Sector of Economic Activity and Poverty in Benin

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Sector of Economic Activity and Poverty in Benin

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Abstract

This study, based on the theory of labour market segmentation, assesses the participation in the labour market in connection with poverty status. Using cross-sectional data from the household standard living condition survey of 2006 and k-means algorithm, the paper shows that the labour market in Benin comprises five segments. These are characterized by irregular workers, rural vulnerable independent, rural competitive salaried, urban competitive salaried, and a mixed group of protected employees and independent with capital. The paper presents a poverty profile for each segment. The rural vulnerable independent segment and that of the rural competitive salaried proved to be the poorest. The poverty status was estimated with a continuous censored dependent variable with selection controlled for by the conditional probabilities deriving from a multinomial logit. Results show the presence of unobserved factors affecting participation in segments that influence poverty status. The study suggests that poverty in the labour market is addressed by moving away from the traditional subdivision of the labour market in formal and informal markets. The study recommends that the labour market be considered as a set of heterogeneous segments in terms of poverty status and employment characteristics. This sub-division into a segment goes beyond simple formal-informal classification..

Keywords: K-mean algorithm, poverty, labour market, selection bias
JEL Classification: I32, J42, C52

1. Introduction

Employment is the starting point from which economic growth reduces poverty. When employment opportunities increase as economic activity expands, the benefits of growth are widely shared. Access to employment has been identified as an important factor in reducing inequality and poverty gaps. The situation of individuals with respect to their jobs becomes a key determinant of their living conditions. This is especially strong in developing countries where many households derive their incomes from selling labour. The most disadvantaged individuals are often the most vulnerable to changes in the labour market (Agenor and El Aynaoui, 2005). Several other studies show that poverty should not be regarded as a mere residual problem, but rather as the result of a particular dynamic of the labour market (Addison and Demery, 1994; Laïb, 2006).

Indeed, the structure of the labour market and its mechanisms aggravate or even generate poverty. This market may not be regarded as a place where goods and services are exchanged in the strict sense and the equilibrium are realized by simple adjustments in prices. The relationship between sellers and buyers here has a composite content that does not limit itself to the market. The heterogeneity of conditions on the labour market, the variety of institutions and mechanisms determining access to employment and its stability, and the legal and social contexts are part of a wider social process that determines the use and the remuneration of labour. Poverty rises from this "employment process" in the broad sense, and from obvious factors such as the general level of production and productivity in the economy (Rodgers, 1989). There is a multiplicity of underlying dynamics of poverty. The structure of the labour market and the nature of its stratification proved to be central elements in explaining the incidence of poverty.

The heterogeneity of the labour market is generally translated into developing countries by its duality. The labour market in developing countries is generally characterized by the presence of a large informal sector. The formal sector is subject to regulation and taxation, with wages paid on a regular basis and explicit contracts between employers and employees. Conversely, the informal sector is not subject to institutional regulation and most often comprises small firms or self-employment. The informal sector has an important place in the economies of developing countries. Indeed, evaluations commonly show that this sector contributes 50% to the gross domestic product (GDP) in these countries. The main players in this sector are

individual workers (street vendors, freelance, etc.) and enterprises. The goods and services produced by this sector are mainly supplied to low-income populations. This sector also creates jobs, particularly those requiring unskilled workforce.

This duality of labour markets in developing countries through its underlying mechanisms directs toward the informal sector individuals with low relative productivity (with respect to the formal sector) [Heckman and Sedlacek, 1985] or individuals rationed in the formal labour market (Fields, 1990). According to this thesis, the informal sector would be counter-cyclical. Gradually, as production declines, layoffs and the unemployment rate increase in the formal sector, increasing the workforce in the informal sector. The informal sector is regarded as a survival strategy or as a buffer between unemployment and formal work. This credits the argument that there exists a correspondence between unemployment or low pay and poverty. The job is important, but the type of employment and the job quality are not less significant. The informal sector keeps people in poverty because of low incomes, and the insecurity and the vulnerability of their jobs. Using this logic, one is tempted to believe that the informal sector develops mechanisms that hold people in poverty. It is, therefore, appropriate to explicitly incorporate the informal sector in poverty reducing strategies.

New directions in development policies give the informal sector a new and central role in the strategies to fight poverty. The focus on poverty reduction through the Millennium Development Goals and the Sustainable Development Goals, places the policies supporting the informal sector at the heart of development strategies.

All this reflects a renewed interest in matters of employment and micro-credit, both of which are intimately related to the informal sector. Benin has subscribed to this interest. The government has implemented microfinance programmes for the poorest citizens and the National Fund for the Promotion of Youth Employment, which finance women and youth in the informal sector. The goal of these programmes is to fight poverty, that is, the progressive formalization that will result from the development of micro-enterprises would reduce the size of the informal sector and in turn reduce the number of the poor.

This highlights the idea of working poor which includes all poor workers, because of their insufficient income. This reflects a positive correlation between low wages, poverty and the informal sector. Existing data do indeed show the complexity of this relationship. An estimate from the International Office of Employment shows that more than 500 million employees across the world live in poor households (Kapsos, 2004) while of the three billion people worldwide who are employed, nearly 1.8 billion work in the informal sector. These statistics show that not all individuals working in the informal sector are poor. Recent data on Benin also seem to confirm these predictions. Indeed, 90% of the workforce is employed in the informal sector while only 33.3% of the population is considered poor (EMICoV, 2006). Moreover, the trade in contraband petrol (70% of national demand) generates a net profit of 68 million USD per year, a monthly gross margin between US$140 and US$340 for each player in this trade (Igué, 2008). Compared to the wages of public sector employees, the situation of

individuals in this sub-sector of the informal sector is far better. The situation is similar for other important activities of the informal sector such as distribution (informal trade), zemidjan[1] (which brings about $150 per month) or restaurants (Igué, 2008). In light of these statistics, it would be difficult to conclude that in Benin or in general, that the informal sector is the refuge of the poor, and that economic growth would reduce the informal sector and hence the proportion of the poor. Many other studies confirm these reservations about the conclusions that incomes are systematically polarized in favour of the formal sector (Fields, 1990; Lachaud, 1995).

Vulnerable forms of employment do not follow the lines of the two mutually exclusive sectors. In fact, some employees of the formal sector are disadvantaged just as are independent workers in the informal sector. These arguments show that the labour market is heterogeneous. Considering it as homogeneous in these two segments (formal and informal) would bias the policy. The reality is rather that of a market fragmented into sub-segments which are different from each other. Then the forces that structure the labour market condemn certain groups of workers into poverty, by confining them in precarious and vulnerable jobs. The incidence of poverty thus maintains links with the participation of individuals in the labour market, but also with how this integration is made. Thus, the status of the labour market strongly influences the standard of living of households. This is the analytical direction this work seeks to explore.

Building on the heterogeneity that characterizes the functioning of the labour market, this study aims to analyse its implications in terms of poverty.

The study will fill the gap in Benin with respect to the interaction between the labour market and poverty. In the past, most studies conducted in Benin were especially interested in the measure of poverty and its dynamics (Keke and Biaou, 2010). In these studies no formal reference is made as to the potential complexity of the links between labour markets and poverty. However, Lachaud (1996) tries to link poverty and the status of the labour market. However, this study is subject to fundamental methodological criticism. The work does not address the problems of selection or the truncation or censure inherent in this type of study. Lachaud (1996) also used 1986 data for which the dynamics that characterized the labour market are no longer relevant.

The main objective of this study is to determine whether there is a segmentation of the labour market beyond the traditional divide between the formal and informal sectors and how far belonging to a particular segment could explain an individual's poverty status. These include:

- Proving the existence of segmentation of the labour market by capturing the latent process of allocating individuals into segments

- Testing the existence of simultaneity between the choice of sector and poverty status

The study uses data from the Integrated Modular Survey on Household Living Conditions (EMICoV) conducted by INSAE (2006)

The rest of the paper is organized as follows: Second two presents an overview of the literature on the segmentation of the labour market and poverty. Section three is an empirical analysis of market segmentation in relation to poverty in Benin. In section four an econometric analysis of poverty and work status is presented.Section five concludes.

2. Literature review

The analysis of dynamics and changes in the labour market and its consequences on the economy often come up against its discontinuity and its heterogeneity. We propose a review of the economic literature that accounts for this stylized fact and its influence on the distribution of income and, therefore, on the evolution of poverty.

The labour market dualism and poverty

Traditionally, the labour market is assumed to be segmented into two parts: the formal, modern, industrial sector; and, the informal sector — traditional, agricultural, or rural. The approach of dual labour market stems from the fact that earnings of individuals are largely based on their sectoral location on the labour market. The segmentation of the labour market into formal and informal sectors has been analysed in depth in the past two decades. Two different views on the role of the informal sector coexist: the theory of rationing in the formal sector (Fields, 1990); and symmetric competitive market. First, the proponents of the theory of rationing in the formal sector state that those who cannot get a job in the formal sector are either unemployed and are prospecting opportunities from this position or deciding to work temporarily in the informal sector. In other words, the informal sector is a drop point for individuals who have not yet found a job in the formal sector. The informal sector is then considered as a buffer area between unemployment (not working) and the formal sector. Second, the two sectors are considered as symmetric and competitive. The formal and informal sectors have different production functions and the heterogeneity between workers justifies the fact that some are more productive in one sector or another. This view clings to the assumption that the wage differentials observed are the result of underlying individual differences in human capital endowment. Thus, workers choose to work unrestricted where it is most productive, and where they can earn the highest salary (Heckman and Sedlacek, 1985).

