers, and the demand elasticity stays close to unity even in case of informal distribution. Results for informal goods are less clear-cut, but it can still be concluded that formal (informal) distribution channels tend to show elasticities above (below) unity. Graphically these results are illustrated for Benin in Figure 1. The steep slope of the fitted values of formal distribution represents clearly the higher elasticity of this distribution channel compared to the informal channel. In all countries except Senegal informal goods are considered inferior. Using a simple Chow test we find differences in slopes and intercepts between formal and informal distribution channels to be significant throughout, for informal goods at the 10% level and for all other categories at the 1% level of significance. Regarding the household characteristics, we cannot observe clear tendencies of influence, which may at least partly reflect the high level of aggregation. Most notably, employment of the household head in the informal sector is in almost all cases statistically insignificant. This corroborates the above finding that informal households reveal no particularly

strong preference for informal goods and services. Looking at the instrumented estimates (2SLS) of the expenditure categories (lower part of Table 8), we find that all major results remain qualitatively unaffected when employing the 2SLS estimation technique. Differences between formal and informal distribution channels even tend to be somewhat more pronounced compared to the OLS estimates.

The quadratic OLS estimations are shown in Table 9. Recall that the RESET test points to a non-linear specification only in the case of Food and Beverages as well as Transport and Communication. We find that the elasticity function for Food and Beverages is concave, which is in line with the saturation hypothesis. We also observe that the turning point (the maximum) is located in the 10th expenditure decile in all countries; it is comparatively higher in Benin and Senegal than in the other countries. For Transport and Communication the elasticity function is first falling with income and after a certain threshold point increasing again.[9] In this case the turning point is a minimum, which is lowest in Benin and Togo and highest in Niger, but practically irrelevant as it is located outside the observable income range.

Up to now, we have considered the four expenditure categories only in the aggregate. This is because a further disaggregation dramatically reduces the number of observations. We nonetheless specifically looked at Food and Beverages as well as Transport and Communication, for which the number of observations is largest.[10] But even in these two categories we partly run into data problems. For Food and Non-Alcoholic Beverages, only between 1% and 7% of all purchases where located in the formal sector, i.e. products that have been distributed by formal vendors (see Table 10). The data restriction becomes even more severe if one focuses on a single expenditure category such as formally produced domestic products. The corresponding results thus have to be interpreted very cautiously. For all three expenditure categories considered (services are not recorded), the estimated expenditure elasticities for formally distributed food products reveal a very mixed picture, which arguably reflects to a large part the lack of sufficient data. By contrast, a stable pattern of elasticities below unity appears for informal distribution channels, which corroborates the findings obtained at the aggregate level. Aggregated over distribution channels, the three product categories are found to be inferior in all but two cases.

[9] See Diaz et al. (2008) for a survey of transport expenditures in Sub-Saharan Africa.

[10] Ideally, one would want to disaggregate even further so as to arrive at fairly homogenous items (e.g. single goods such as maize or millet) where quantity and quality aspects can be disentangled. This would, however, render the distinction between formal and informal distribution channels meaningless as one of them prevails.

For Transport and Communication, we disentangle different types of products and their distribution channels. While formal and imported goods are composed mainly of capital intensive items such as cars and other vehicles, services are composed of public and private transport modes such as public buses and taxies. Imports and services account for the bulk of expenditures in this category (see Table 11). If significant, estimated demand elasticities at formal points of sale tend to exceed unity. Most notably, formally distributed formal products such as cars turn out to be strong luxuries in the two richest countries, Benin and Senegal. In contrast to Food and Beverages, even the elasticities for informal distribution channels are partly above unity, suggesting that informal sales will not necessarily fall with rising incomes.

4. Concluding Remarks

In this paper, we have offered a descriptive overview of demand in six capitals of the West African Economic and Monetary Union as well as an analysis of budget elasticities for different sectors and distribution channels. Our main findings are that

(i) there is support for linkages between the formal and informal sector regarding the channels through which goods are distributed, with the exception that informal goods are hardly bought through formal distribution channels;
(ii) there appears to be a strongly overlapping customer base between the formal and informal sector;
(iii) in general, rising incomes lead to a lower propensity to consume informal sector goods and to use informal distribution channels.

