Essay 4

A Competitive and Segmented Labor Market

All models are wrong. Some of them are useful.
G.E.P. Box, 1919-

Abstract: It has recently been argued that the informal sector in developing countries has a dual structure with part of the informal sector being competitive to the formal sector and part of the informal sector being the result of labor market segmentation. Although several authors have stressed this hypothesis of unobserved heterogeneity within the informal sector, this theory has so far not received satisfactory empirical treatment. In this paper, we formulate an econometric model which allows for a heterogenous informal sector with unobserved sector affiliation of individuals. Moreover, the model takes into account selection bias induced by the employment decision of individuals. Our empirical results for the urban labor market in Côte d'Ivoire show indeed the coexistence of competitive and segmented employment in the informal sector.

based on joint work with Andrey Launov.
4.1 Introduction

One often observed characteristic of urban labor markets in developing countries is the coexistence of a small formal sector with relatively high wages with a large informal sector with low and volatile earnings. The role of the informal sector in the course of economic development was an extensively researched question in the 1970s (Fields, 1974; Hart, 1973; Livingstone, 1971; Mazumdar, 1976), when it became widely acknowledged that the informal sector was often the most important source of employment in developing countries, rather growing than shrinking as it would have been predicted by traditional dual economy theories (e.g. Lewis, 1954). Hence, in 1972 the International Labor Office (ILO) started to undertake studies especially focused on this sector of the labor market (ILO, 1972). Somewhat forgotten in the 1980s, at the end of the 1990s, with international development policy focusing on poverty reduction, the role of the informal sector, which is generally considered as the economy of the poor, reemerged on the policy and research agenda.

4.1.1 Theory of Informal Labor Markets

An important question both for the understanding of the informal sector as well as for policy recommendations is whether the observed differences in wages and working conditions in the formal and informal sector are the result of labor market segmentation or whether competitive labor market theories hold despite the observed differences in wages. A related question is whether individuals are poor because they are employed in the informal sector (segmented labor market), or whether they are employed in the informal sector because they are poor(ly endowed) with characteristics which generate high returns in the formal sector (competitive labor market).

Traditional dual labor market theories, which can be seen as a spin-off of dual economy theories (e.g. Lewis, 1954), assert that the informal sector is the disadvantaged sector into which workers enter to escape unemployment once they are rationed out of the formal sector where wages are set above market-clearing prices.

1Besides low and volatile earnings, the informal sector can (among others) be characterized by small-scale enterprises, labor-insensitivity, simple technology, ease of entry, family ownership and unregulated contracts and markets.
(Fields 1975; Harris and Todaro, 1970) for either institutional or efficiency-wage reasons (Stiglitz, 1976). Hence it is argued that workers in the informal sector, or the 'residual sector' of a segmented labor market, earn less than identical workers in the formal sector (see Figure 4.1). If no entry barriers existed, workers from the informal sector would enter the formal sector.

**Figure 4.1: Segmented Labor Market**

While the sizable differences in earnings between the formal and informal sectors are uncontroverted, it has been claimed that the mere existence of lower
wages and lower returns to education and experience in the informal sector does not yet imply market segmentation (see e.g. Dickens and Lang, 1985; Heckman and Hotz, 1986; Rosenzweig, 1988; Gindling, 1991; Maloney, 2004). More precisely, a labor market with two distinct wage equations does not constitute a segmented labor market as long as individuals are free to move between the two sectors.

An explanation for the existence of a formal and informal segment in the labor market would rather be that a large number of those working in the informal sector do so voluntarily, either because the informal sector has desirable non-wage features (Maloney, 2004) and individuals maximize their utility rather than their earnings, or because workers, given their characteristics, have a comparative advantage in the informal sector (e.g. Gindling, 1991) and would not do any better in the formal sector (see Figure 4.2).

Hence, two opposing theories exist. The segmentation hypothesis sees informal employment as a strategy of last resort to escape involuntary unemployment (Figure 4.1), whereas the comparative advantage hypothesis sees informal employment as a voluntary choice of workers based on income (or utility) maximization (Figure 4.2). This is nicely illustrated in Figures 4.1 and 4.2. In both figures average earnings as well as returns to education are lower in the informal than in the formal sector of the labor market. However, only in Figure 4.1 would all individuals (given their characteristics) earn more in the formal than in the informal sector, whereas this is not the case for Figure 4.2, where lower educated individuals earn more in the informal than in the formal sector. Hence, as long as we find the lower educated in the informal sector and the higher educated in the formal sector, earning differentials (as well as lower returns to education) do not constitute a segmented labor market but a competitive labor market, where individuals are found in the sector in which they have a comparative advantage.

Most recent theory on urban labor markets in developing countries has combined these polar views of competitive and segmented labor markets and emphasized a more complex structure of the informal sector, with an 'upper-tier' and 'lower-tier' or a 'voluntary entry' and 'involuntary entry' informal sector (Fields, 2005). The ‘upper-tier’ represents the competitive part into which individuals enter voluntarily because, given their specific characteristics, they expect to earn more than they would earn in the formal sector. The ‘lower-tier’, to the contrary,
is the part that consists of individuals which were rationed out of the formal (and, possibly, ‘upper-tier’ informal) labor market.

4.1.2 Empirics of Informal Labor Markets

This latest theory is quite appealing as it could explain the inconclusive outcomes of several studies which have tried to test empirically whether formal-informal labor markets in developing countries are segmented or competitive. Among the most notable empirical contributions are Magnac (1990) and Gindling (1991). Magnac (1990) addresses the hypothesis of competitiveness in a framework of an extended Roy model whereas the paper of Gindling (1991) considers the same question in a framework of a generalized regression with sample selection introduced by Lee (1983). Both find weak evidence of a competitive rather than a segmented labor market structure.

In contrast, the latest hypothesis about competitive and segmented structure of the urban informal labor market has so far hardly received any empirical treatment. The difficulty of testing such a hypothesis is that the affiliation of any given individual to either part of the informal sector is unobservable, i.e. data on the causes of informal employment is in most cases missing. In addition, the selection bias that arises due to the non-random active population should be taken into account to get reliable estimates of expected earnings in both the formal sector as well as in any unobserved sector of the informal labor market (Heckman, 1979).