The conceptual distinction between the formal and informal sectors is based on two principles: the free entry into the informal sector, in the sense that this sector is not subject to rationing, and differentiation of the labour market arising from the production system. De facto, the location of individuals in different strata of the labour market depends on their membership to a particular productive sector. According to these dichotomization criteria, the informal sector becomes the refuge of the poor.

Faced with the general lack of formal employment, and by the limited social security systems, the poor often have to accept any type of work to ensure their survival. Those who are dismissed from the formal sector must often take the first job they find, even if it is not as good as the one they just lost.

Informal jobs are often insecure, of low productivity and low overall quality. Most informal workers are exposed to various risks - health, safety, loss of income - and do not receive adequate protection. In developing countries, many people are unable to manage periods of unemployment. Recourse to informal work becomes a survival strategy. In addition, some groups - such as youth and women - are disproportionately represented in this job category. Except the income level, informal employment causes an erosion of fundamental rights and makes their defence more difficult. As such, it can be a major cause of poverty regardless of income level.

The dual approach to the labour market is a theoretical justification of the link between informal sector and poverty in the sense that only those excluded from the formal market animate the informal sector. Thus, since the adoption of the MDGs in 2000 by over 190 heads of state and government, the reduction of poverty is among the major concerns of policy makers in developed and developing countries. Discussions on how to enable the achievement of these targets have raised questions again about the role of employment in this matter (Islam, 2006; Ronnas and Lundström, 2006 Cook et al 2008) and how to create not just more jobs but also better jobs (Paci and Serneels, 2007). Many studies that analyse "pro-poor growth" indicate that the existence of well-functioning labour markets is critical to effective reduction of poverty through growth (Osmani, 2005; Islam, 2006; Ronnas and Lundström, 2006).

To better understand the relationships that bind the labour market (or sector) and poverty, since the 1990s the debate has focused on whether workers and firms deliberately choose to leave the formal sector or if they are excluded from the formal structure that is governed by laws and obligations. There are two dominant schools of thought according to a 2007 study by the World Bank, the "exit" or "exclusion" (Perry et al, 2007). The idea is to determine what motivates individuals to participate in the labour market. If the choice of the industry is voluntary, then it would be difficult to link poverty and the informal sector because, in the absence of constraint, an individual chooses the maximal utility to achieve the maximum level of welfare. Rather, in a situation of exclusion it is possible that poverty and the informal sector are linked because the poor are the most vulnerable and more likely to be excluded.

For supporters of the theory of exit or deliberate choice, most entrepreneurs, and to some extent employees, choose to work in the informal sector after weighing the advantages and disadvantages of formality. Empirical analysis has been conducted in this direction, particularly in the context of studies in Latin America and sub-Saharan Africa (Maloney, 2003; Perry et al, 2007; Diagne and Thiaw, 2008). These studies emphasize tax evasion issues (Lewis, 2004), but recent literature also highlights the fact that individuals or companies deliberately do not choose informality just to avoid tax. Several other factors can motivate this choice such as financial (the costs of compliance or return on investment of social security services) or non-financial

factors (entrepreneurship or greater freedom from self-employment). But since one cannot voluntarily choose to be poor, it is difficult to link poverty to the industry or to the informal sector.

Conversely, proponents of the theory of exclusion argue that workers in the informal sector are denied access to formal jobs. This vision is consistent with the dualist school, which focuses on the segmentation of the labour market, and with the legalistic school (de Soto, 2000[2]), whereby the segmentation stems from the prohibitive cost of formality imposed to a subset of the population. Finally, the heart of the problem lies in the relative incentives on work and segmentation in the justification of informal employment.

The debate has given rise to a third point of view that argues that the labour market and the informal sector are heterogeneous.

Heterogeneity of informal employment and poverty implications

The controversy over the motivations of individuals participating in the labour market associated with many studies has shown that proclaimed duality of the labour market was not particularly obvious. It does not cover the reality of the labour market and therefore does not explain all the motivations that are developed in it. The data provide even less support to the idea that the modern-informal dichotomy corresponds to the reality of the market in the sense that homogeneous form of work is unequally paid for reasons of sectoral affiliation (Mazumdar, 1989; Kannappan 1985). Thus, the observed differential in earnings disallows the notion that revenues are systematically biased in favour of the formal sector.

Originally, it is assumed that working in the informal sector was not rewarding for entrepreneurs and workers. However, more recently empirical evidence (Charmes and Lakehal, 2006) showed that small-scale entrepreneurs in the informal sector earn several times the minimum wage and sometimes even several times the average wage in the formal sector, while employees—generally younger—roughly earn the equivalent of the minimum wage. OCDE (2009) shows that the incomes of small-scale informal sector entrepreneurs are systematically higher than the legal minimum wage: the multiple varies from 1.5 in Niger to 4.3 in Morocco and 5.8 in Mali. Turkey, which experienced extremely high inflation during this period, is an exception (19.9 times). In Benin, the average minimum wage in the informal sector is 1.7 times the minimum wage in the formal sector. Kalugina and Najman (2003) show that in Russia, working in the informal sector as the sole and exclusive activity, decreases the probability of being or feeling poor, compared to the status of formal employment. Lachaud (2003) showed, by studying poverty and the labour market in Benin, that the living standard of households is enhanced when the head of household is located in the informal sector. These results show that the informal group is very heterogeneous. The heterogeneity of the earnings and of activities within each segment is a serious analytical limit (Mazumdar, 1989; Fields, 1990; Lachaud, 1995).

Considering the labour market in general or the informal sector in particular as a homogeneous mass is likely to bias the analysis and thus compromise the effectiveness of policies to eradicate poverty, which are designed around the informal and labour markets. In terms of diversity and heterogeneity, informality does not seem to be the refuge of the poor, but a sector whose relationships with poverty are complex and multifaceted.

Econometric analysis of the relationship of labour market segmentation and poverty

Most studies that explore the relationship between labour market and poverty, after identifying the segments of the labour market, determine the poverty profiles and poverty measurement based on standard indicators from the family of measures proposed by Foster, Greer and Thorbecke (1981). These measures statistically relate poverty in sub-groups to total poverty. In this category of study, we can include Agenor et El Aynaoui (2005) and Lachaud (1994). The limitation of this approach is that it gives only statistical correlations that do not reflect cause and effect. But increasingly, the authors, in a complementary way, adds an econometric analysis. We propose here a non-exhaustive survey of this literature. Lachaud (2003) uses a selection model to estimate the choice of sector and poverty in Burkina Faso. He explains the choice of this model by the fact that the endogeneity of sectoral choice implies a simultaneous explanation of the determinants of socioeconomic and living standards of households. Indeed, the process of determining the causes of poverty, regardless of the choice equation, may face a selection bias when the choice of the labour market segment is endogenous. The author uses a two-stage estimation. In the first step, he estimates a multinomial logit model of segment choice using the maximum likelihood method. In the second he uses the estimated bias deriving from the first step to estimate the living standard of the households by the least squares method.

The results of Lachaud (2003) show that all the variables considered in the model are statistically significant. There are variables on the household head and on household: (i) household head: education, sex, marital status, ethnicity, employment status, specific experience in work, and migration status—looking for work or cropland; and (ii) household: size, age structure, geographical location and transfer. With regard to the non-agricultural sector, one can add to the above factors elements that characterize the functioning of the company: age, mode of operation, size, trends in employment, and branch of activity. It is the same for farm businesses for which the regression functions of the standards of living incorporate, in addition to factors inherent to the employees, the following variables: livestock, farm equipment, owned farmland, marketing, inputs, credit and management.

Agenor and El Aynaoui (2005) use a multivariate regression analysis to capture more accurately the interactions between the standard of living of households and individual characteristics relating to the household head. In his model they use,

as does Lachaud (2003), two types of explanatory variables. A first set of variables relates to the household head (job status, education, training and learning, age, and age squared) and a second category of variables is more specific to the household (size and percentage of individuals employed in the household). They estimate their equation using the ordinary least squares method. Their results indicate that only the variables related to employment status, education and household characteristics are significant. Parameters related to the status of work contribute to most of the variance of the adjusted expenditure (standards of living). Ultimately, Agenor and El Aynaoui (2005) highlights the power of the dependence of the standard of living of households with respect to the status of the household head in the labour market, and to a less extent on level of education. Furthermore, the analysis showed the significant role of labour market participation of other members of the households in terms of its impact on the well-being of the household.

To better specify the strong dependence of the well-being of the household with respect to the status of the household head, Lachaud (1996) tests the existence of a relationship between the employment status of the household head and the living standard of the households. This successively captures living standards with the current expenditure and the adjusted real income, and estimates a model using the least squares method. His model includes as explanatory variables the status of work, the secondary activities, the age and its square, nationality, household size, and number of persons employed by the household. All explanatory variables of the model except age and its square are binary. The variables which refer to employment status, education, nationality, size of household and the percentage of people employed by the household are significant (Lachaud, 1996). The main result from the model is the strong dependence of the standard of living of households with respect to the employment status of the household head.