The last result implies that the development of the informal sector in West Africa will most likely be constrained from the demand side, which is in accordance with the hypothesis of quality dualism, with the informal sector being characterized by low quality. However, the pattern is not uniform, underscoring the notion of a heterogeneous informal sector put forward in studies of the supply side. At the sectoral level, the large differences between Food and Transport and Communication in the estimated demand elasticities of the informal distribution channel stand out. Along expenditure categories, elasticities of the informal distribution channel are much higher – in some cases even above unity – for imports and services than for domestically produced informal as well as formal goods. By contrast, we find no systematic variation in demand elasticities across countries.

The overall demand bias against the informal sector suggests that the majority of poor informal households, for example those who produce or sell food, would be affected less than proportionately by recessions. The implications for their welfare in the longer run depend on how easily they can switch to more productive activities. As long as the high entry barriers previously identified for West Africa (Grimm et al. 2011) continue to limit the adjustment possibilities of informal entrepreneurs, the growth process of the urban economy is unlikely to be pro-poor. In the food sector, which accounts for a large share of informal activities in all six capitals, future competition by supermarkets may even further reduce the room of maneuvering for informal households.

As concerns future research, the next step would ideally involve a further disentangling of the relation of quality and quantity by using more homogenous goods and panel data. This would allow us to mitigate the well known difficulties caused by the aggregation of broad product groups.

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Table 1: Summary statistics of sample households by country

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali - Bamako	Niger - Niamey	Senegal - Dakar	Togo - Lomé
Category	coastal	sahel	sahel	sahel	coastal	coastal
Mean number of household members						
Infants (<6)	0.4	0.6	0.8	0.8	0.4	0.4
Children (6-15)	0.7	1.3	1.2	1.5	1.2	0.7
Adults (>15)	3.0	4.0	3.6	3.9	6.1	3.0
Mean age of householdhead	42.5	43.2	43.8	44.5	50.5	39.6
Sex of householdhead (male=1)	72.9%	87.0%	88.6%	86.3%	73.0%	72.1%
Completed primary education of householdhead (%)	83.9%	54.2%	53.1%	48.0%	58.7%	83.3%
Household head earns primary income in the informal sector (%)	54.1%	46.8%	50.1%	47.1%	38.2%	61.3%
Observations	573	936	956	575	567	569

Source: Authors' calculation based on 1-2-3 Surveys

Table 2: Annual Household Expenditure Shares by Sector (%)

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali - Bamako	Niger - Niamey	Senegal - Dakar	Togo - Lomé
Food and Non-Alcoholic Beverages	29.0	29.6	35.0	36.2	36.4	33.4
Alcoholic Beverages and Tobacco	1.7	2.9	0.5	1.1	0.8	1.8
Clothing and Shoes	6.1	6.6	7.2	7.1	5.2	8.5
Housing	14.4	11.2	15.9	13.2	17.8	9.8
Gas, Electricity and Water	6.9	6.7	9.6	7.6	8.3	5.4
Furniture and Household Maintenance	3.8	4.6	5.3	5.7	6.0	4.4
Health and Education	8.5	9.4	5.3	5.7	6.4	7.9
Transport and Communication	14.7	16.3	13.5	12.4	9.8	10.8
Leisure and Culture	3.1	3.8	1.7	2.7	2.9	2.5
Hotels and Restaurants	7.0	4.9	1.7	4.6	2.2	9.3
Diverse Goods and Services	4.8	4.0	4.3	3.6	4.1	6.2

Source: Authors' calculation based on 1-2-3 Surveys

Table 3: Annual Household Expenditure Shares by Sector and Quintile (%)

Country	Benin - Cotonou		Burkina Faso - Ouaga		Mali - Bamako		Niger - Niamey		Senegal - Dakar		Togo - Lomé	
Quintile (Total Expenditure)	*1*	*5*	*1*	*5*	*1*	*5*	*1*	*5*	*1*	*5*	*1*	*5*
Food and Non-Alcoholic Beverages	34.6	24.4	38.7	21.4	40.1	28.0	42.1	27.5	41.1	29.0	30.1	31.3
Alcoholic Beverages and Tobacco	1.3	1.9	2.7	2.8	0.9	0.3	2.3	1.0	1.1	0.6	1.5	2.1
Clothing and Shoes	5.9	5.7	5.6	7.4	5.2	7.8	4.7	7.5	4.4	5.8	6.8	9.1
Housing	17.4	15.5	14.9	10.1	24.7	12.0	18.1	11.9	17.7	16.1	16.6	7.7
Gas, Electricity and Water	6.8	6.5	6.0	6.3	5.7	11.9	8.5	8.0	10.3	7.1	5.9	5.5
Furniture and Household Maintenance	3.2	4.2	3.6	5.7	3.2	6.7	3.3	6.8	4.9	7.1	4.2	5.1
Health and Education	4.2	9.6	5.4	10.7	3.8	6.7	3.1	7.5	3.1	8.7	4.8	10.1
Transport and Communication	8.4	19.0	5.6	23.7	6.7	18.5	4.4	19.7	5.0	15.6	9.0	13.4
Leisure and Culture	2.0	3.5	2.1	4.5	0.8	2.3	1.0	3.5	1.7	4.0	1.6	2.9
Hotels and Restaurants	11.6	5.1	11.7	3.0	5.4	1.0	9.4	3.0	6.8	1.7	12.6	7.2
Divers Goods and Services	4.7	4.5	3.7	4.3	3.6	4.7	3.1	3.7	3.8	4.3	7.0	5.5