One of the very few empirical studies on a dual informal labor market has been undertaken by Cunningham and Maloney (2001), who represent the informal sector as a mixture of ‘upper-tier’ and ‘lower-tier’ enterprises. But as Cunningham and Maloney (2001) consider only informal entrepreneurs, an option of choosing formal sector employment does not even exist in their model. Moreover, unlike Magnac (1990) and Gindling (1991), Cunningham and Maloney (2001) do not consider selection bias induced by the employment decision of individuals. In this paper we hence suggest an econometric framework which is able to model the hypothesized heterogenous structure of the informal labor market as Cunningham and Maloney (2001) and at the same time considers sample selection bias as Magnac (1990) and Gindling (1991).
Following the argument of Fields (2005), we let the informal sector consist of a finite number of segments with unobservable sector affiliation of individuals and distinct earnings equations in each segment. Hence, the whole labor market is represented as a mixture model with both observable (for the formal sector) and unobservable (for the informal sector) membership. As the individual employment decision is influenced by the outside option of being non-employed, the earnings equations in each segment of the labor market should also depend on the labor market participation decision of individuals (Heckman, 1979). This leads to a finite mixture with sample selection, which allows us to estimate the distribution of individuals across different segments of the labor market as well as to estimate an unbiased earnings equation in each of them. Or in other words, we analyze whether the hypothesis of a dual informal sector can be supported by the data, and, if so, analyze the determinants of earnings in the two segments of the informal labor market.

Furthermore, we try to address the question if one part of the possibly detected heterogenous structure of the informal labor market is indeed the result of comparative advantage considerations whereas the other part is the result of entry barriers into the formal (and eventually also the competitive informal) labor market. Here we apply a quite simple and intuitive test. We assume that if individuals were earnings maximizers and could freely move between different parts of the labor market, the distribution of individuals across sectors induced by an earnings maximizing decision should be the same as the estimated distribution of individuals across sectors with the finite mixture model. Rejection of the equality of these two distributions implies the existence of entry barriers between different segments of the labor market, i.e. market segmentation.

The paper is structured as follows. Section 4.2 outlines the econometric model and constructs the test for market segmentation. Section 4.3 presents the data and the discussion of the empirical estimation results. Section 4.4 summarizes and concludes.

### 4.2 Econometric Model

We assume that the labor market consists of one formal and a finite number of unobservable informal sectors, with each sector having its own unique wage func-
4.2. Econometric Model

It is possible to empirically observe whether an individual does not participate in the labor market or belongs to the formal sector but impossible to observe affiliation to any of the latent segments of the informal sector. Workers are earnings maximizers and once they decide to become employed, knowledge of sector-specific wage functions allows them - given their characteristics - to form rational expectations about the wage they get in every sector. The labor market is competitive if there are no barriers to enter the sector which pays - conditional on workers’ characteristics - the highest expected wage.

Below we develop an econometric model, which is a finite mixture with sample selection. Thus, we can test for unobserved informal sector heterogeneity as well as appropriately control for selection bias induced by the employment decision of individuals. Second, we formulate a test that allows to analyze whether informal employment is a result of market segmentation or comparative advantage considerations of individuals.

4.2.1 Specification

Finite Mixture

Assume that the labor market \( Y \) consists of \( J \) sectors \( Y_j \) such that \( Y = \bigcup_{j=1}^{J} Y_j \). Let earnings in each segment \( Y_j \) be the outcome of a random variable with a probability distribution \( F(y_j|\theta_j) \), where for all \( j \), \( F(y_j|\theta_j) \) are distinct and independent of each other. Next, assume that the affiliation of any individual earning \( y_i \) to any segment \( Y_j \) is unobservable. However, it is known that the probability of any individual earning \( y_i \) to belong to \( Y_j \) is given by \( P(y \in Y_j) = \pi_j \). With these assumptions we can write the density of individual earnings \( y_i \) as

\[
f(y_i) = \sum_{j=1}^{J} f(y_i|\theta_j) \pi_j.
\]  

(4.1)

In other words, we suggest that the labor market consists of an arbitrary number of segments with a distinct earnings distribution in each of them and with unobserved sector affiliation of individual earnings. Our specification is hence a conventional mixture model. In this model the discrete mixing distribution \( \{\pi_j\}_{j=1}^{J} \) is a parameter-free distribution of workers across all segments of the labor market. Each value \( \pi_j \) can therefore be interpreted as the size of the \( j \)-th sector relative to the size of the whole market.
Next, assume that in any segment \( Y_j \) of the labor market \( Y \), the sector specific log-earnings are given by

\[
\ln y_i = x_i \beta_j + u_i, \quad u_i \sim N(0, \sigma_j^2 | y_i \in Y_j), \tag{4.2}
\]

where \( x_i \) represents a set of personal characteristics. Using (4.1) and (4.2) it is easy to show that the expected log-earnings of any individual drawn from the whole population \( Y \) are given by 

\[
E(\ln y_i) = \sum_{j=1}^J [x_i \beta_j] \pi_j. \tag{4.3}
\]

We can hence write down the earnings regression

\[
\ln y_i = E(\ln y_i) + u_i, \quad y_i \in Y, \tag{4.3}
\]

where the density of the error term \( u_i \) is a mixture of standard normal densities

\[
h(u_i) = \sum_{j=1}^J \frac{1}{\sigma_j} \phi \left( \frac{\ln y_i - x_i \beta_j}{\sigma_j} \right) \pi_j. \tag{4.4}
\]

**Sample Selection** One of the reasons why the regression in (4.3) might be misspecified is that earnings \( y_i \) are only observed if an individual has decided to participate in the labor market. Being influenced by a subjective employment decision, the observed earnings sample may not necessarily be representative for the whole population (Heckman, 1979). This gives rise to sample selection bias.

If we assume that the employment decision of an individual depends on a set of personal characteristics \( z_i \), we can write down the following selection equation

\[
y_{is} = z_i \gamma + u_{is}, \quad u_{is} \sim N(0, 1), \tag{4.5}
\]

where \( z_i \gamma \) reflects the individual's decision to work. We can then state that wages \( y_i \) in equation (4.2) are observed only if the realization of the selection variable \( y_{is} \) is positive, i.e. whenever \( u_{is} > -z_i \gamma \).