Kalugina and Najman (2003) estimated a biprobit model using the maximum likelihood method to explain the link between labour market status and poverty in Russia. They simultaneously estimated a probit model of participation in the labour market (formal and informal) and a probit model of poverty status (poor and non-poor). They also used an objective measure (monetary) and a subjective measure of poverty. For the objective poverty, compared to the childless couple, all other status have a higher probability of being poor. The presence of dependents, children and/or the elderly, increased the probability of being poor. Being a single person was also a disadvantage vis-à-vis the objective poverty. For subjective poverty, couples with children felt better than couples without children and, the single alone or with relatives felt more vulnerable. Household size was always negatively correlated with subjective poverty. Individuals felt less poor in large families.

In all their regressions (except the regression with objective poverty where the variable formal employee and informal employee are used as reference), Kalugina and Najman (2003) obtained a significant correlation coefficient ρ. This justifies the use of a bivariate probit model that considers the strong relationship between poverty and the status of the labour market.

The main result of their study was that formal employment does not make individuals feel wealthier, and especially does not allow them to be richer, relative to those in the informal sector. Having a single activity increased the risk of poverty compared with having multiple activities. Working in an informal activity provides a feeling of greater wealth relative to work in the formal sector.

3. Empirical analysis of the relationship between business and poverty in Benin

The stratification of the labour market in Benin

To understand the dynamic evolution of the labour market in developing countries, it is important to acknowledge its heterogeneity. This is essential for modeling the functioning of the labour market in Africa in general and in Benin in particular. In this section we present the conceptual approach and the analytical method.

The conceptual approach

The theory of labour market segmentation developed by Taubman and Wachter (1986) is difficult to apply in developing countries. Indeed, this theory, applied initially to the U.S., examines the functioning of the labour market through the formal–informal dualism approach. It states that the earnings of individuals are largely a function of their sectoral location (formal vs. informal) on the labour market. Thus, the mode of wage setting is completely different depending on the chosen market segment. Also, emphasis was placed on the nature of occupation rather than on workers' qualifications.

Todaro (1969) was the first to apply a dualized labour market approach in developing countries. However, several studies have shown that the duality of the labour market is not obvious because it ignores the reality of the urban labour market. Indeed, the criteria used to dualize the labour market fail to separate the formal from the informal sector (Kannappan, 1985). Indeed, significant differences between the earnings are not proof that incomes are systematically oriented in favour of the formal sector. There is heterogeneity of incomes in activities within a single segment, formal or informal, that considerably restricts the analysis of the functioning of the labour market (Mazumdar, 1989; Fields, 1990; Lachaud, 1994a).

Noting the failure of the market segmentation approaches in a dualistic theory, more pragmatic work attempts to articulate the segments of the labour market around the concepts of protection, control and autonomy (Lachaud1994a, 1994b). Thus, based on a cluster analysis of groups, the following stratification has been identified by Lachaud (1994a, 1994b):

- Group of irregular workers
- Group of protected workers: regular salaried work, permanent contract, monthly remuneration, skilled worker

- Group of independent marginal workers: self-employed regular job, capital below a certain threshold (varies by country)
- Group of independent workers with capital: self-employed regular job, capital exceeding a certain threshold (varies by country)
- Group of non-protected workers: regular paid employment; term contract with determined term, monthly remuneration or not, semi-skilled worker.

The empirical analysis in several African countries, excluding Benin, has confirmed the relevance of this pragmatic approach to analysis of urban poverty and social exclusion. It helped highlight the close link between urban poverty and employment status of the household head to identify the segments of the urban labour market.

In this study, we assumed that the emergence of inequalities is linked to the segmentation process and to the mode of integration and the evolution of individuals in the labour market. We discuss and highlight segmentation based on the nature of occupation of individuals in the labour market. This stratification based on the differential in the activity status is of great interest in the analysis of the interactions between the labour market and the poverty in Benin. This is the approach used in the analysis for this study.

Method of analysis

The method of analysis was twofold. First, we used the K-means classification method to subdivide the sample into homogeneous segments of the labour market. Second, we used an econometric method to estimate belonging to a specific class and the poverty status.

The labour market segmentation method

The following thoughts are based on the pragmatic approach presented in the previous section. Instead of relying on market segmentation work postulated without being demonstrated, and which does not guarantee homogeneity within segments, group classification was done to segment the workforce into groups statistically homogeneous that are emerged from the data analysis. The advantage of this method is that it allows consideration of a range of variables to capture the impact of institutional dynamics on the segmentation of the labour market. However, the items included in the procedure are crucial because this determines the points of similarities within groups and dissimilarities between groups. Thus, the variables used to identify these homogeneous segments of the labour market are related to characteristics of the individual occupations. In other words, these variables are chosen among others as criteria autonomous (independent or dependent) and the overall quality of employment (decent or indecent). These are: industry, occupational category, type of business, contract of employment, wage, workplace, and presence of trade union (Lachaud, 1994a, 1994b; Agenor and El Aynaoui, 2005).

To do this, the K-means group classification procedure was used because the number of individuals to segment was above 200 (Anderberg, 1973).

The K-means procedure classification group has been used by several authors to segment the labour market (Anderberg, 1973; Lachaud, 1994a; Agenor and El Aynaoui, 2005). It is an algorithm used to determine whether an individual belongs to a specified group with regard to a given principle. The K-means algorithm[3] is an improved version of the method of dynamic clusters. It is currently one of the most used and most effective methods of data analysis. In fact, it allows a partition of a set of individuals in K (integer) classes; K is a fixed number set by the user. Let σ_j ($1 \leq j \leq N$) be the N individuals in the population that is to be partitioned. The K-means algorithm is as follows:

1. We choose the first K individuals of the data[4] Let (R_1, R_2, ..., R_K), the family of K selected individuals. These are the representatives of the K classes (C_1, C_2, ..., C_K) that are empty for now (they are also called the centres of the K classes).

2. We affect each individual of the set to one of the classes according to the nearest representative (centre) on a principle of distance[5] or similarity: $\text{argmin}_{k,1\leq k\leq K}\, d(\sigma_j, R_k)$, where d is a distance or a similarity between individuals.

3. We calculate the new representatives for the classes. The new class representatives correspond to the average of individuals in the class. The new representatives are calculated as follows:

$$\forall k, 1 \leq k \leq K,\ R_k = \frac{1}{|C_k|} \sum_{j,\sigma_j \in C_k} \sigma_j$$

4. We return to step 2 until two successive iterations lead to the same partition, that is the case when two successive iterations give the same representatives of the classes or also return to step 2, as the difference Δ(R) between the old and new centres is greater than a discretionary threshold. A fixed number of iterations can also be fixed. In that case, the algorithm stops as soon as the maximum number of fixed iterations has been reached. The order of complexity of the K-means[6] algorithm is O(KNIs) where I is the number of iterations to achieve in the algorithm and s the complexity of the distance or similarity calculating. The k-means algorithm is related to the number of classes K fixed, and resulting partitions are strongly and closely related to K[7] centres from the first level.

Econometric strategy

The estimation of the poverty status of individuals is biased by a selection in the entry of the segments one should account for. The bias stems from the fact that

participation in a segment is not random. Indeed, variables exist that affect both the fact of participating in a business segment and poverty status (Lachaud, 2003). The use of the least squares method produces inconsistent estimates due to the endogeneity of labour market segments. It is, therefore, essential to use selection models.

To account for the selection bias in the membership of the segments and its effect on poverty status (measured through expenditures), we used a multinomial logit model selection (described in Bourguignon, Fournier and Gurgand, 2004). This model generalizes the contribution of Lee (1983) and Dubin and McFadden (1984) that are extensions to the selection model of Heckman (1979). Bourguignon et al (2004) relax the assumption made by Dubin and McFadden (1984) on the structure of the correlation. We describe the model as follows.

The segmentation of the labour market, produced by our study gives five classes or segments: irregular workers, rural vulnerable independent, rural competitive salaried, urban competitive salaried, and a mixed group of protected employees and independent with capital.