Source: Authors' calculation based on 1-2-3 Surveys

Table 4: Annual Household Expenditure Shares by Sector and Distribution Channel (%)

Country	Benin - Cotonou		Burkina Faso - Ouaga		Mali - Bamako		Niger - Niamey		Senegal - Dakar		Togo - Lomé	
Distribution Channel	*formal*	*informal*	*formal*	*informal*	*formal*	*informal*	*Formal*	*informal*	*formal*	*informal*	*formal*	*informal*
Food and Non-Alcoholic Beverages	2.0	27.0	1.1	28.5	0.4	34.5	0.5	35.8	1.0	35.4	0.3	33.0
Alcoholic Beverages and Tobacco	0.2	1.5	0.1	2.7	0.0	0.5	0.0	1.1	0.0	0.7	0.1	1.8
Clothing and Shoes	1.4	4.7	0.8	5.8	1.0	6.2	1.1	6.1	0.9	4.3	0.2	8.3
Housing	0.5	13.9	0.7	10.5	0.9	15.0	0.4	12.8	1.7	16.0	0.1	9.7
Gas, Electricity and Water	4.0	2.9	4.3	2.4	6.0	3.6	4.3	3.3	5.0	3.3	3.0	2.4
Furniture and Household Maintenance	0.8	3.1	0.5	4.1	0.4	4.9	0.6	5.1	0.7	5.3	0.2	4.3
Health and Education	7.6	0.9	7.7	1.7	3.7	1.6	4.5	1.3	5.3	1.1	6.3	1.5
Transport and Communication	6.4	8.3	8.3	8.0	5.4	8.0	6.7	5.7	6.5	3.4	3.0	7.8
Leisure and Culture	1.4	1.7	1.3	2.5	0.4	1.3	0.8	1.9	1.3	1.6	1.0	1.5
Hotels and Restaurants	0.5	6.5	0.4	4.5	0.2	1.5	0.6	4.0	0.4	1.9	0.4	8.9
Divers Goods and Services	1.0	3.7	0.6	3.5	0.7	3.5	0.6	3.0	0.8	3.3	0.4	5.8

Source: Authors' calculation based on 1-2-3 Surveys

Table 5: Annual Household Expenditure Shares by Product Category (%)

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali - Bamako	Niger – Niamey	Senegal - Dakar	Togo - Lomé
Budget share goods						
Budget share formal goods						
Formal distribution channel	4.3	5.5	7.2	4.5	8.3	0.4
Informal distribution channel	9.5	11.9	15.1	9.3	22.2	7.2
Budget share informal goods						
Formal distribution channel	0.7	0.5	0.3	0.1	0.5	0.1
Informal distribution channel	17.1	17.3	25.5	15.0	17.7	21.7
Budget share imported goods						
Formal distribution channel	10.0	10.1	5.2	6.7	4.1	8.8
Informal distribution channel	18.3	21.9	16.5	31.6	11.3	24.5
Budget share services						
Formal distribution channel	10.7	9.5	6.4	8.6	10.7	6.1
Informal distribution channel	29.4	23.2	23.7	24.1	25.1	31.3

Note: For each country, budget shares sum up to 100 percent.
Source: Authors' calculation based on 1-2-3 Surveys.