Assuming that the errors of the \( Y_j \)-specific earnings equation (4.2) and the selection equation (4.5) follow a bivariate normal distribution with \( \text{Cov}(u_i, u_{is}) = \rho_j \sigma_j \) we can represent the sample selection bias as an omitted variable in (4.3):

\[
E(\ln y_i | y_{is} > 0) = E(\ln y_i) + \sum_{j=1}^J E(u_i | u_{is} > -z_i \gamma, x_i, \theta_j) \pi_j,
\]

where \( E(u_{ij} | u_{is} > -z_i \gamma) \neq 0 \) unless \( \rho_j = 0 \). Since \( \sum_{j=1}^J E(u_i | u_{is} > -z_i \gamma) \) is in general not equal to zero, the expected value of the error term \( v_i \) in (4.3) will not
be equal to zero. Thus the density of the error term in (4.4) will be misspecified. The selected-sample counterpart of the regression (4.3) is
\[ \ln y_i = E(\ln y_i | y_{is} > 0) + v_i, \quad \{y_i \in Y : y_{is} > 0\} \]  
and it can be shown that the density of the error term \(v_i\) in (4.6) is a mixture density
\[ h(v_i | y_{is} > 0) = \sum_{j=1}^{J} h(u_i | \theta_j, y_{is} > 0) \pi_j \]
\[ = \sum_{j=1}^{J} \left[ \frac{\sigma_j^{-1}}{\Phi(z_j \gamma)} \varphi \left( \frac{\ln y_i - x_i \beta_j}{\sigma_j} \right) \Phi \left( \frac{z_j \gamma + \rho_j \sigma_j^{-1} [\ln y_i - x_i \beta_j]}{\left(1 - \rho_j^2\right)^{1/2}} \right) \right] \pi_j, \]  
where \(\varphi\) and \(\Phi\) are the standard normal density and distribution functions.\(^2\) The above mixture model is a generalization of Heckman regression with sample selection that allows for \(J\) different conditional distributions of the dependent variable instead of only one.

The model in (4.7) is only identifiable, i.e. it rules out the existence of two distinct mixtures that have the same probability law for the observed dependent variable \(Y_i\), if \(\rho_j = \rho \forall j = 1, \ldots, J\).

**Proposition 1** For any given selection rule \(\{Z, \gamma\}\), the finite mixture (4.7) is identifiable if \(\rho_j = \rho \forall j = 1, \ldots, J\).

**Proof.** We verify the Teicher (1963) sufficient condition for identifiability of finite mixtures (see Appendix B).

Thus, the general class of finite mixtures with sample selection is not identifiable. So we should focus on a sub-class where the correlation between the errors of the selection and earnings equations is the same for every segment of the labor market, i.e. \(\rho_j = \rho, \forall j = 1, \ldots, J\). This result is however rather of a statistical nature, as setting \(\rho_j = \rho\) implies no artificial economic restrictions to the model.\(^3\)

\(^2\)Derivation of the component density of this mixture is presented in Appendix B.

\(^3\)The main interpretation of \(\rho_j\) is a statistical one of \(\rho_j\) indicating the importance of model selection for analyzing earnings equations, i.e. mapping the correlation between the selection and the earnings equation. In Appendix B, Remark 1, it is furthermore shown that the proof of Proposition 1 also implies the assumption of a common selection rule \(\gamma_j = \gamma, \forall j = 1, \ldots, J\). This means that individuals with the same characteristics have the same probability to participate in the labor market - independent of the segment they will later be found in if employed.
The specification of the error distribution in the regression on a selected sample of earnings (4.6) therefore becomes

$$h(v_i|\theta, \rho) = \sum_{j=1}^{J} \left[ \frac{\sigma_j^{-1}}{\Phi(x_i \gamma)} \phi \left( \frac{\ln y_i - x_i \beta_j}{\sigma_j} \right) \Phi \left( \frac{z_i \gamma + \rho \sigma_j^{-1} \ln y_i - x_i \beta_j}{(1 - \rho^2)^{1/2}} \right) \right] \pi_j,$$

(4.8)

where $\theta = \{\beta_j, \sigma_j\}_{j=1}^{J}$. This model allows for a labor market with multiple segments where individuals’ sector affiliation is unobserved. Moreover, the model accounts for the subjective employment decision of individuals. Thus we can analyze whether a model with a latent heterogenous structure of the informal labor market, as suggested by Fields (2005), can better explain observed earnings in the labor market than traditional models with a homogenous informal sector.

### 4.2.2 Test for Segmentation or Competitiveness

The above formulated model also suggests a simple test to analyze whether the ‘revealed’ distribution of individuals across the sectors of the labor market is a result of market segmentation or a result of comparative advantage considerations.

Assume that workers are earnings maximizers and every worker knows the wage function in each sector, and hence - given his own characteristics - his expected wage in each sector. Let $y_i^j$ denote the earnings of individual $i$ in sector $j$. Given the above assumptions, competitive theory would imply that an individual - knowing the wage function in each sector - would be found in the sector where his expected earnings - given his personal characteristics - are maximized. The probability distribution of individuals across sectors would then become

$$P(y \in Y_j) = P \left( E \left[ \ln y_i^j | y_s > 0; x \right] \right) = \max_{l, l \neq j} \left\{ E \left[ \ln y_i^l | y_s > 0; x \right] \right\}. \quad (4.9)$$

Equation (4.9) provides us with a ‘hypothetical’ distribution of individuals across sectors. This distribution is conditional on individual characteristics and rests on the assumption that there are no barriers to enter the sector that pays the highest expected wage. Hence Equation (4.9) provides us with the distribution of individuals across sectors if the market were competitive. On the other hand, the

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4Details on the computation of Equation (4.9) are presented in Appendix B.
4.2. Econometric Model

'actual' distribution of individuals across sectors is given by the mixing distribution \( \{ \pi_j \}_{j=1}^J \) in equation (4.8). This distribution is independent of wage functions in any sector and relies on no assumptions regarding entry barriers.

An equal distribution of individuals across sectors induced by the mixing probabilities \( \{ \pi_j \}_{j=1}^J \) in (4.8) and induced by individuals’ optimal sector choice as described in (4.9) indicates perfect mobility between the various sectors of the labor market, i.e. a competitive market. In contrast, if the ‘actual’ mixing distribution in (4.8) and the ‘hypothetical’ distribution in (4.9) differ significantly from each other, entry-barriers between the sectors seem to prevent some individuals entering the sector that pays them the highest expected wage. Hence we would face a segmented labor market.

4.2.3 Implementation

To estimate the above described model we suggest the following two-step procedure:

Step 1: Estimate \( \gamma \) in the selection equation (4.5) by running a Probit.

Step 2: Use \( z_i \hat{\gamma} \) as consistent estimates of \( z_i \gamma \) to estimate the model in (4.8).