Determinants of participation in these segments can be estimated using a multinomial logit model. Let L be the variable indicating the status of individuals. The utility of belonging to the institutional sector j is denoted U_{ij} and is assumed to be linear in Z, a vector of observable characteristics of individual i:

$$U_{ij}^{*} = Z_i\delta_j + \eta_j \quad (6) \tag{1}$$

The probability that individual i belongs to sector j_1 is the probability that the utility derived from membership in this segment is higher than the levels it would have reached in the other j segments, with $j \neq j_1$.

$$\forall\, j_1 = 1, \ldots, M: P(L = j_1) = P\left(U_{ij_1}^{*} > U_{ij}^{*}, j \neq j_1, j \in [1, \ldots, 5]\right) \tag{2}$$

$$\forall\, j_1 = 1, \ldots, M: P\left(\left(\delta_{j_1} - \delta_j\right)Z_i > \eta_j - \eta_{j_1}, j \neq j_1, j\epsilon[1, \ldots, 5]\right) \tag{3}$$

Assuming that the η_j are iid and follow a Weibull law, the probability of belonging to segment j_1 is given by:

$$P(L_i = j_1) = \frac{\delta'_{j_1} Z_i}{\sum_{j=1}^{5} \delta'_j Z_j} \tag{4}$$

For the model to be identifiable, we assume that $\delta_2 = 0$. As described, estimating the status of poverty in this context refers to estimate a continuous censored dependent variable with selection being controlled for by the conditional probabilities deriving from a multinomial logit. The model of Bourguignon et al (2004) fits well with this situation and can be presented as follows.[8]

$$Y_j = X_j\beta + \mu_j$$

$$U_j^* = Z\delta_j + \eta_j \qquad (5)$$
$$J = 1, \ldots, M$$

Where Y_i is the poverty status (as measured by the level of expenditure of each individual[9]), and is observed for the class j of M classes (irregular workers, rural vulnerable independent, rural competitive salaried, urban competitive salaried and a mixed group of protected employees and independent with capital) if $U_j^* > maxU_k^* \; avec \; j \neq k$. The variable Z contains the covariates of sector participation such as household size, education level of head of household, sex, place of residence, age, immigration status, household type, the ethnicity and religion, while the variable X does not include variables related to ethnicity and religion, but contains variables related to household type. (Lachaud, 1994a, 1994b, 1995, 1996, 2003; Pradhan and Van Soest, 1995; Agenor and El Aynaoui, 2005; Charmes and Lakehal, 2006; Kalugina and Najman, 2003; Ambapour, 2006).

Because residues, μ_j,η_j respectively of poverty status and participation in the segments are correlated because of the selection bias, we estimate, as described in Bourguignon et al (2004), the equation:

$$Y_j = X_j\beta + \lambda_j + \nu_j \qquad (6)$$

λ_j corrects for the selection bias related to membership in the class j rather than another class of potentially resulting unobservable. The parameters λ_i are created as a result of the estimated multinomial logit in the first stage of estimation. In the above equation, the residuals υ_j are now independent of residues η_j belonging to the segments. We will then implement the Equation 7 with the stata11 program of Bourguignon et al (2004).

$$\begin{aligned} Y_j = {} & \beta_{j0} + \beta_{j1}Tailmen + \beta_{j2}Sexe + \beta_{j3}Rural + \beta_{j4}Intruction + \beta_{j5}Age2 + \beta_{j6}Age3 + \beta_{j7}Age4 \\ & + \beta_{j8}Migratoire2 + \beta_{j9}Migratoire3 + \beta_{j10}Ethnie1 + \beta_{j11}Ethnie2 \\ & + \beta_{j12}Ethnie3 + \beta_{j13}Relig2 + \beta_{j14}Relig3 + \beta_{j15}Relig4 + \lambda_j + \nu_j \end{aligned} \qquad (7)$$

Data and variables definition

The data used in this study came from EMICoV organized by the National Institute of Statistics and Economic Analysis (INSAE) between 2006 and 2007. EMICoV is a national survey of a sample of 18,000 households. It is a representative sample that incorporates several themes including poverty, land, microfinance, governance, democracy, employment and the informal sector. The EMICoV sampling is developed from a stratified area frame with two degrees. In the first degree, 750 enumeration areas (EAs) of the General Census of Population and Housing (PHC) of 2002 were obtained and updated; in the second-degree each selected EA, an average of 24 households were selected. A total of 17,982 households were selected nationally.

In this study, the main variables used were those relating to the employment module. The choice of these variables is due to their availability and the predictions of theoretical and empirical models discussed above in the review of the literature (Lachaud, 1994a,1996, 2003; Kalugina and Najman, 2003; Agenor and El Aynaoui, 2005). Thus we have:

- Poverty: several variables from EMICoV allow measuring poverty. Note that like most AFRISTAT country members, the threshold of absolute poverty in Benin is calculated from the method of the cost of basic needs. The various indicators of poverty according to monetary and non-monetary approaches (incidence, depth and severity) are calculated by INSAE and the corresponding variables are available in the EMICoV database used for this study.

- Activity status (SITAC): This variable has four modes, namely the employed, unemployed according to the International Labour Organization (ILO), the registered unemployed and the inactive.

- Job type (TYPEMPL): this variable measures the type of employment or the type of labour market participation. It has four terms—employees, formal independent, informal independent and dependents of the informal sector. It is an important variable in the segmentation of the labour market. The expected sign varies with regard to the segment. We then expect – or + effect on the poverty status.

- Industry: the choice of the industry of the worker as an important variable in this study is justified by the fact that it facilitates the targeting of the poverty phenomenon in the labour market.

- Level of education: education is an important variable used to make analyses on the labour market and to appreciate the ability of a household to leave the state of poverty. We chose it for this study because of its importance in both the theoretical and empirical literature. We expect a negative effect of this variable on poverty.

- Age of the household head: this is a critical variable to see the position of the household head on the labour market.

- Migration status: the literature on the functioning of the labour market gives an important place to migration as a movement maintaining the informal sector in developing countries. Thus, the choice of this variable allows measuring its importance in this study for Benin.

Finally we used the variables of gender, religion, and ethnicity. Religion and ethnicity allow taking into account the contribution of family ties to membership in a market segment.[11] The use of these variables is justified by the social capital theories. Social capital is a complex concept, which can be approached on an individual level but also at an aggregated level (Durlauf, 2002). Social capital at the individual level refers to the idea of a set of relations of trust and influence on which individuals can rely during their decisions process (Bourdieu, 1980; Coleman, 1988). This capital reflects a greater capacity to benefit or not from the interactions with others. According to Pénard and Poussing (2006), this ability is often linked to membership and other social networks or communities. Thus defined, trust developed between members belonging to the same religion, ethnicity or gender can lead to social capital creation. Moreover, several studies have attempted to measure the impact of these factors on the participation of individuals in several business activities (Jones, 1972; Himbara, 1994; Fafchamps, 2002), and the expected signs are then undetermined.

The nature and the measure of the variables used for the econometric analysis are presented in Table 1. The descriptive statistics are presented in Tables A3 and A4 in Appendix 1.

Table 1: The different variables used in the model, their definition and measure

Variable		Definition	Nature	Expected signs
Dept		The amount (normalized) to pay to the poor to escape poverty status	Quantitative	
Informal	Formal = 0 Informal = 1	The segmentation of the labour market in formal and informal sectors	Qualitative	+/–
Tailmen		Household size	Quantitative	+
Sex	Male = 0 Female = 1	Sex of household head	Qualitative	+
Rural	Urban = 0 Rural = 1	Place of residence	Qualitative	+
Instruct	Primary =0 minimum secondary =1	The education level of the head of household	Qualitative	_

continued next page

Table 1 Continued

Variable		Definition	Nature	Expected signs
Cla_age	15 - 24=Age1 25 - 34=Age2 35 - 44=Age3 35 - 44=Age3 plus de 45=Age4a	The age group of the head of household	Qualitative	+/–
Migration status	Non-migratory = 1 Return migration = 2 Other migration 3	Migration status of household head	Qualitative	+/–
Typemenage	Single = 1 couple without children = 2 large family=3	Household typology	Qualitative	+/–
Ethnicity	adja = 1 barbia, dendi , yoa and lokpa, betamari, peulh = 2 yoruba, neighbouring countries, others countries and others language = 3 fon = 4	Ethnicity of household head	Qualitative	+/–
Branch	Agricultural = 1 Non-agricultural = 2	Sector of activity of household head	qualitative	+/–

Source: Authors

4. Results

This section presents the nomenclature of the labour market according to its structure and typology. The structure of the labour market is described along several dimensions, including job type, sector and industry, migration, dependency, networks, educational level, age, sex, etc. The typology of the labour market of Benin is performed using the segmentation method of k-mean. Finally, we present the poverty profiles per class or segment.

Structure of the labour market in Benin

Based on the EMICoV survey, the informal sector dominates the labour market in Benin (93.5%), with a large majority of entrepreneurs operating as a unit of independent production (60.6%). The formal sector accounts for only 6.5% of the labour market with a predominance of employees (4.3%). The agriculture sector remains by far the largest employer (61.1%) while the banking and insurance sector is the smallest (0.2%). This can be explained by the low quality of the workforce that comprises over 62% of illiterate or uneducated and largely rural (64%) population.

The results in Table 1 in Appendix 1 give a more detailed description of this market along several dimensions.

Description and characterization of the classes from K-means segmentation

The k-means algorithm has yielded five[12] statistically homogeneous classes of individuals[13] (Table 2 in Appendix 1). Indeed, the quality assessment of this result is twofold. First, the review of Euclidean distances between the centres of classes provides a final assessment of the differentiation between the different groups: if all the classes are distinguished correctly between them, some distinguished themselves more than others. Thus, class 2 is different from the other four classes.[14] To give an idea of inter- and intra-group variability, the analysis of variance shows that all the variables differ between classes, as the observed significance levels of the Fisher test are zero.[15]

We checked the consistency of the groups from the statistical procedure with the conceptual framework defined above, and specified the structure of the labour

market across the various segments obtained. In this regard, the examination of cross-tabulations between the classification variable[16] and the variables allowing capturing the characteristics of the labour market will be of great importance.