Table 6: Share of informal households in overall expenditures (%)

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali – Bamako	Niger - Niamey	Senegal - Dakar	Togo - Lomé
Goods						
Formal goods						
Formal distribution channel	36.8	24.1	31.0	48.1	26.2	35.5
Informal distribution channel	50.0	39.7	43.7	50.5	34.6	56.3
Informal goods						
Formal distribution channel	27.0	37.4	24.3	56.2	33.8	55.4
Informal distribution channel	49.6	42.1	46.1	49.1	35.2	57.5
Imported goods						
Formal distribution channel	34.6	24.3	31.5	35.2	24.5	48.0
Informal distribution channel	48.5	38.2	41.8	51.8	34.5	56.7
Services						
Formal distribution channel	36.0	24.8	34.3	43.2	20.8	48.6
Informal distribution channel	35.5	26.9	28.3	37.1	18.4	48.4

Note: Informal Households are defined as those for whom the informal sector is the primary income source. From each cell, expenditure shares of formal households can be calculated as 100 percent minus the expenditure share of informal households. The expenditure share of formal households on formal goods distributed through formal distribution channels in Benin, for example, is 100 - 36.8 = 63.2.
Source: Authors' calculation based on 1-2-3 Surveys

Table 7: Budget Elasticities for Sectors (Expenditure)

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali - Bamako	Niger - Niamey	Senegal - Dakar	Togo - Lomé	Pooled[a]
Elasticities by Sector (OLS)							
Food and Non-Alcoholic Beverages	0.79***	0.77***	0.76***	0.73***	0.80***	0.96***	0.79***
Alcoholic Beverages and Tobacco	0.87***	0.85***	0.47**	0.28	0.20	0.69***	0.64***
Clothing and Shoes	1.08***	1.14***	1.17***	1.17***	1.23***	1.29***	1.17***
Housing	0.69***	0.64***	0.50***	0.61***	0.83***	0.42***	0.62***
Gas, Electricity and Water	0.86***	0.86***	1.19***	0.89***	0.79***	0.85***	0.93***
Furniture and Household Maintenance	1.23***	1.18***	1.20***	1.25***	1.36***	1.14***	1.20***
Health and Education	1.22***	1.33***	1.26***	1.30***	1.45***	1.34***	1.30***
Transport and Communication	1.38***	1.75***	1.67***	1.71***	1.83***	1.39***	1.63***
Leisure and Culture	1.13***	1.17***	1.23***	1.32***	1.37***	1.19***	1.23***
Hotels and Restaurants	0.56***	0.39***	0.41***	0.49***	0.38***	0.57***	0.45***
Diverse Goods and Services	0.83***	1.07***	1.12***	1.02***	1.14***	0.88***	1.02***
Elasticities by Sector (2SLS)							
Food and Non-Alcoholic Beverages	0.59***	0.53***	0.50***	0.37***	0.55***	0.51***	0.52***
Gas, Electricity and Water	1.02***	1.29***	1.53***	1.32***	1.02***	1.52***	1.27***

Dependent Variable is log of total household expenditure on a specific product group; Independent Variable is log of total household expenditure; Included Control Variables are log number of household members, gender of household head, age of household head, completed primary education of household head, religion of household head (Muslim or Catholic Christian) and informal sector is source of household head's primary income; *** p<0.01, ** p<0.05, * p<0.1 based on robust standard errors; [a] includes country dummies -