Typically we can observe from the data whether an individual belongs to the formal sector. So, only the affiliation to the latent segments of the informal sector remains unobservable. Denote the set of earnings outcomes in the formal sector by \( Y_F \) and the number of observations in the formal sector by \( N_F \). Using (4.8), the log-likelihood is

\[
\ln \mathcal{L}_L = \sum_{i \in Y_F} \ln h_i(\theta_F, \rho | y_i, x_i, z_i \hat{\gamma}) - N_F \ln \pi_F
+ \sum_{i \notin Y_F} \left[ \ln \left( \sum_{j=1}^{J-1} h_i(\theta_{l,j}, \rho | y_i, x_i, z_i \hat{\gamma}) \pi_{l,j} \right) \right],
\]

where \( \pi_F \) is the probability of belonging to the formal sector, \( \pi_{l,j} \) is a probability of belonging to the \( j \)-th segment of the informal sector and \( h_i(\theta_j, \rho) \) is a component density from (4.8). It is also straightforward to show that a maximum likelihood (ML) estimate of \( \pi_F \) is equal to the share of formal workers in the whole sample.
The asymptotic covariance matrix of the estimates of the second step vector of the parameters \( \xi = \left\{ \{ \theta_j \}_{j=1}^J, \rho, \{ \pi_{i,j} \}_{j=1}^{J-1} \right\} \) is given by

\[
V(\xi) = D^{-1}(\xi) + D^{-1}(\xi) M(\xi, \gamma) D^{-1}(\xi),
\]

(4.11)

where \( D(\xi) \) is the expected negative Hessian and \( M(\xi, \gamma) \) is the matrix constructed using the scores from the first and second steps (for the exact form of \( M(\xi, \gamma) \), see Murphy and Topel, 1985).

Note that a full information maximum likelihood estimation is also possible. In this case the log-likelihood function becomes

\[
\ln L_F = \ln L_L(\xi, \gamma) + \sum_{i \in Y^c} \ln (1 - \Phi(z_i \gamma)),
\]

(4.12)

where \( \ln L_L \) is the log-likelihood function in (4.10) with \( \gamma \) as an unknown parameter vector and \( Y^c \) denotes the complementary set of non-employed individuals.

### 4.3 Empirical Application

#### 4.3.1 Data Description

The data we use is drawn from the 1998 Ivorian household survey, the *Enquête de Niveau de Vie*, which was undertaken by the *Institut National de la Statistique de la Côte d’Ivoire* and the World Bank. We focus our analysis on the urban population and limit our sample to individuals between the age of 15 and 65 years. This leaves us with a sample of 5592 observations. Among these, we consider those individuals as inactive who voluntarily stay out of the labor market as well as those who are involuntarily unemployed, as this is only a very small share of the inactive population.\(^6\)

The active population is classified into the informal and formal sector according to reported primary employment.\(^7\) The formal sector includes individuals

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\(^5\) We used a rather dated survey of Côte d’Ivoire to exclude the adverse effects of the Ivorian crisis since 2001.

\(^6\) Only 11.3 percent of the inactive population are looking for employment.

\(^7\) Consideration of secondary informal employment of employees in the formal sector, which is an often observed characteristic of urban labor markets in developing countries, would imply that the earnings distributions in \( Y_F \) and \( Y_I \) are no longer independent. An extension of the model that incorporates this fact is left for future research.
working in the public sector as well as wage workers and self-employed in the formal private sector. As formal private we consider being employed in an enterprise which either pursues formal bookkeeping and/or offers written contracts and/or pay slips. The informal sector comprises the active population which is neither employed in the public nor in the private formal sector.

Figure 4.3: Densities of Monthly Earnings

![Densities of Monthly Earnings](image)

**Source:** Enquête de Niveau de Vie, 1998. Computations by the authors.

In Table 4.1 and Figure 4.3 we present the sample means and kernel densities of monthly formal and informal earnings. We use monthly wages instead of hourly wages because given the irregular and often constrained working hours in the informal sector we think that monthly wages reflect earning opportunities in the informal sector better than hourly wages. As expected, there is a large earnings differential between informal (64,837 CFA per month) and formal (164,995 CFA per month) workers. However, Figure 4.3 also demonstrates that despite the considerable difference in mean earnings, the densities of informal and formal earnings overlap to a large extent, already indicating that not all informal employment is inferior to all formal employment.

Table 4.1 also displays summary statistics of the variables used in the earnings equations. The information is provided for the population as a whole as well as separately for inactive workers and workers in the informal and formal sectors respectively. The educational level is the highest in the formal sector (8.1 years),
Table 4.1: Summary Statistics of the Urban Labor Market

<table>
<thead>
<tr>
<th></th>
<th>Total*</th>
<th>Inactive</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Informal</td>
<td>Formal</td>
</tr>
<tr>
<td>Sample</td>
<td>100%</td>
<td>52.6%</td>
<td>31.3%</td>
</tr>
<tr>
<td>Monthly earnings</td>
<td>98,815</td>
<td>-</td>
<td>64,837</td>
</tr>
<tr>
<td>Male</td>
<td>49.7%</td>
<td>40.6%</td>
<td>49.0%</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>30.0</td>
<td>25.2</td>
<td>34.7</td>
</tr>
<tr>
<td>Education (in years)</td>
<td>5.3</td>
<td>5.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Literacy rate</td>
<td>64.1%</td>
<td>69.8%</td>
<td>44.4%</td>
</tr>
<tr>
<td>Training after school</td>
<td>17.6%</td>
<td>11.1%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>43.4%</td>
<td>38.3%</td>
<td>56.8%</td>
</tr>
<tr>
<td>Christian</td>
<td>42.2%</td>
<td>46.2%</td>
<td>30.6%</td>
</tr>
<tr>
<td>Indigenous</td>
<td>14.4%</td>
<td>15.5%</td>
<td>12.6%</td>
</tr>
<tr>
<td>Living in Abidjan</td>
<td>49.6%</td>
<td>50.4%</td>
<td>42.2%</td>
</tr>
</tbody>
</table>

Source: Enquête de Niveau de Vie, 1998. Computations by the authors.

Notes: Monthly earnings in CFA Francs. *) 'Total' refers to individuals between 15 and 65 years of age.

with somewhat lower and much lower educational attainment among inactive (5.8 years) and informal (2.9 years) workers. With regard to age, we find the youngest individuals among the inactive (mean age of 25.2 years) followed by informal (34.7 years) and formal (36.6 years) employees. In addition, membership in the formal sector is a privilege of males, who constitute 80.6 percent of formal employees. In contrast, only 49.0 percent of informal workers and 40.6 percent of inactive individuals are males.

Finally, an interesting observation can be made about the distribution of religious groups in the active population: despite the same fraction of Muslims and Christians in the entire sample, the formal sector is dominated by Christians whereas the informal sector is dominated by Muslims. This can first be caused by the specific composition of the government, i.e. the public sector, which constitutes a large part of the formal sector and which is dominated by Christians. An alternative 'geographic' explanation might be that formal employment is predominantly concentrated in the Southern cities - especially in Abidjan - where most
Christians live, whereas Muslims are rather living in the Northern part of Côte d’Ivoire.

Hence, there are considerable differences in characteristics between both the inactive and active population as well as between workers employed in the informal and formal sectors. Systematic differences between active and inactive individuals highlights the possible sample selection bias, that may arise if we ignore the employment decision of individuals in our model. The nature of systematic differences in characteristics of formal and informal workers is a bit less clear. It might be the result of self-selection of employees into the sectors where they maximize their earnings as well as the result of employers’ discrimination based on workers’ characteristics.