The first group from the analysis comprises informal sector workers (25.4%) mostly labourers (33.6%) and very young with 81% aged under 35. This class includes much of the child labour with 37.5% of the sample aged under 15. A total of 27.4% of the individuals in this group are without education or did not complete primary school. They are largely dependent on the informal sector (31.6%) for their livelihood. We called this stratum irregular workers group whose presence in the labour market depends on the fluctuations of economic activity.

The second group consists mainly of informal workers (34.2%), largely young (under 35 years), representing more than 90% of this group. Over 90% of individuals in this group had not reached university level and were largely rural (38.4%). But it differs fundamentally from the first group based on the institutional sector in the sense that they are mostly informal self-employed (38%). We called this layer rural vulnerable independent, meaning they were vulnerable to any deterioration in economic conditions.

A third group is composed mainly of formal workers (17.8%) and of employees, public sector workers (20.2%), managers of formal private sector firms (26.5%), and employees of the private sector (35.3%). They had an average low level of education: only 13.2% reached the university, and 22.6% had secondary level education. They are found in construction (34.0%), trade and restaurants (28.1%) and transport and telecommunications (30.5%); they were mainly urban. This category, presumably exposed to competitive forces, whose employment conditions are unstable, was labelled urban competitive wage sector.

The fourth group is predominantly informal (15.4%) and rural (18.6%) with a very low level of schooling, less than 3% of high school level. The main distinction of this class with class 1 is the predominance of rural areas. They are also characterized by the lowest unemployment rate. Only 15.1% of individuals from this class had not experienced migration, showing their inability to sell their work force in other more remunerated areas. In other words, in this group are people that can do anything to survive in the rural area. They are also widely dependent (49.3%). We categorized this group as the rural competitive wage sector. The low level of unemployment rate is due to the availability of members of this group to accept low wage rate.

Finally, the analysis distinguishes a fifth group composed mostly of workers from the formal sector (56.1%). This class comprises 81.1% of public managers, 68.7% of the employees of the public sector, and 47% of formal private sector managers. Over 76% had university education; they occupy activities such as banking and insurance (75.5%), and transport and telecommunications (67.7%). The group mainly comprises formal sector employees (64.2%) with jobs that are mostly urban (33.2%). Nearly half (40.5%) of the self-employment in the formal sector are found in this group. This segment, in which individuals are given priority in terms of protection and security of their jobs (because of the predominance of public and private sector formal employment) is a mix of protected employee and independent with capital.

Link between poverty status and the five classes

Three indicators were used to measure the degree of poverty in each class: the incidence, depth and the severity.

As displayed in Table 2, class 4 is the poorest (36.7%), while class 5 had the lowest incidence (27.7%). This result reinforces those obtained at the level of segmentation. Indeed, class 4 (rural competitive wage sector) corresponds to the most vulnerable to poverty because of the exaggerated low wage that is paid in that class. Conversely, class 5 is where workers were secure because of salary protection and capital; this class is therefore logically less exposed to poverty.

With regard to the monetary poverty depth index, we found that the average income gap of workers in class 1 relative to the poverty line was the highest (0.11) while that of workers in class 5 was the lowest (0.084), reflecting a greater depth of poverty in the first class and a lower depth in the fifth. This analysis allows capturing the fundamental difference between workers in these two groups. The necessary additional amount of money to bring the poor of class 5 to the poverty line is low compared to what will be necessary to bring the poor of class 1 to the poverty line.

Class 3 (urban competitive wage sector) displays a low incidence of poverty (31%) compared to other classes except class 5. This is justified by the fact that individuals in class 3 mostly worked in the formal sector and thus benefit from a regular wage that guaranteed them a steady income, helping them avoid the risk of poverty. Compared to class 4 (rural competitive wage sector), the individual who can migrate will always prefer to be salaried and from the urban competitive sector than from the rural competitive one.

Although the poor are mainly in class 4 (36.7%), the poorest are in class 1 (P1 = 0.11 and P2 = 0.054). This is due to the irregularity of the employment of individuals from class 1 which makes them poorer in monetary terms than individuals of class 4 who are often worked (low unemployment rate) for low wages.

Total poverty status between and within class confirms the predictions of the classification approach of K-mean.

Table 2: Poverty status by class

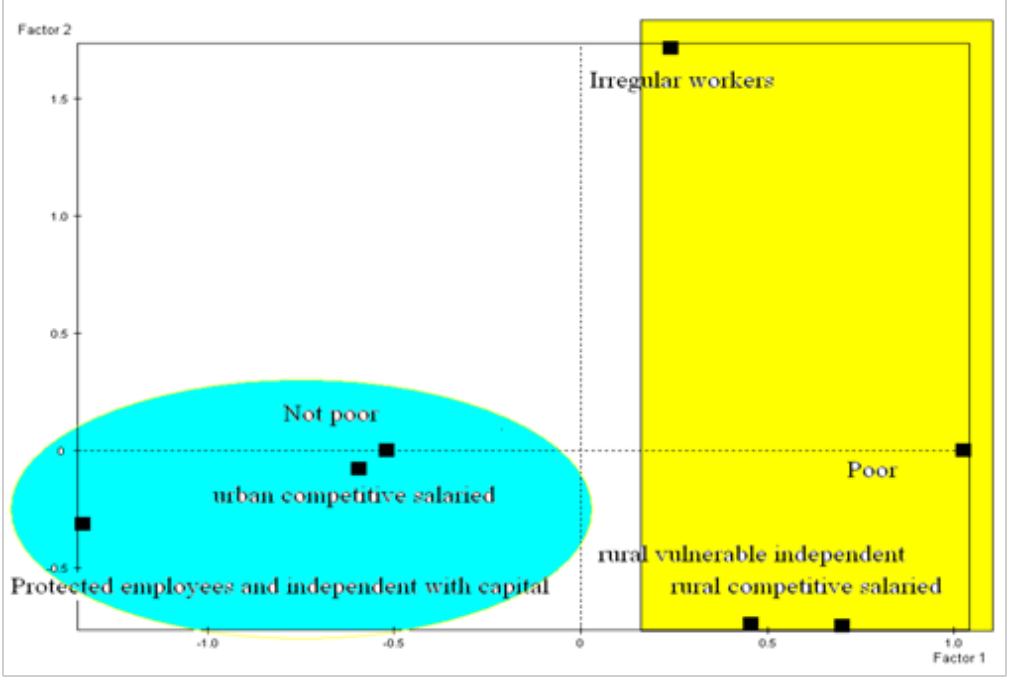
Monetary poverty	P0	P1	P2
Class 1	0.346	0.11	0.054
	(0.476)	(0.205)	(0.139)
Class 2	0.356	0.104	0.045
	(0.479)	(0.104)	(0.112)
Class 3	0.31	0.085	0.036
	(0.462)	(0.169)	(0.097)
Class 4	0.367	0.105	0.045
	(0.482)	(0.185)	(0.107)
Class 5	0.277	0.084	0.038
	(0.448)	(0.175)	(0.105)

Source: Authors from EMICoV (2006)

Other analyses confirm these results. A multiple correspondence analysis (Figure 1) visualizes the link between the two groups of standard of living and the stratification of the labour market. The points on the figure are based on score of the variables on the first main component which is the most discriminant axe with 21.35% of the total inertia. Thus, given that the analogies between the modalities of these variables are a function of the position of the points, we can easily read the figure.

Clearly, the first axe (factor 1) opposes the group of non-poor of the urban competitive wage (though it is closer to the group of the poor than the class of protected wage class) and the mixed group of protected wage and independent with capital to the group of poor, including the class of irregular workers, rural independent vulnerable and rural competitive wage (Figure 1). Indeed, the rural competitive salaried were the most linked to the group of the poor individual followed by the rural independent vulnerable and by the irregular workers. The mixed class of protected salaried and independent with capital were linked to the non-poor group followed by the urban competitive salaried.

Figure 1: Multiple correspondence analyses: Labour market segmentation and poverty status



Source: Authors

Results of the econometric analysis

Participation in segment of activity determinants

Variables related to family background (Table 4) play an important role in the participation decision of individuals in a segment of the labour market. Thus, variables related to household size, gender, level of education, residence area, status of migration, ethnicity and religion significantly affect participation in the activity segment. Lachaud (2003) and Agenor and El Aynaoui (2005) found the same for Benin and Morocco respectively.

The level of education plays a fundamental role in the occupational situation. We observed that the higher the educational level, the higher the individuals concerned were found in the class of irregular workers and that of urban competitive salaried. This is explained by the fact that graduates in Benin are generally found in a buffer situation between unemployment and employment in maintaining their employability through small-scale seasonal and irregular jobs. The significance of the parameter with respect to the segment of urban competitive salaried, is because the probability of integrating formal segments, increases with educational attainment.

The age level is generally not significant except for participation in the segment of irregular workers for which the probability of participation declines with age level. This is explained by the fact that family responsibilities become more important the older one becomes (over 45 years) and this forces people to find their equilibrium in a class that is not subject to the irregularity. One can also think that at this age the individual has explored the labour market fully to find equilibrium in a stable activity.

Migration status is assigned a positive coefficient on participation in all segments. We can say that immigration status is not a source of exclusion in the labour market. In other words, there is work for all immigrants relative to non-immigrants if they first accept all types of job. The back from immigration status positively and significantly influences the likelihood of the individual to participate in urban competitive salaried segments or in the mixed group of protected employees and independent with capital. This is explained by the fact that immigrants who choose to come back, for the most part, were certain of having good working conditions in the formal or settled in freelance with the financial and material saving they made.