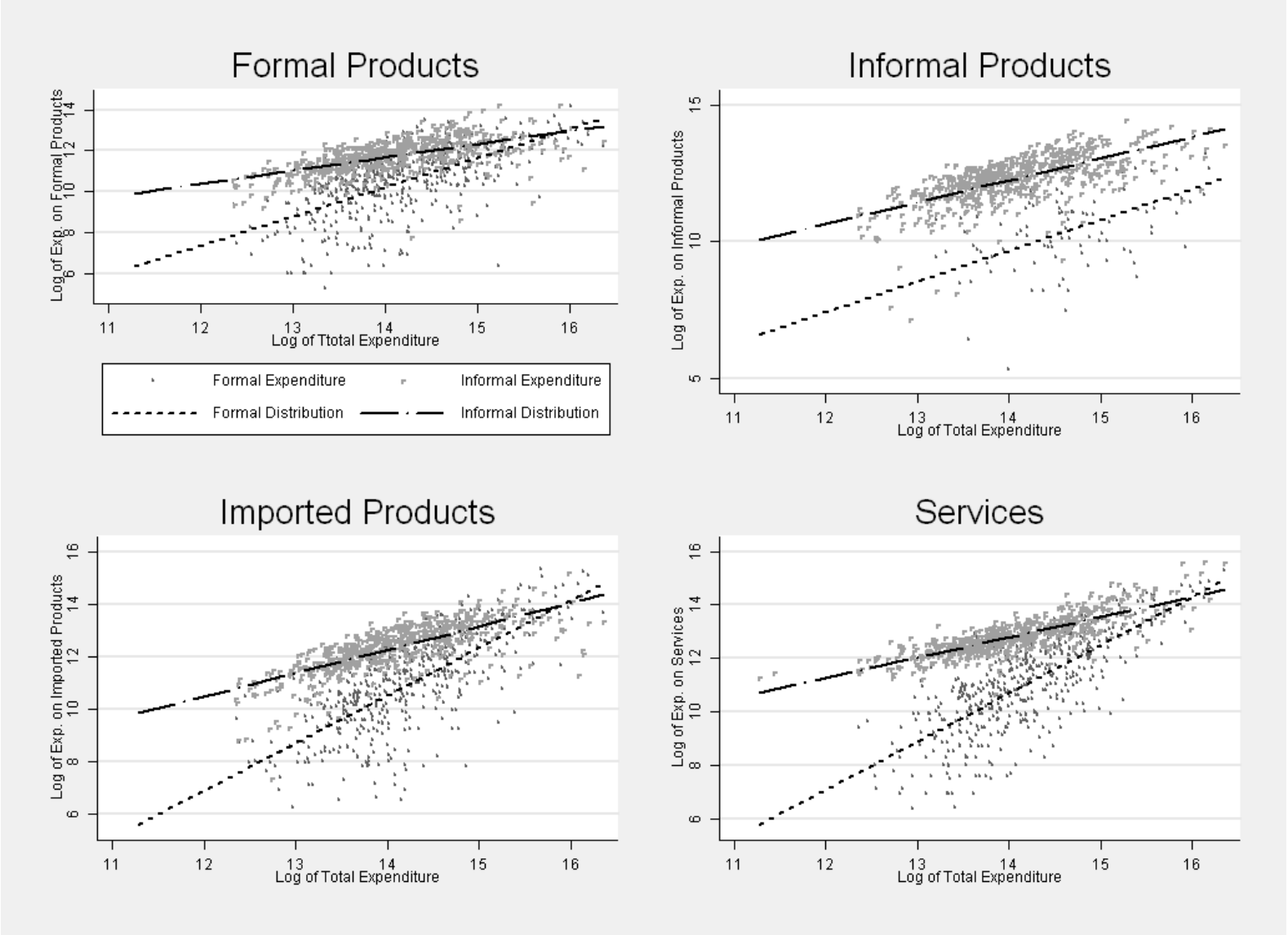
Source: Authors' calculation based on 1-2-3 Surveys

Table 8: Budget Elasticities for Spending Categories (Expenditure)

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali - Bamako	Niger - Niamey	Senegal - Dakar	Togo - Lomé	Pooled[a]
Elasticities by Product Category and Distribution Channel (OLS)							
Elasticities of goods							
Elasticities of formal goods	0.97***	1.19***	1.33***	1.11***	0.98***	1.00***	1.13***
Formal distribution channel	1.39***	1.44***	1.46***	1.13***	1.46***	1.24***	1.41***
Informal distribution channel	0.60***	0.92***	0.91***	0.67***	0.63***	0.88***	0.80***
Elasticities of informal goods	0.82***	0.79***	0.85***	0.89***	1.12***	0.88***	0.87***
Formal distribution channel	1.24***	0.77***	0.53	0.58	1.19***	0.90	0.87***
Informal distribution channel	0.65***	0.69***	0.75***	0.84***	0.92***	0.86***	0.76***
Elasticities of imported goods	1.43***	1.32***	1.41***	1.12***	1.26***	1.32***	1.31***
Formal distribution channel	1.93***	1.53***	1.52***	1.47***	1.53***	1.65***	1.60***
Informal distribution channel	0.93***	1.01***	1.10***	0.82***	0.80***	1.12***	0.97***
Elasticities of services	1.06***	1.09***	0.96***	1.18***	1.20***	0.96***	1.07***
Formal distribution channel	1.79***	1.59***	1.60***	1.85***	2.00***	1.45***	1.68***
Informal distribution channel	0.75***	0.76***	0.69***	0.84***	0.82***	0.72***	0.76***
Elasticities by Product Category and Distribution Channel (2SLS)							
Elasticities of goods							
Elasticities of formal goods	0.86***	1.38***	1.32***	1.21***	0.95***	0.59***	1.12***
Formal distribution channel	1.66***	2.24***	2.03***	1.86***	2.09***	1.67***	2.00***
Informal distribution channel	0.20**	0.63***	0.50***	0.30***	0.40***	0.46***	0.45***
Elasticities of informal goods	0.66***	0.57***	0.44***	0.64***	0.94***	0.35***	0.61***
Formal distribution channel	1.12***	0.86***	1.17*	-0.33	1.11***	1.22***	0.92***
Informal distribution channel	0.40***	0.44***	0.35***	0.62***	0.66***	0.31**	0.47***
Elasticities of imported goods	1.35***	1.13***	1.44***	0.97***	0.92***	1.53***	1.21***
Formal distribution channel	1.95***	1.71***	1.97***	2.24***	1.60***	2.95***	1.98***
Informal distribution channel	0.73***	0.66***	1.04***	0.45***	0.33**	0.92***	0.69***
Elasticities of services	1.27***	1.41***	1.32***	1.53***	1.57***	1.25***	1.39***
Formal distribution channel	2.01***	1.88***	1.80***	2.17***	2.05***	2.15***	1.95***
Informal distribution channel	0.99***	1.00***	1.11***	1.20***	1.25***	0.86***	1.06***