To specify the selection equation we use other variables such as the number of infants in the household, the number of children under 14 in the household, the number of old household members, household size and the number of active members in the household. The reason for this choice is twofold. First, the above listed variables filter out non-individual reasons for making job decision, such as family and environment matters, so that the magnitude of the earnings could be later explained by only individual qualities. Second, these variables provide sufficient exclusion restrictions advocated by Olsen (1980) and Little (1985) for Heckman regressions.

4.3.2 Heterogenous Informal Labor Markets

We start with an analysis of the sector composition of the labor market. The econometric model described in Section 4.2 allows for an arbitrary number of (finite) labor market segments where individual affiliation to any of them is not necessarily observable.\(^8\) Initially we estimate two specifications: a model with a homogeneous informal sector and a model with an informal sector that consists of two segments (see Table 4.4). To decide on the number of segments in the

\(^8\) Moreover, the model takes into account selectivity induced by individuals’ employment decision, which ensures consistent estimation of marginal returns to individual characteristics in each sector of the labor market.
labor market we use information criteria.⁹ Akaike, Schwarz, consistent Akaike and Hannan-Quinn. The results on model selection are presented in Table 4.2. All information criteria uniformly show that the specification with a dual informal sector is superior to the model with a homogeneous informal sector. Thus the labor market under study consists of at least three distinct parts: the formal sector and two latent segments of the informal sector.

Table 4.2: Model Selection - Total Urban Labor Market

<table>
<thead>
<tr>
<th></th>
<th>Homogeneous Informal Sector</th>
<th>Two-Segment Informal Sector</th>
<th>Three-Segment Informal Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akaike</td>
<td>13708.12</td>
<td>13610.56</td>
<td>13610.73</td>
</tr>
<tr>
<td>Schwarz</td>
<td>13835.38</td>
<td>13808.40</td>
<td>13879.27</td>
</tr>
<tr>
<td>Consistent Akaike</td>
<td>13921.59</td>
<td>13906.60</td>
<td>13989.47</td>
</tr>
<tr>
<td>Hannan-Quinn</td>
<td>13774.16</td>
<td>13702.09</td>
<td>13727.90</td>
</tr>
<tr>
<td>( \ln L_k )</td>
<td>-5332.92</td>
<td>-5272.11</td>
<td>-5260.23</td>
</tr>
<tr>
<td>( \ln L_F )</td>
<td>-6823.06</td>
<td>-6762.25</td>
<td>-6750.37</td>
</tr>
</tbody>
</table>

*Source: Enquête de Niveau de Vie, 1998. Computations by the authors.*

*Notes: \( \ln L_k \) is the log-likelihood from the second step and \( \ln L_F \) is the log-likelihood from the full model. All information criteria are based on \( \ln L_F \). However, our conclusions would not change if we based the information criteria on \( \ln L_k \).*

Extending the model to a three-segment informal sector does not lead to an improvement in terms of information criteria. From the last column of Table 4.2 we see that all information criteria show that such a specification would overparameterize the model. In addition, the extended three-segment model would place a very low probability (i.e. size) on the third segment of the informal market. The estimated size of this additional segment would only be 4.1 percent of the informal sector and 2.7 percent of the whole labor market respectively. We hence conclude that the specification with a two-segment informal labor market is the best fitting and simultaneously most parsimonious model.

⁹Using information criteria is the only feasible way to decide on the appropriate specification. Since the component densities in (4.8) do not belong to the exponential family, the residual-based methods for selecting the optimal mixture (see Lindsay and Roeder, 1992) cannot be applied here.
We also estimate the model with a homogenous and a heterogenous informal sector separately for the 'male' and 'female' urban labor market, as it is often argued that there is a gender-specific division of the labor market in developing countries and especially in sub-Saharan Africa (see e.g. Klasen, 2006 for an overview). Hence, we test if the result of a two-segment informal labor market is dependent on whether we estimate the model for the total urban population or for males and females separately.

Table 4.3 demonstrates, that only two out of four information criteria indicate that the male informal labor market has a heterogenous structure and two information criteria would suggest that the specification with a homogeneous informal sector is best. For the female labor market the model with a heterogenous informal labor market is supported by three out of four information criteria whereas Consistent Akaike is inconclusive (Table 4.3). Hence, the informal labor market of males might - in contrast to the informal labor market of females - be homogenous. Moreover, the results indicate that part of the strong heterogenous structure of the overall informal labor market (Table 4.2) might be caused by a gender-specific division.

Table 4.3: Model Selection - Male and Female Urban Labor Market

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Homogeneous Informal</td>
<td>Two-Segment Informal</td>
</tr>
<tr>
<td></td>
<td>Sector</td>
<td>Sector</td>
</tr>
<tr>
<td>Akaike</td>
<td>6243.16</td>
<td>6202.06</td>
</tr>
<tr>
<td>Schwarz</td>
<td>6383.26</td>
<td>6412.22</td>
</tr>
<tr>
<td>Consistent Akaike</td>
<td>6361.26</td>
<td>6379.22</td>
</tr>
<tr>
<td>Hannan-Quinn</td>
<td>6287.03</td>
<td>6267.88</td>
</tr>
</tbody>
</table>

*Source: Enquête de Niveau de Vie, 1998. Computations by the authors.*

Estimation results for the total urban labor market and for the model with a two-segment informal labor market are presented in Table 4.4. Considering the

---

10 The respective earnings regressions of Table 4.4 for male and female workers separately are not shown as they do not provide any additional insights above the results stated in Table 4.4.
estimation results, our first important finding is that the correlation coefficient between the selection equation and the earnings equations is significant, which underlines the necessity of accounting for sample selection bias when estimating coefficients in segment-specific earnings equations.\textsuperscript{11}

With regard to the characteristics of each segment of the labor market, Table 4.4 suggests that expected wages in both informal segments are clearly below the expected wage in the formal sector. However, there is an additional significant differential between expected earnings in the higher-paid (Informal-I) and lower-paid (Informal-2) informal sectors.\textsuperscript{12} Moreover, the two unobserved informal segments make up 37.7 percent (Informal-I) and 28.4 percent (Informal-2) of the labor market, or 57.6 percent and 42.4 percent of the informal labor market respectively, which shows that each of them constitutes a significant part of the informal sector (Table 4.4).\textsuperscript{13}

Last, notice that wage equations across the three segments are quite diverse. As expected, returns to education and experience (measured in years of age) are high in the formal sector. Also, in the higher-paid segment of the informal sector (Informal-I) education and experience have a high and significant impact on earnings. But, whereas returns to experience in this segment are the same as in the formal sector, returns to education are only half as high. In the lower-paid part of the informal sector (Informal-2) returns to experience are only two thirds of the returns to experience in the formal and higher-paid informal sectors, and education appears to have no returns at all. Hence, workers in the lower-paid informal sector are stuck with very low wages almost independent of their abilities

\textsuperscript{11}The correlation coefficient $\rho$ is also significant whether we estimate the model separately for males or females (not shown).