Ethnicity and religion are involved in the explanation of the participation of individuals in different segments. This can be explained by the importance of trust relationships and influence networks that are based on ethnic and religious groups in the country. Table 3 presents the results of the determinants of the participation in labour market segment.

Table 3: Participation in segment of activity determinants

Variables	Irregular workers		Regular competitive salaried		Urban competitive salaried		Mixed group	
	Coef-ficient	Standard error	Coef-ficient	Standard error	Coef-ficient	Standard error	Coef-ficient	Standard error
Tailmen	-0.09***	0.0177	-0.03**	0.0155	0.00	0.0229	-0.02	0.0183
Sex	0.47***	0.1867	0.19*	0.2215	-0.01	0.2725	0.06	0.2055
Rural	-1.50***	0.1156	-0.07	0.1165	-1.42***	0.1898	-0.21	0.1351
Instruction	1.02***	0.1463	-0.32	0.2154	3.04***	0.1975	0.43**	0.1964
Age2	-0.36	0.2562	-0.00	0.2658	0.20	0.4081	-0.23	0.2947
Age3	-0.31	0.2571	0.17	0.2663	0.29	0.4083	-0.11	0.2934
Age4	-0.75***	0.2571	0.15	0.2611	0.75*	0.4069	-0.43	0.2902
Migratoire2	0.18	0.1487	0.29*	0.1666	0.66***	0.2331	0.35**	0.1513
Migratoire3	1.24***	0.1365	0.88***	0.1610	1.86***	0.1968	0.93***	0.1716
Ethnie1	-0.83***	0.1369	-13.41	0.3204	-0.42**	0.1981	-0.20	0.1462
Ethnie2	-1.44***	0.2154	24.51***	0.3221	-0.29	0.2970	1.96***	0.2089
Ethnie3	20.40***	0.3907	47.01	.	21.71***	0.4340	23.87***	0.4309
Relig2	3.96***	0.2560	3.03***	0.3258	3.80***	0.3322	3.88***	0.2271
Relig3	1.32***	0.2455	-1.70***	0.1675	0.13	0.3649	-37.27	0.3487
Relig4	1.59***	0.1613	-1.03***	0.2000	1.03***	0.2507	-36.22	0.3944
Constance	-0.33	0.3194	-23.31	.	-4.14***	0.5221	-0.95***	0.3545

* significant at 10%, ** significant at 5%; *** significant at 1%

Dependent variable: segment of activity. Independent variables: Size of the household (tailmen). The segmentation of the labour market in formal and informal. Household size. The sex of household head (sex). Place of residence (Rural). The education level of the head of householde (instruction). The age group of the head of householder (Age 1, 2, 3). Migration status of household head (Migratoire 1, Migratoire 2). Ethnicity (Ethnie 1, Ethnie 2 Ethnie 3); Religion (Relig 2, 3 and 4).

Source: Authors from EMICoV (2006)

Selection model of poverty status by segment of activity

The results (Table 4 in Appendix) show that the selection parameter λ is significant and positive in the segments corresponding to rural vulnerable independent segment and the mixed group of protected employees and independent with capital segment. The parameter is negative in the rural competitive salaried segment and non-significant both in the irregular workers and urban competitive salaried segments.

In the rural vulnerable independent segment and the mixed group of protected employees and independent with capital segment, unobserved characteristics affecting segments participation positively and significantly influence the probability of being non-poor. We can say that individuals participating in these two segments have chosen voluntarily to work in these sectors because they were more productive in these sectors, and can then expect the highest wage. This result is consistent with the model of voluntary choice of sector of activity of Heckman and Sedlacek (1985).

In the segment of the rural competitive workers, unobserved characteristics negatively influence the potential earnings of workers (and then on their expenditure) and therefore on the probability of belonging to the group of non-poor. In Benin, workers participating in the rural competitive salaried segment have not made this choice to maximize their utility (income) but have made this default choice because

they are constrained by lack of capital (land, financial resources, etc.). So, they are there against their will.

In the segments corresponding to irregular workers and urban competitive salaried, these characteristics have no influence on poverty status.

As for the observed characteristics, we find that variables related to the individual and the household influence the probability of belonging to the group of non-poor. These include the level of education that positively influences the probability of being non-poor when one participates in the segments of urban competitive salaried, mixed group of protected employees and independent with capital and irregular workers.

The results show that poverty remains a rural phenomenon. Indeed, the coefficients associated with the rural variable remain negative for all segments but are significant for segments corresponding to the irregular workers and vulnerable rural independent. The results show that all things being equal irregular workers in rural areas are more vulnerable to poverty than those living in urban areas.

Household type does not influence the overall poverty status. However, being single positively and significantly affects the probability of belonging to the group of non-poor when one participates in the rural vulnerable independent segment. This can be justified by the absence in these conditions of family responsibilities that can be captured through the household size.

The variable gender (female) is negative and significant only in the segment of irregular workers. Being a woman then negatively influences the probability of belonging to the group of non-poor when one participates in the segment of irregular workers. This variable is not significant (although sometimes has a negative sign) in other segments. This suggests that poverty in Benin is not a phenomenon related to sex.

All other variables are non-significant and their exclusion from the model does not modify the influence of the other variables.

5. Conclusion and policy recommendations

This study informd the understanding of the links between sector of activity and poverty status based on survey data on household living conditions conducted in 2006 in Benin. The current debate on poverty and the persistence of inequality is related to the dominant theories of human capital and labour market segmentation. Contrary to the predictions made by neoclassical theory, proponents of the theory of segmentation suggest that there are distinct segments in the labour market. This paper is based on the thesis of the segmentation of the labour market. Variables related to ethnicity, industry, age, area of residence, educational attainment, gender, and sector of activity were used for this purpose.

The study found that the job market in Benin can be segmented into five homogenous classes: irregular workers, vulnerable rural independent, rural competitive salaried, urban competitive salaried, and a mixed group of protected employees and independent with capital. The analysis showed that employees in the rural competitive salaried segment were strongly linked to the group of poor people followed by the vulnerable rural independent and irregular workers segments.

In a second step, the results of the estimation of poverty status for which the selection bias is controlled for by a conditional probability derived from a segment participation multinomial logit model confirms the simultaneity between poverty status and some segments. The results show that unobserved characteristics affecting participation in segments positively influences the probability of not being poor in the vulnerable independent segment and that of the mixed group of protected employees and independent with capital. However, these characteristics negatively influence the probability of not being poor in the rural competitive salaried segment; they have no influence on the segments of irregular workers and that of urban competitive salaried. Based on these results one can speculate that there is simultaneity between the sector of activity and the poverty status for workers belonging to the vulnerable rural independent segment, the rural competitive salaried segment and the mixed group of employees protected and with independent capital.

With these results, the study confirms the existence of some heterogeneity of the labour market in relation to the poverty status. This diversity goes beyond the traditional division of formal–informal because informal workers are found in all the segments. These observations support the idea of coexistence of a survival informal sector where the poor are found (the case of rural competitive salaried)

and an informal sector whose choices are rather dictated by economic rationality and the objective of productivity maximization. In this logic, formalizing the whole economy would both worsen the poverty of individuals (those excluded from formal employment) and create new poor (the deliberate choices of the informal sector).

The economic policies from this study focused on three points. First, since labour force is the primary source of household income in Benin, the fight against poverty must always continue by giving great importance to the possible implications of participation in the labour market. In this logic, it becomes important to consider the labour market not as a formal-informal division, but as a cohabitation of different segments of several features that go beyond the informality. For Benin these include the industry, the professional group, the employment status, the job type, the education level, the area of residence, the age, the migration status, the sex, the religion and ethnicity. When considering all these features we have a labour market segmented into five classes. Public policies should, therefore, prioritize the participants in the informal sector who are in the segments most affected by poverty (rural competitive salaried, vulnerable rural independent). Second, the lack of capital creates rural competitive salaried and the vulnerable independent. It becomes important to fight against financial-non-financial (endowment of arable land) exclusion by supporting self-employment initiatives. Third, irregular workers and urban competitive salaried though mainly in urban areas are also closed to the status of poor. Attention should also be given to legislation on the types of contracts that guarantee a certain stability of employment.