Dependent Variable is log of total household expenditure on a specific product group; Independent Variable is log of total household expenditure which is instrumented by a wealth index; Included Control Variables are log number of household members, gender of household head, age of household head, completed primary education of household head, religion of household head (Muslim or Catholic Christian) and informal sector is source of household head's primary income; *** p<0.01, ** p<0.05, * p<0.1 based on robust standard errors; [a] includes country dummies - Source: Authors' calculation based on 1-2-3 Surveys

Figure 1: Elasticities by Product Category and Distribution Channel in Benin



Source: Author calculation based on 1-2-3 Surveys

Table 9: Budget Elasticities for Sectors, Quadratic Specification (OLS)

Country	Benin - Cotonou		Burkina Faso - Ouaga		Mali - Bamako		Niger - Niamey		Senegal - Dakar		Togo - Lomé	
Elasticities by Sector	*EXP*	*EXP²*	*EXP*	*EXP²*	*EXP*	*EXP²*	*EXP*	*EXP²*	*EXP*	*EXP²*	*EXP*	*EXP²*
Food and Non-Alcoholic Beverages	4.51***	-0.13***	7.17***	-0.23***	8.19***	-0.26***	7.86***	-0.25***	5.79***	-0.17**	6.00***	-0.19***
Marginal Effects	0.83		0.81		0.79		0.80		0.79		0.99	
Standard Errors	0.06		0.03		0.04		0.06		0.05		0.06	
Observations	568		933		953		571		567		568	
R^2	0.68		0.67		0.65		0.53		0.65		0.59	
Transport and Communication	-3.09*	0.16**	0.50	0.04	-5.07**	0.23***	-9.78***	0.41***	-5.96*	0.27**	-3.39*	0.18**
Marginal Effects	1.33		1.73		1.64		1.61		1.83		1.35	
Standard Errors	0.07		0.05		0.07		0.08		0.08		0.08	
Observations	560		880		868		531		563		560	
R^2	0.66		0.64		0.46		0.55		0.56		0.49	

Dependent Variable is log of total household expenditure on a specific product group; Independent Variable is log and squared log of total household expenditure; Included Control Variables are log number of household members, gender of household head, age of household head, completed primary education of household head, religion of household head (Muslim or Catholic Christian) and informal sector is source of household head's primary income; *** p<0.01, ** p<0.05, * p<0.1 based on robust standard errors

Source: Authors' calculation based on 1-2-3 Surveys

Table 10: Annual Household Expenditure Shares and Budget Elasticities for Food Products and Non-Alcoholic Beverages