\textsuperscript{12}As indicated by the coefficient on the impact of gender on earnings, if we estimate the model only for female employees the wage differential between the formal and higher-paid informal sector is higher whereas it is lower between the higher-paid and lower-paid informal sector.

\textsuperscript{13}If we estimate the model for males only the respective shares are 32.7 (Informal-I) and 21.0 (Informal-2) percent of the labor market whereas for the female labor market the shares amount up to 44.7 (Informal-I) and 39.0 (Informal-2) percent, respectively. Hence, not only is the share of women working in the informal sector much higher, but especially the share of women working in the lower-paid informal sector is much higher than the share of males working in this - with regard to expected earnings - most-disadvantaged sector.
### Table 4.4: Regression Results for log Earnings

<table>
<thead>
<tr>
<th></th>
<th>Formal</th>
<th>Informal 1</th>
<th>Informal 2</th>
<th>Selection Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>7.0516</td>
<td>7.5818</td>
<td>7.4643</td>
<td></td>
</tr>
<tr>
<td>Male *</td>
<td>0.3476</td>
<td>0.6659</td>
<td>0.4417</td>
<td></td>
</tr>
<tr>
<td>Age *</td>
<td>0.1301</td>
<td>0.1199</td>
<td>0.0816</td>
<td></td>
</tr>
<tr>
<td>Age²/100</td>
<td>-0.1187</td>
<td>-0.1285</td>
<td>-0.1012</td>
<td></td>
</tr>
<tr>
<td>Education *</td>
<td>0.1058</td>
<td>0.0577</td>
<td>0.0210</td>
<td></td>
</tr>
<tr>
<td>Literacy</td>
<td>-0.1420</td>
<td>-0.1405</td>
<td>0.0706</td>
<td></td>
</tr>
<tr>
<td>Training *</td>
<td>0.1600</td>
<td>-0.1190</td>
<td>0.6664</td>
<td></td>
</tr>
<tr>
<td>Muslim</td>
<td>0.1550</td>
<td>-0.0923</td>
<td>0.7532</td>
<td></td>
</tr>
<tr>
<td>Christian</td>
<td>-0.0185</td>
<td>-0.0505</td>
<td>0.4026</td>
<td></td>
</tr>
<tr>
<td>Abidjan</td>
<td>0.0807</td>
<td>0.1871</td>
<td>0.2530</td>
<td></td>
</tr>
</tbody>
</table>

\[ \pi_F = \begin{pmatrix} 0.3392 \\ 0.0092 \end{pmatrix}, \quad \pi_{\text{mix}} = \begin{pmatrix} 0.3767 \\ 0.0403 \end{pmatrix}, \quad \pi_{\text{cens}} = \begin{pmatrix} 0.2840 \\ 0.0401 \end{pmatrix} \]

<table>
<thead>
<tr>
<th></th>
<th>Exp. log-Wage:</th>
<th>Exp. log-Wage:</th>
<th>Exp. log-Wage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>11.3524</td>
<td>10.4956</td>
<td>10.0964</td>
</tr>
<tr>
<td>Male *</td>
<td>105095.04</td>
<td>40992.12</td>
<td>28054.92</td>
</tr>
</tbody>
</table>

**Selection Equation**

<table>
<thead>
<tr>
<th></th>
<th>Coeff. (Std.Error)</th>
<th>Coeff. (Std.Error)</th>
<th>Coef. (Std.Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.0422 (0.0400)</td>
<td>Number of Obs. (cens): 2939</td>
<td></td>
</tr>
<tr>
<td>Male *</td>
<td>0.5682 (0.0374)</td>
<td>Number of Obs. (mix): 2653</td>
<td></td>
</tr>
<tr>
<td>Infants *</td>
<td>0.2705 (0.0196)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children *</td>
<td>0.2677 (0.0162)</td>
<td>Log-Likelihood: -5272.11</td>
<td></td>
</tr>
<tr>
<td>Olds</td>
<td>-0.0518 (0.0439)</td>
<td>( \rho = 0.1058 )</td>
<td></td>
</tr>
<tr>
<td>HH Size *</td>
<td>-0.2693 (0.0092)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Members *</td>
<td>0.4709 (0.0157)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** *Enquête de Niveau de Vie*, 1998. Computations by the authors.

**Notes:** * denotes significance at 5% level.
Furthermore, whereas gender has a considerable impact on earnings in all segments of the labor market, the male-female wage gap in the two informal segments is much higher than in the formal sector. An explanation could be, that positions in the formal sector are much more specified, preventing high gender-specific wage discrimination. Alternatively, it is also possible that only the most (unobserved) able females enter the formal labor market, leading to a lower difference in earnings in the formal sector. Last, both location and religion does not have an impact on earnings in the formal sector but does have a significant impact on earnings in the better- and lower-paid informal sector.

Thus we do not only find that the urban labor market in Côte d’Ivoire consists of one formal and two latent informal segments. Also, each of these segments shows a quite distinct pattern of returns to individual characteristics. On a first glance, among the different labor market theories (as described in the introduction), the proposed labor market structure of Fields (2005) seems to be supported most by our empirical results.

However, even a significant diversity in the characteristics of the different labor market segments does not necessarily mean that the labor market does not fit into either the segmented or the competitive labor market model. Following Basu (1997), it is beyond doubts that the labor market may be split into several segments. But as long as these segments possess the properties attributable to a competitive market, the whole labor market can still be treated as competitive. Alternatively, if entry barriers between some detected fragments could be found, the market would be segmented. Thus, to learn about the nature of segmentation and/or competition in the labor market, it has to be analyzed whether the observed distribution of individuals across segments is the result of sector choice (competitive market) or entry-barriers into sectors (segmented market).

4.3.3 Competitive or Segmented Labor Markets?

In this section we analyze whether employment in the two informal segments is the result of own comparative advantage considerations or a result of entry-barriers into the formal market, i.e. market segmentation. If no entry-barriers between sectors exist the ‘earnings-maximizing’ individual enters the sector where, given his characteristics, his expected earnings are the highest. This induces the
distribution of individuals across sectors formulated in Equation (4.9), which we could call the ‘earnings-maximizing’ distribution across sectors \( \{ \tilde{\pi}_j \}_{j=1}^J \). Without entry-barriers the earnings-maximizing distribution should be the same as the actual distribution of individuals across sectors, i.e. the mixing distribution \( \{ \tilde{\pi}_j \}_{j=1}^J \) in Equation (4.8).\(^{14}\)

If, however, certain entry-barriers are in place, individuals should be underrepresented in the sectors where they would have the highest expected earnings (given their specific characteristics). Or in other words, if entry-barriers existed, there should be a statistically significant difference between the estimated actual mixing distribution and the distribution induced by the earnings-maximizing sector choice of individuals.