Table 4: Result of the selection model of poverty status by segment of activity

Variables	Irregular workers		Vulnerable rural independent		Rural competitive salaried		Urban competitive salaried		Mixed group	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Tailmen	0.16 ***	0.0599	0.23***	0.0783	0.14 ***	0.0442	0.12 ***	0.0380	0.11	0.0648
Sex	-0.82***	0.3870	-0.41	0.2443	-0.06	0.4450	-0.28	0.2236	0.33	0.6261
Rural	-1.23***	0.7209	-0.17**	0.2286	-0.27	0.4032	-0.41	0.2268	-0.06	0.2665
Instruction	0.64 **	0.4195	-0.53	0.2749	-0.42	1.0979	0.86 **	0.7356	-0.45 **	0.2971
Age2	0.25	0.4170	0.01	0.2689	-1.25	0.5939	-0.28 **	0.3753	-0.04	0.3775
Age3	0.32	0.5516	0.27	0.3146	-1.50	0.6797	-0.03 **	0.3961	0.50	0.4412
Age4	0.11	0.3616	0.05	0.2802	-1.56	0.8677	0.15 **	0.3864	-0.05	0.3921
Migratoire2	0.08	0.6549	-0.34	0.1712	-0.21	0.4193	0.12	0.2660	0.60	0.6139
Migratoire3	0.17	0.4717	-0.49	0.3334	0.08	0.5189	0.74	0.6038	0.29	0.3155
Typemenage1	0.38	0.4589	0.50***	0.1715	0.10	0.4113	-0.44	0.4137	0.12	0.6464
Typemenage3	0.04	0.6128	0.21	0.2140	0.03	0.3333	-0.54	0.4092	0.55	0.7900
λ	-0.89	1.4712	-0.53***	0.5273	0.46 ***	1.0309	1.30	1.1878	-0.76**	0.6705
Constance	0.08	2.1782	-0.22	0.8183	2.66	3.4513	0.45	0.7148	-1.20	1.0666
Sigma	17.67 ***	12.1150	8.50 ***	4.6522	5.04***	5.4346	18.09	14.7059	15.57**	11.2053
Rho	-0.21	0.2719	-0.18 ***	0.1576	0.20	0.3087	0.30	0.2234	-1.19 *	0.2207

This result comes from estimating the status of poverty using the model of Bourguignon et al (2004). In this context, it refers to estimate continuous censored dependent variable with selection being controlled for by the conditional probabilities deriving from a multinomial logit.

Dependent variable: The amount (normalized) to pay to the poor to escape poverty status; this amount is positive for poor and 0 for non-poor. Independent variables: Size of the household (tailmen). The segmentation of the labour market in formal and informal sectors. Household size. The sex of household head (sex). Place of residence (Rural). The education level of the head of household (instruction). The age group of the head of household (Age 1, 2, 3). Migration status of household head (Migratoire 1, Migratoire 2). Typology of household (Typemenage 1, 2).

Source: Authors from EMICoV (2006)

Notes

1. Motor bike taxi.

2. the Economic and Statistics Observatory of West Africa www.afristat.org

3. Z = 393,444 FCFA corresponds to 73.4% of the median of the distribution of consumption expenditure of households in the sample.

4. The first debates on informality focused primarily on the relationship between the formal and informal sectors, generating four perspectives:

   - the dualist school, which considers the informal sector as a set of marginal subsistence activities unrelated to the formal sector (Hart, 1971). To its proponents, informal work is the only option for the surplus labor within the meaning of the Lewis (1954) model.

   - the structuralist school (Moser, 1978; Castells and Portes, 1989), which estimates that informal activities are subject to the formal sector and therefore a formal way for companies to reduce costs;

   - the legalist school, particularly associated with the work of de Soto (1990, 2000), which emphasizes the role of excessive regulation or the cost of the activity in the formal sector, which grow potential entrepreneurs to exercise their informal activity;

   - a school parasitic (coupled with Lewis [2004]), focuses on the illegality of informal activities and presents them as an unfair advantage over competitors in the formal sector. Although they are inherently intertwined, legalistic and parasitic currents differ markedly. One focuses on over-regulation from the state (de Soto, 1990), the other on the parasitic behaviour of informal entrepreneurs (Lewis, 2004).

5. Quick-cluster SPSS is used in this study (Norusis, 1994).

6. The file contains all individuals. In SPSS, the first k individuals represent the k initial starting centres.

7. Euclidean distance between two individuals X and Y is calculated by the quick-cluster command of SPSS and expressed as: Distance (X,Y) = $\sqrt{(\sum X_i - Y_j)^2}$ (Norusis, 1994).

8. According to Anderberg (1973), the procedure k-means classification group provides a better score for the number of specific groups, where the number of cases to be classified is large (over 200). The quick-cluster procedure of SPSS software is used in this study and runs according to the algorithm described by Norusis (1994).

9. Moreover, to overcome this dependence, we execute the algorithm of k-means and k and d being fixed with different initializations, and keep the best score. The quality of the score is measured by the following quantity: $D = \sum_{k=1}^{K} \sum_{j,\sigma_j \in C_k} d(\sigma_j, R_k)$ This quantity measures the cohesion of the classes obtained.

10. The index of the individual is omitted for simplicity.

11. The rationale for this choice is made in Appendix 3.

12. For more details, see Appendix 4.

13. The informal sectors in Africa mainly comprise micro-businesses and are mostly family based. The influence of the family in the creation of businesses is sometimes critical, especially for activities such as shoemaking, blacksmithing and jewelry. Participation in the informal sector is not always an expression of free choice, but it could be due to the individual belonging to specific ethnic groups or to some families. Sometimes, to survive in the informal sector, one uses family networks. It is easier for an individual who belongs to an ethnic or religious group strongly represented in the informal sector to work in that sector.

14. As for a fixed K, five classes were selected from a process of trial and error that we started with four (according to the literature). But with K = 4 we did not get completely homogeneous classes since it was difficult to characterize; we then tried K = 5 which gave better results.

15. After treatment of missing values in some variables such as the social professional category by sector, job type, industry, formal/informal sector and employment status of individuals older than 15 years old, 30,245 individuals were selected for the classification.

16. See Appendix 5 for a table of the matrix of Euclidean distances between the centres end.

17 The F tests should be used only for descriptive purposes because the classes were chosen to maximize the differences between the observations of various classes. Significance levels observed are not corrected and therefore cannot be interpreted as testing the hypothesis that the means of the classes are equal. See Appendix 4 for the results.

18 Once the method of k-means executed generates a variable reflecting the allocation of each individual selected for five classes. This variable is a categorical variable with five terms: Class 1, Class 2, Class 3, Class 4 and Class 5.

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Appendix 1

Table A1: Descriptive analysis of the labour market in Benin

		Frequency	Percentage
Sector	Formal	2,003	6.5
	Informal	28,819	93.5
	Total	30,822	100.0
Type of employment	Salaried formal	1,314	4.3
	Independent informal	18,665	60.6
	Dependent informal	10,154	32.9
	Independent formal	689	2.2
	Total	30,822	100.0
Situation in the activity	Employed	30,229	98.1
	ILO unemployment	326	1.1
	Unemployment	267	0.9
	Total	30,822	100.0
Industry	Agriculture, fisheries and forestry	18,844	61.1
	Industry	2,115	6.9
	Water, electricity and gas	41	0.1
	Construction	583	1.9
	Trade and restaurants	5,290	17.2
	Transport and communication	872	2.8
	Bank and insurance	53	0.2
	Other services	2,425	7.9
	Without industry	599	1.9
	Total	30,822	100.0
Education level	Without or less than primary	19,267	62.5
	Primary	7,698	25.0
	Secondary school	2,338	7.6
	High school	719	2.3
	Technical	300	1.0
	University	500	1.6
	Total	30,822	100.0
Working area	Urban	11,101	36.0
	Rural	19,721	64.0
	Total	30,822	100.0

continued next page

Table A1 Continued

		Frequency	Percentage
Age (years)	Younger than 15	3,863	12.5
	15–24	4,959	16.1
	25–34	8,282	26.9
	35–44	5,944	19.3
	Older than 45	7,774	25.2
	Total	30,822	100.0
Sex of the household head	Male	26,272	85.2
	Female	4,550	14.8
	Total	30,822	100.0
Migration status	Non-migrant	19,591	63.6
	return from migration	3,892	12.6
	Other migrant	7,339	23,8
	Total	30,822	100.0
Ethnicity	Adja and related	4,944	16.0
	Barbia and related	2,620	8.5
	Dendi and related	912	3.0
	Fon and related	12,657	41.1
	Yoa and Lokpa related	1,377	4.5
	Betamari and related	2,824	9.2
	Peulh and related	1,648	5.3
	Yoruba and related	3,163	10.3
	non national	307	1.0
	Other countries	114	0.4
	Other ethnicity	256	0.8
	Total	30,822	100.0
Religion	Vodoo	5,843	19.0
	Other traditional	1,207	3.9
	Islam	6,934	22.5
	Catholic	8,254	26.8
	Protestant	1,016	3.3
	Other christian?	982	3.2
	Celeste Christian	1,878	6.1
	Other Christian	2,531	8.2
	Other religion	459	1.5
	No religion	1,718	5.6
	Total	30,822	100.0

Source: Authors from Emicov (2006)

Table A2: Segmentation of the labour market following the classification of K means (percentages)