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali - Bamako	Niger - Niamey	Senegal - Dakar	Togo - Lomé	Pooled[a]
Expenditure Shares in %							
Budget share formal goods							
Formal distribution channel	1.6	0.7	0.1	0.2	0.6	0.3	0.5
Informal distribution channel	12.8	12.0	13.8	6.0	30.5	10.0	15.9
Budget share informal goods							
Formal distribution channel	2.4	1.7	0.8	0.3	1.0	0.2	1.1
Informal distribution channel	57.4	56.3	72.2	41.0	48.2	66.2	57.9
Budget share imported goods							
Formal distribution channel	2.8	1.2	0.3	0.8	1.1	0.6	1.0
Informal distribution channel	23.0	28.0	12.8	51.7	18.6	22.7	23.5
Budget Elasticities (OLS)	Estimates						
Elasticities of formal goods	0.83***	1.00***	0.75***	0.76***	0.80***	0.80***	0.86***
Formal distribution channel	1.04*	0.95***	1.26**	2.03*	0.86***	1.24	1.07***
Informal distribution channel	0.63***	0.89***	0.71***	0.69***	0.66***	0.73***	0.75***
Elasticities of informal goods	0.80***	0.82***	0.84***	0.94***	1.13***	0.90***	0.88***
Formal distribution channel	1.25***	0.77***	0.61	0.55	1.15***	0.83	0.89***
Informal distribution channel	0.62***	0.72***	0.74***	0.91***	0.93***	0.87***	0.78***
Elasticities of imported goods	1.20***	0.88***	0.72***	0.78***	0.78***	1.37***	0.91***
Formal distribution channel	1.15***	0.56**	1.39***	0.83**	0.58	0.79	0.91***
Informal distribution channel	0.90***	0.72***	0.64***	0.66***	0.61***	1.23***	0.75***

Dependent Variable is log of total household expenditure on food and non-alcoholic beverages in a specific product group; Independent Variable is log of total household expenditure; Included Control Variables are log number of household members, gender of household head, age of household head, completed primary education of household head, religion of household head (Muslim or Catholic Christian) and informal sector is source of household head's primary income; *** p<0.01, ** p<0.05, * p<0.1 based on robust standard errors; [a] includes country dummies

Source: Authors' calculation based on 1-2-3 Surveys

Table 11: Annual Household Expenditure Shares and Budget Elasticities for Transport and Communication

Country	Benin - Cotonou	Burkina Faso - Ouaga	Mali - Bamako	Niger - Niamey	Senegal - Dakar	Togo - Lomé	Pooled[a]
Expenditure Shares in %							
Budget share formal goods							
Formal distribution channel	1.6	2.4	2.0	4.5	16.0	0.2	4.4
Informal distribution channel	1.1	4.0	7.1	3.2	4.1	0.0	4.1
Budget share imported goods							
Formal distribution channel	17.5	33.1	17.3	24.0	8.0	20.4	20.6
Informal distribution channel	19.3	23.6	19.9	13.1	1.5	11.8	16.6
Budget share services							
Formal distribution channel	24.3	15.2	21.0	25.5	41.7	7.0	23.0
Informal distribution channel	36.2	21.7	32.7	29.7	28.8	60.5	31.3
Budget Elasticities (OLS)	Estimates						
Elasticities of formal goods	1.12***	0.85***	0.84***	1.23**	2.60***	0.96	1.08***
Formal distribution channel	2.25***	1.04***	0.23	0.94	2.71***	0.98	1.27***
Informal distribution channel	1.68*	0.69***	1.07***	0.93	2.11*	-	0.83***
Elasticities of imported goods	1.48***	1.53***	1.23***	1.48***	0.71	1.59***	1.43***
Formal distribution channel	1.42**	1.25***	0.99***	0.69*	1.53	0.92***	1.17***
Informal distribution channel	1.16***	1.00***	1.17***	1.07***	0.53	0.73***	1.01***
Elasticities of services	1.32***	1.69***	1.33***	1.52***	1.68***	1.27***	1.49***
Formal distribution channel	1.66***	1.47***	1.60***	1.36***	1.69***	0.88**	1.51***
Informal distribution channel	0.66***	1.11***	0.88***	0.94***	1.17***	1.05***	0.97***

Dependent Variable is log of total household expenditure on transport and communication in a specific product group; Independent Variable is log of total household expenditure; Included Control Variables are log number of household members, gender of household head, age of household head, completed primary education of household head, religion of household head (Muslim or Catholic Christian) and informal sector is source of household head's primary income; *** p<0.01, ** p<0.05, * p<0.1 based on robust standard errors; [a] includes country dummies