Figure 4.4: Distribution of Individuals across Sectors

![Figure 4.4](image)

**Source:** Enquête de Niveau de Vie, 1998. Computations by the authors.

Figure 4.4 plots the detected market segments from the mixture model \( \{ \tilde{\pi}_j \}_{j=1}^J \) against the earnings-maximizing distribution \( \{ \tilde{\pi}_j \}_{j=1}^J \). We see that the fraction of those who, conditional on their personal characteristics, would be better off in the formal sector is almost double the actual share of formal sector employees. The contrary can be observed in the lower-paid informal segment, where the actual

\(^{14}\)See also Section 4.2.2. Note that the term ‘actual’ here refers to ‘estimated’ and may not be confused with the term ‘perfectly observable’, because we are in the mixture setting and the affiliation of an informal worker to any part of the informal sector is unobservable.
number of workers is almost three times as high as the number of workers that would choose to be employed in this segment for comparative advantage considerations.

Table 4.5: Distribution of Individuals across Sectors

<table>
<thead>
<tr>
<th></th>
<th>Formal</th>
<th>Informal-1</th>
<th>Informal-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Value</td>
<td>Value</td>
</tr>
<tr>
<td>Actual</td>
<td>0.33</td>
<td>[0.32, 0.35]</td>
<td>0.37</td>
</tr>
<tr>
<td>Maximizing</td>
<td>0.61</td>
<td>[0.37, 0.77]</td>
<td>0.29</td>
</tr>
<tr>
<td>Actual/Maximizing</td>
<td>0.55</td>
<td>[0.43, 0.92]</td>
<td>1.28</td>
</tr>
</tbody>
</table>

Source: Enquête de Niveau de Vie, 1998. Computations by the authors.

Notes: 'Actual' denotes the actual mixing distribution, whereas 'Maximizing' denotes the estimated earnings-maximizing distribution. [95% Conf.Int.] denotes a 95% Confidence Interval.

Table 4.5 presents the corresponding estimated values of the actual mixing, \{\hat{\pi}_j\}_j, and earnings-maximizing, \{\tilde{\pi}_j\}_j, sector affiliation probabilities as well as the ratios of these values for each segment \(j\). In addition, we report the bootstrap confidence intervals for the estimated probabilities and for their ratios. The hypothesis of equality of the two distributions is rejected when the \(\hat{\pi}_j/\tilde{\pi}_j\) ratios significantly diverge from unity.

The results in Table 4.5 indicate that the actual sector affiliation probability is significantly different from the earnings-maximizing affiliation probability both for the formal sector and the lower-paid informal sector (Informal-2) and only equal for the higher-paid informal sector (Informal-1). More precisely, at a 5% significance level we find that \(\hat{\pi}_j/\tilde{\pi}_j = 1\) for the higher-paid informal sector, \(\hat{\pi}_j/\tilde{\pi}_j < 1\) for the formal sector and \(\hat{\pi}_j/\tilde{\pi}_j > 1\) for the lower-paid informal sector. These findings imply:

(i) the share of workers who would choose to enter the formal sector is significantly higher than the share of workers indeed employed in the formal sector,

(ii) the actual share of individuals affiliated to the Informal-1 sector is equal to the share of those who would optimally choose working in this sector,
(iii) the actual share of workers in the Informal-2 sector is significantly higher than the share of workers that would voluntarily stay in this sector.

The three statements above clearly imply the rejection of the hypothesis of unlimited inter-sectoral mobility with no entry-barriers between any sectors. Thus, the labor market under study is segmented and features involuntary employment, mainly in its lower-paid informal segment, where a significant fraction of workers would do better in another sector (Table 4.5). This means that competitive theories do not apply. Moreover, our results do neither support full labor market segmentation, that considers all informal employment as a strategy of last resort to escape involuntary unemployment. Figure 4.4 and Table 4.5 show that both informal segments, mainly Informal-1 but also Informal-2, also contain individuals who will not be better off in any other sector. Thus the informal market seems to consist of both workers who are employed there voluntary - the upper-tier - and involuntary - the lower-tier. Hence, we conclude that the hypothesis of Fields (2005) can largely be supported.

More precisely, the earnings-maximizing distribution \( \{ \hat{\pi}_j \} \) of Informal-1 and Informal-2 constitutes the upper-tier, i.e. individuals who voluntary work in the informal sector and would not be better off in any other sector. The difference between these earnings-maximizing individuals in the informal sector and the actual size of the informal sector indicates the lower-tier informal sector, i.e. individuals who involuntary work in the informal sector and would do better in the formal sector. Table 4.5 shows that the relative size of the lower-tier informal sector is about 27% of the entire labor market\(^{15}\) or about 40% of the informal sector and that those individuals are mainly found in the lower-paid informal sector (Informal-2). The higher-tier informal segment makes up 60% of the informal labor market and is mainly found in the upper-paid informal segment (Informal-1).

Table 4.6 shows the actual mixing \( \hat{\pi}_j \) and the predicted earnings-maximizing probabilities \( \hat{\pi}_j \) separately for males and females. With regard to the labor market of males, only 14% of males are not found in the sector where they would maximize their earnings, or in other words the size of the lower-tier informal sector is about 25% of the ‘male’ informal labor market. For females, 17% (20%) of the ‘female’ total (informal) labor market are found in the lower-tier informal sector.

\(^{15}\) This is equal to the difference between the actual and earnings-maximizing fractions of workers employed in the formal sector.
These in the lower-tier involuntary trapped women and men are almost exclusively found in the lower-paid informal sector, Informal-2 (see column 2 and 3 of Table 4.6). Thus, if we analyze the female and male labor market separately most individuals seem to be in the sector where they maximize their earnings, which indicates 'gender-specific' competitive labor markets; and hence, in combination with the results of the total labor market (Table 4.5), a partly 'gender-driven' labor market segmentation.