		Class assignment				
		1	2	3	4	5
Formal	Formal	11.5	10.2	17.8	4.5	56.1
	Informal	25.4	34.2	8.0	15.4	17.0
Migration status	Non-migration	25.6	38.2	6.3	15.1	14.8
	Returning immigrant	22.9	29.3	10.0	17.6	20.2
	Other migration	22.6	19.3	14.1	12.2	31.8
By institutionnal sector	Public manager	0.2	2.2	15.9	0.7	81.1
	Civil servants	3.4	5.4	20.2	2.3	68.7
	Labourers and other public	17.3	23.2	12.5	11.8	35.3
	Manager private formal	7.7	13.7	26.5	5.1	47.0
	Employees, private formal	4.4	7.4	35.3	5.9	47.1
	Labourers and other private formal	26.9	15.4	9.6	11.5	36.5
	Independent workers informal	22.0	38.0	7.8	15.9	16.4
	Employee informal	8.4	10.2	20.3	2.7	58.4
	Labourers and other informal	33.6	27.5	7.8	15.1	16.1
Age (years)	Younger than 15	37.5	30.0	5.7	14.8	12.0
	15–24	23.3	29.1	10.5	16.7	20.4
	25–34	21.0	31.1	10.6	15.4	22.0
	35–44	22.0	31.3	9.9	14.2	22.6
	Older than 45	24.6	38.7	5.8	13.1	17.8
Education	Without or less than primary	27.4	37.3	6.4	16.5	12.5
	Primary	22.9	28.6	11.1	14.3	23.1
	Secondary school	17.5	22.6	13.7	10.1	36.2
	High school	8.9	12.5	19.2	2.9	56.5
	Technical	7.3	7.7	16.0	2.0	67.0
	University	4.8	4.8	13.2	0.4	76.8
Activity	Agriculture, fisheries and forest	32.0	46.8	0.0	21.3	0.0
	Industry	24.9	52.1	0.0	23.1	0.0
	Water, electricity and gas	19.5	36.6	2.4	31.7	9.8
	Construction	9.1	6.5	34.0	0.0	50.4
	Trade and restaurants	15.0	0.0	28.1	0.0	56.9
	Transport and communication	1.8	0.0	30.5	0.0	67.7
	Bank and insurance	0.0	0.0	24.5	0.0	75.5
	Other services	0.0	0.0	24.3	0.0	75.7
Type of employment	Salaried formal	5.9	8.1	17.8	4.0	64.2
	Independent informal	22.1	38.3	7.7	16.0	16.0
	Dependent informal	31.6	26.6	8.4	14.4	18.9
	Independent formal	22.2	14.1	17.7	5.5	40.5
Sex of household head	Male	25.3	33.2	8.2	14.8	18.4
	Female	20.0	28.8	10.8	14.2	26.2
Working place	Urban	23.9	22.2	12.8	7.9	33.2
	Rural	24.9	38.4	6.2	18.6	11.9
Activity Status	Occupied	24.5	33.0	8.4	14.9	19.1
	ILO unemployment	19.9	11.7	16.3	4.6	47.5
	Unemployment	28.5	15.0	17.6	5.2	33.7

Source: Authors from Emicov (2006)

Table A3: Descriptive statistics on the variable used for the econometric estimation

Variable	Frequency	Percentage
Informal		
Formal	408	9.22
Informal	4.017	90.78
Segments of activity		
Irregular workers	874	19.75
Rural vulnerable independent	1691	38.21
Competitive urban salaried	906	20.47
Competitive rural salaried	297	6.71
mixed group	657	14.85
Rural		
Urban	1.806	40.81
Rural	2.619	59.19
Education level		
Primary	3.601	81.38
>=secondary	824	18.62
Age (years)		
15–24	213	4.81
25–34	1.288	29.11
35–44	1.256	28.38
Older than 45	1.668	37.69
Sex of household head		
Male	3.635	82.15
Female	790	17.85
Household typology		
Single	1.005	22.71
Couple	1.949	44.05
Large family	1.471	33.24
Ethinic group		
Ethinis=1	1.165	26.33
Ethinic=2	1.606	36.29
Ethinic=3	388	8.77
Ethinic=4	1.266	28.61
Religion		
Voodoo, other traditional, other religion	1.331	30.08
Other Christian	730	16.50
Islam	1.203	27.19
Catholica	1.161	26.24

continued next page

Table A3 Continued

Variable	Frequency	Percentage
Sector		
Agricultural	2.663	60.18
Non-agricultural	1.762	39.82
Migration status		
Non-migration	2.647	59.82
Returned migrant	709	16.02
Other migration status	1.069	24.16

Source : Authors from EMICoV (2006)

Table A4: Descriptive statistics on continuous variables of the model

Variable	Obs	Mean	Standard error	Minimum	Maximum
Dept	4425	1.266938	3.598463	0	105.2961
Tailmen	4425	5.218983	3.320875	1	27

Source: Authors from EMICoV (2006)

Appendix 2: Calculation of poverty indicators

The poverty indicators most used in the literature are those of the P_α family proposed by Foster, Greer and Thorbecke (1981). They are also called FGT indicators. Their general expression is:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^\alpha \quad \text{(A1)}$$

where n is the number of individuals in the population, the poverty line z and y_i the income or consumption (the measure of well-being) of the ith poor individual (or household), α the degree of aversion to poverty (an integer greater than or equal to 0) and q the number of poor in the total population. The term:

$$\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right) \quad \text{(A2)}$$

is the sum of the individual differences between the poverty and the income of those below him, this amount being expressed as a fraction of the poverty threshold itself.

- The incidence of poverty: this indicator can capture the extent of poverty. It gives the percentage of poor in the total population. In fact, for $\alpha = 0$ it, $P_0 = H = q/n$ (A3) where q is the number of the individual living in poverty situation in the total population. And H denotes the ratio of poverty.

- The poverty depth is calculated as follows:

$$P_1 = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right) \quad \text{(A3)}$$

where $\alpha = 1$, individual differences are taken into account. This indicator measures the income gap relative to the poverty line. This is especially important since one can

have a large proportion of poor people with incomes close to the poverty line and a smaller proportion of poor people with living standard far away from the subsistence level. For this reason, the indicator P_1 is interesting. It measures the depth of poverty, the average amount of money that must be allocated to the poor to bring them back at the threshold poverty.

- The severity of poverty, if poverty is measured using P_2. In this case the poor are given more weight

$$P_2 = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^2 \qquad \text{(A4)}$$

Also known as the squared poverty gap, this is often described as indicative of the severity of poverty. While the poverty gap considers the distance separating the poor from the poverty line, the poverty gap squared considers the square of this distance. Like P1, P2 increases if the average income of the poor decreases; it also increases if the distribution of income among the poor becomes more unequal. Using the squared poverty gap involves weighting the poverty gap as a function of itself to favour those in extreme poverty. In other words, the squared poverty gap considers the inequality among the poor.

Appendix 3: Rationale for using consumer spending to understand poverty

When assessing poverty using monetary measures, it is necessary to choose income or consumption as an indicator of well-being. Provided that the household survey gives sufficiently detailed consumption data, most analysts believe that consumption is a better indicator of poverty than income for the reasons discussed in this section.

Consumption (expenditure) is a better indicator of outcomes than income. Actual consumption is more directly related to the welfare of a person under this definition, namely possessing enough resources to cover its basic needs. Moreover, income is only one element that allows the consumption of goods. It should also take into account the potential problems of access and availability.

Consumption can be better measured than income. In poor agrarian economies, rural household income fluctuates throughout the year, depending on the crop cycle. In urban economies with large informal sectors, income flows can be irregular. This implies a potential problem when households are required to remember their income; information provided by surveys on income may therefore be of poor quality. Estimated agricultural income has an additional challenge in the way that we must subtract from the total income of the expenditure in production input. Finally, large shares of income are not monetized if households consume their own production or exchange it against other goods whose value is difficult to assess

The evaluation of consumption has its own challenges, but it can be more reliable if the consumption module of the household survey is well designed.

Consumption may better reflect the real standard of living of a household and its ability to meet basic needs. Consumption expenditures reflect not only the goods and services a household can obtain based on its current income, but also its ability to access credit markets or savings when incomes are lower or even negative. The reduced savings may be because of seasonal variations, crop failures or other circumstances that can significantly affect incomes.

Since the literature used different methods to define absolute poverty lines (see Ravallion and Bidani, 1994; Ravallion, 1994; Deaton, 1997; Wodon, 1997a). The choice of method can significantly affect measures of poverty and the selection of persons classified as poor. It is important to define poverty lines that ensure consistency of measuring well-being in time and space.

These are some of the reasons that support the use of consumer spending as a proxy of poverty for the simultaneous analysis of participation in the labour market and poverty status.

Appendix 4: Calculating method of the expenditure variable

The equation of the poverty status $Y_j = X_j\beta + \lambda_j + \nu_j$ (A6) for the empirical implementation, Y_j is replaced by the variable Dept. Dept is a latent variable corresponding to the unobserved level of consumption expenditure of non-poor households determined by the formula: $Depo = \frac{Deptot - Z}{Z}$, where Z[3] is the threshold of poverty and Deptot the total household expenditure. Depo variable is the ratio of the amount of money that will be paid to a household to bring it out of poverty or the extra money owned by individuals that makes them non-poor. This ratio is based on the calculation of P_α:

$$Dept = \begin{cases} Depo & si\ Depo > 0 \\ 0 & si\ Depo \leq 0 \end{cases} \quad \text{(A5)}$$

Appendix 5: Further statistics on the K-means

Table A5: Distances between the final classes centres

Class	1	2	3	4	5
1		6,327	5,446	5,202	5,774
2	6,327		9,295	9,167	9,159
3	5,446	9,295		4,426	5,949
4	5,202	9,167	4,426		6,066
5	5,774	9,159	5,949	6,066	

Source : Authors from EMICoV (2006)

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