DOCUMENT DE TRAVAIL DT/2006-16

Education and Labour Market Outcomes in Sub-Saharan West Africa

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EDUCATION AND LABOUR MARKET OUTCOMES IN SUB-SAHARAN WEST AFRICA[1]

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Document de travail DIAL
Novembre 2006

ABSTRACT

The purpose of this paper is to study the effects of education on urban labour market participation and earnings in seven major West African cities. Our results show that although education does not always guard against unemployment, it does increase individual earnings in Abidjan, Bamako, Cotonou, Dakar, Lome, Niamey and Ouagadougou and opens the door to get into the most profitable niches, which are found in the formal private and public sectors. We shed light on convex returns to education in all the cities considered. Besides, not controlling for the endogeneity of education leads to biased estimated returns (either upward or downward depending on the city) which stresses the complexity of the mechanisms linking education and earnings across cities and sectors. We also bring some support to the idea according to which social capital may largely be at work in this relationship. Finally, a major contribution of this paper is to provide evidence of significant effects of education on individual earnings in the informal sectors of the major WAEMU cities, even at high levels of schooling.

Key Words: Returns to education, earnings, endogeneity, selectivity, informal sector, Sub-Saharan West Africa

RESUME

L'objectif de ce papier est d'étudier les effets de l'éducation sur la participation au marché du travail urbain et la rémunération du travail dans sept capitales d'Afrique de l'Ouest francophones. Nous montrons que si l'éducation ne constitue pas toujours un rempart contre le chômage, elle est un facteur incontestable d'accroissement des gains sur les marchés du travail d'Abidjan, Bamako, Cotonou, Dakar, Lomé, Niamey et Ouagadougou. Elle permet notamment aux individus les mieux dotés de s'insérer dans les créneaux les plus rentables à savoir les secteurs formels privé et public. Les rendements marginaux de l'éducation estimés sont convexes dans toutes les villes considérées. Nous montrons également que ne pas prendre en compte l'endogénéité supposée de la variable d'éducation dans les fonctions de gains conduit à surestimer ou à sous-estimer les rendements de l'éducation suivant les cas. Ce résultat rend compte de la complexité du lien entre éducation et revenus en fonction de la ville et du secteur d'affiliation des individus. De plus, nos estimations corroborent l'idée selon laquelle le capital social des travailleurs interférerait de façon significative dans ce mécanisme. Finalement, l'apport de notre étude est aussi de montrer que le capital éducatif, y compris à des niveaux élevés, permet un accroissement substantiel des gains dans le secteur informel de la plupart de ces grandes villes de l'UEMOA.

Mots-clefs : Rendements de l'éducation, revenus, endogénéité, effet de sélection, secteur informel, Afrique de l'Ouest.

JEL Code : J24, J31, O12

[1] We would like to thank participants at the Cornell University/CREA Conference 2005 in Dakar, at the CSAE Conference 2006 in Oxford and at the IREDU/World Bank Conference 2006 in Dijon for helpful suggestions. Usual disclaimers apply.

Contents

List of tables

List of figures

1. INTRODUCTION

At a time when all development policies are focused on poverty reduction, it is a paradox that the research community has not taken the full measure of the role that could be played by improving the way urban labour markets work in Sub-Saharan Africa (SSA). This bias can partly be explained by the concentration of pockets of poverty in rural areas. And yet, in labour-abundant countries undergoing rapid urbanisation where, for the vast majority, the population – particularly the poor – earns its income from work, the creation of "decent work" in towns (to use the International Labour Organization's terminology) is a major challenge for Africa's future[2]. In SSA, education is often seen as the main policy instrument in the fight against poverty because it may help individuals access better jobs and thus raise their labour earnings. However, in practice, although the value of education is strongly reaffirmed as an intrinsic component of development and of the well-being of populations in SSA (through the Millennium Development Goals, the Education for All initiative, etc.), its economic efficiency, on the contrary, is more contested.