Table 4.6: Distribution of Individuals across Sectors - Males and Females

<table>
<thead>
<tr>
<th></th>
<th>Forma1</th>
<th>Informal-1</th>
<th>Informal-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value [95% Conf.Int.]</td>
<td>Value [95% Conf.Int.]</td>
<td>Value [95% Conf.Int.]</td>
</tr>
<tr>
<td>Actual</td>
<td>( \hat{\pi}_f ) 0.45</td>
<td>[0.43, 0.48]</td>
<td>0.32 [0.12, 0.50]</td>
</tr>
<tr>
<td>Maximizing</td>
<td>( \hat{\pi}_m ) 0.60</td>
<td>[0.12, 0.71]</td>
<td>0.32 [0.12, 0.83]</td>
</tr>
<tr>
<td>Actual/Maximizing</td>
<td>( \hat{\pi}_f / \hat{\pi}_m ) 0.75</td>
<td>[0.63, 3.78]</td>
<td>0.99 [0.22, 3.98]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Formal</th>
<th>Informal-1</th>
<th>Informal-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value [95% Conf.Int.]</td>
<td>Value [95% Conf.Int.]</td>
<td>Value [95% Conf.Int.]</td>
</tr>
<tr>
<td>Actual</td>
<td>( \hat{\pi}_f ) 0.16</td>
<td>[0.14, 0.18]</td>
<td>0.44 [0.23, 0.75]</td>
</tr>
<tr>
<td>Maximizing</td>
<td>( \hat{\pi}_m ) 0.32</td>
<td>[0.22, 0.81]</td>
<td>0.45 [0.07, 0.65]</td>
</tr>
<tr>
<td>Actual/Maximizing</td>
<td>( \hat{\pi}_f / \hat{\pi}_m ) 0.49</td>
<td>[0.19, 0.74]</td>
<td>0.98 [0.37, 4.86]</td>
</tr>
</tbody>
</table>

Source: Enquête de Niveau de Vie, 1998. Computations by the authors. 
Notes: 'Actual' denotes the actual mixing distribution, whereas 'Maximizing' denotes the estimated earnings-maximizing distribution. [95% Conf.Int.] denotes a 95% Confidence Interval.

One might argue, that in reality individuals are utility- rather than earnings-maximizers. Thus, it is possible to argue that our empirical results are a consequence of non-wage preferences for the lower-paid informal sector and not an

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16 The actual size of the higher-paid informal sector, Informal-1, is almost equal to the earnings-maximizing size of Informal-1.
4.4 Conclusion

In this paper we formulate an econometric model that allows for various sectors in the labor market, when sector affiliation of any particular individual is not necessarily observed. In addition, the model accounts for sample selection due to individuals' employment decision. The model further suggests a straightforward test for labor market segmentation.

We apply the model to study the structure of the urban labor market in Côte d'Ivoire. Our estimation results support the hypothesis that informal labor markets in developing countries are composed of two segments with a distinct wage equation in each of them. We further state that both informal sectors are considerable in size and make up 60 percent and 40 percent of informal employment, respectively. In addition, we show that one segment of the informal sector (the higher-paid informal sector) is superior to the other (the lower-paid informal sector) in terms of significantly higher earnings as well as higher returns to education and experience.

We also test whether the detected structure of the informal sector is a result of market segmentation that deters individuals from entering the formal sector, or a result of comparative advantage considerations of workers. Our results reject unlimited intersectoral mobility of workers and indicate that the lower-paid informal sector is largely the result of market segmentation whereas comparative

---

17 However, there might be a difference for men and women, with the flexibility of the informal sector offering more advantages for women (usually being the once raising children) than for men.
advantage considerations seem to be the cause for the existence of the higher-paid informal sector. Hence, the informal sector comprises both individuals for whom the informal sector is a strategy of last resort to escape involuntary unemployment and individuals who are voluntarily employed in the informal sector. As a result, among the existing theoretical views on the structure of the informal labor market in developing economics, the one of Fields (2005) gets the largest empirical support.

For the theoretical modeling of labor markets in developing economies this means that there might exist cases in which neither solely competitive theories nor exclusively segmented labor market theories will provide an appropriate explanation of labor market interactions. Moreover, we might even rethink the general assumption of no entry-barriers into the informal sector, with entry-barriers to the higher-paid informal sector.

For the empirical literature our results clearly show that testing for labor market segmentation in developing economies can be misspecified by either ignoring the employment decision of individuals (e.g. Dickens and Lang, 1985; and Cunningham and Maloney, 2001) or by assuming away a possible latent structure of the labor market (e.g. Heckman and Sédlacek, 1985; Magnac, 1990). However, the later two papers address the interesting issue of specific entry-barriers, namely mobility costs, between the formal and informal sector (Magnac, 1991) and the issue of sector choice of utility-maximizing individuals (Heckman and Sédlacek, 1985), which we do not consider in this paper. It would be interesting to see the impact of a latent heterogenous informal sector on their models’ estimation results. Last, our results demonstrate the importance to distinguish between male and female labor markets, which might show significant differences in structure and dynamics.

Our findings are particularly important for the design of policy measures which aim to reduce informality with low and unsecured earnings. Clearly, to talk about any specific policy measures, one needs to have at least a simple theoretical model that addresses the costs and benefits of decreasing the informal sector, which we do not provide in this paper. However, if we aim for policies with the objective to promote formal employment, we have to take into account that the informal sector consists of both individuals who would like to switch to a formal job and individuals who currently have no incentive of doing so. Policy recommenda-
4.4. CONCLUSION

...tions for those two informal segments should be quite different. Although in both sectors of the informal labor market individuals face ‘poor’ earnings opportunities, it seems that individuals work in the higher-paid informal sector because they are poor(ly endowed) with necessary characteristics for the formal sector whereas individuals are poor because they involuntarily work in the lower-paid sector.

In the upper-tier informal sector, policies should address individuals’ ‘poor’ endowments to improve their earnings possibilities in the formal sector. Moreover, this segment of the informal sector might also be partly ‘responsible’ for the high tax evasion in developing countries. Hence, measures to transform the higher-paid informal sector into the formal sector, i.e. to improve tax collection in this part of the labor market, might be enhanced.

With regard to individuals, who are involuntarily trapped in the informal sector, policy interventions have to counter entry-barriers into the formal sector. Moreover, workers found in this part of the informal market show especially low earnings. Hence, if the objective is to address the most disadvantaged first, the lower-paid informal sector should receive highest priority.

Last, before implementing any policies certain revealing mechanism that allow to determine whether any given individual belongs to one or another segment of the informal labor market need to be established. Even though no mixture model detects with certainty the affiliation of any given individual to any latent segment of the labor market our estimations results for wage functions in the different segments might already provide a guide for policy makers. For example, Table 4.4 reveals that young and uneducated males, living in Abidjan, mainly constitute the upper-tier informal sector, i.e. individuals who voluntarily work in the informal sector.\(^\text{18}\)

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\(^{18}\)Note that the intercept in the higher-paid informal sector is higher than in the formal sector. Thus individuals with no or low endowments should earn more in the higher-paid informal sector than in the formal sector. Moreover, being a male and living in Abidjan yields higher returns in the higher-paid informal sector than in the formal sector.