Source: Authors' calculation based on 1-2-3 Surveys

Appendix

Table A1: PCA with binary coded wealth and asset indicators

	Benin - Cotonou			Burkina Faso - Ouaga			Cote d'Ivoire - Abidjan			Mali - Bamako			Niger - Niamey			Senegal - Dakar			Togo - Lomi		
	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score
Number of Rooms (Number)	2.61	0.03	0.24	3.24	0.04	0.16	2.22	0.02	0.30	2.98	0.06	0.15	2.66	0.03	0.20	3.42	0.04	0.25	2.29	0.05	0.20
Formally registered home owner	0.20	0.01	0.14	0.48	0.01	0.07	0.12	0.01	0.21	0.25	0.01	0.11	0.24	0.01	0.13	0.45	0.01	0.21	0.18	0.01	0.16
House has cement walls	0.78	0.01	0.13	0.48	0.01	0.21	0.80	0.01	0.15	0.51	0.01	0.19	0.39	0.01	0.21	0.92	0.01	0.08	0.90	0.01	0.07
House has electric light	0.76	0.01	0.21	0.43	0.01	0.29	0.93	0.01	0.12	0.46	0.01	0.27	0.53	0.01	0.25	0.87	0.01	0.23	0.51	0.01	0.24
Tap Water	0.46	0.01	0.21	0.27	0.01	0.24	0.51	0.01	0.27	0.31	0.01	0.24	0.24	0.01	0.25	0.71	0.01	0.25	0.25	0.01	0.21
Flush toilete	0.10	0.01	0.25	0.08	0.01	0.23	0.28	0.01	0.33	0.10	0.01	0.21	0.08	0.01	0.24	0.14	0.01	0.18	0.10	0.01	0.26
Telephone land line	0.14	0.01	0.28	0.13	0.01	0.27	0.14	0.01	0.30	0.09	0.01	0.27	0.06	0.00	0.24	0.37	0.01	0.32	0.09	0.01	0.27
Car	0.14	0.01	0.28	0.13	0.01	0.26	0.09	0.01	0.25	0.15	0.01	0.28	0.12	0.01	0.27	0.18	0.01	0.25	0.08	0.01	0.27
Motorbike	0.41	0.01	0.16	0.60	0.01	0.20	0.02	0.00	0.01	0.30	0.01	0.10	0.14	0.01	0.10	0.05	0.00	0.08	0.18	0.01	0.13
Bicycle	0.07	0.00	0.11	0.67	0.01	0.02	0.04	0.00	0.01	0.17	0.01	0.08	0.11	0.01	0.11	0.06	0.00	0.09	0.14	0.01	0.05
Radio	0.87	0.01	0.13	0.86	0.01	0.08	0.80	0.01	0.14	0.83	0.01	0.08	0.74	0.01	0.15	0.84	0.01	0.13	0.79	0.01	0.14
Television	0.53	0.01	0.29	0.42	0.01	0.29	0.62	0.01	0.25	0.46	0.01	0.27	0.38	0.01	0.30	0.63	0.01	0.32	0.39	0.01	0.29
Video / DVD	0.20	0.01	0.29	0.15	0.01	0.28	0.23	0.01	0.23	0.15	0.01	0.31	0.14	0.01	0.25	0.20	0.01	0.21	0.11	0.01	0.30
Stereo System	0.11	0.01	0.25	0.12	0.01	0.23	0.16	0.01	0.24	0.09	0.01	0.24	0.05	0.00	0.21	0.14	0.01	0.24	0.09	0.01	0.24
Refrigerator	0.24	0.01	0.31	0.22	0.01	0.32	0.34	0.01	0.30	0.22	0.01	0.33	0.22	0.01	0.30	0.48	0.01	0.33	0.15	0.01	0.31
Sewing Machine	0.15	0.01	0.07	0.07	0.00	0.09	0.09	0.01	0.09	0.05	0.00	0.11	0.07	0.00	0.10	0.09	0.01	0.14	0.14	0.01	0.10
Air Conditioning	0.02	0.00	0.16	0.01	0.00	0.13	0.08	0.01	0.27	0.04	0.00	0.24	0.05	0.00	0.24	0.04	0.00	0.17	0.03	0.00	0.22
Ventilator	0.43	0.01	0.28	0.31	0.01	0.32	0.71	0.01	0.19	0.32	0.01	0.31	0.39	0.01	0.29	0.53	0.01	0.28	0.31	0.01	0.29
Cellphone	0.24	0.01	0.27	0.17	0.01	0.26	0.41	0.01	0.26	0.05	0.00	0.23	0.11	0.01	0.26	0.45	0.01	0.27	0.18	0.01	0.28
PC	0.03	0.00	0.18	0.03	0.00	0.16	0.03	0.00	0.16	0.01	0.00	0.15	0.03	0.00	0.17	0.05	0.00	0.17	0.02	0.00	0.16
Eigenvalue associated with first component		5.58			6.42			5.25			5.48			6.29			4.84			5.57	
Share of variance associated with first component		0.28			0.32			0.26			0.27			0.31			0.24			0.28	
Number of observations		3001			2458			2494			2409			2500			2479			2500	

Source: Author calculation based on 1-2-3 Surveys