The dilemma is that the ability to increase the demand for education depends greatly on the families' opinion on how profitable it is on the labour market, i.e. its ability to provide attractive jobs. Yet, the results in the past few years are ambiguous in this respect. The idea of a widening education-job gap is widespread. Unemployment of qualified workers, worsened by the lasting freeze in civil service recruitment and the lack of vitality in the formal private sector, massive unemployment and an education system unsuited to the needs of the informal sector, and more generally the deterioration in the quality of public education under pressure from drastic budget restrictions, are all factors that tend to undermine the value of investment in schooling. Education no longer seems to guard against poverty and social exclusion in SSA.

In this context, it is of key importance to be able to reappraise the external efficiency of education in SSA. We intend to do so in this paper by using the unique household *1-2-3 surveys* on employment, the informal sector and poverty in the main agglomerations of seven French-speaking West African countries. The cross-sectional data sets gather a total of nearly 100,000 individuals surveyed between 2001 and 2003.

Traditional studies of the external efficiency of education systems look at the impact of the education received by individuals once they have left their school or training establishment to continue their lives as adults in society[3]. There are two types of impacts – economic in the narrowest sense and social in the wider perspective – and these can be interpreted either from the individual or the collective standpoint. This study focuses solely on the economic and private dimensions of the external efficiency of education. Analyses of the individual effects of education in the economic sphere often study the inter-individual earnings differentials, which were thought to result from wage compensations for workers' different levels of human capital endowment. In this way, standard human capital theory has substantial implications for poor countries because it interprets income differences between individuals in the labour market. The Mincer earnings model derives directly from the theory's assumption that individuals are paid based on their marginal productivity. This suggests that investment in education is an explanatory factor in the distribution of earnings. Under this assumption, a strong implication in terms of economic policy is that if inequalities in income distribution are to be reduced in a given country, the starting point is to reduce inequalities in access to schooling, given that income inequality seems to be higher when education is less equally distributed.

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[2] However, there has been some progress in awareness of the issue at the highest political levels, as shown by the extraordinary Summit of the African Union on employment and the fight against poverty, held in September 2004 in Ouagadougou, or the latest economic reports from the Economic Commission for Africa (ECA, 2005) and the World Bank (2006), which deal precisely with these questions.

[3] By way of comparison, "analyses on the *internal* efficiency of education systems concern the school processes and the way the teaching establishments operate: generally speaking, they compare the schools' activities and organizational methods with the results obtained by pupils whilst they are still in the system, looking for the most cost-effective situations." (Mingat and Suchaut, 2000, p. 170).

Education policies can help reduce poverty by increasing the earned income of the most highly educated workers. It is therefore useful to know the returns to education for individuals with different living standards in different countries. If returns to education are high for individuals from poor families, poverty reduction policies designed to promote equal opportunities in access to schooling would be appropriate. However, numerous objections and criticisms have been made regarding the assumption that education - and hence productivity - are the only determinants of differences in individuals' earnings. The first models were built for industrialised countries (mainly the United States). Yet many authors have demonstrated, particularly in an African context, that the traditional theories postulating the levelling of income levels between individuals with identical levels of human capital endowments do not fit when markets are imperfect or segmented.

Markets in most African countries are not only imperfect, but the nature of work contracts also interferes significantly in the relationship between human capital endowments and earnings. In particular, it is widely acknowledged that there are four types of labour markets in developing countries, namely rural, public, private formal and informal. These markets each have their specific characteristics, such as job seasonality and uncertainty about the level of demand, the nature of contracts and the structure of wages and earnings (Adams, 1991; Ray, 1998; Hess and Ross, 1997; Schultz, 2004).

However, many studies referring to the external efficiency of education in these countries (particularly on the questions of the match between training and employment or on the private returns to education) overlook the fact that the existence of different employment segments, especially in the rural and informal sectors, can have major implications as to the role of education in labour market integration. Vijverberg (1995) observes that some types of employment, such as self-employed work, cannot be linked to the individuals' credentials, or to a pay scale of any sort, meaning that education can only play a minor role in explaining individual earnings levels. Bennell (1996) notes that many studies on developing countries are based on data for formal-sector employees and do not take into account income in rural and informal sectors where returns to education are probably very low. Glewwe (1996) also reveals that the wage structures in the private sector reflects the impact of education on the workers' productivity more than they do in the public sector.

Taking account of these African specificities, the aim of our study is to analyse the effects of education on urban labour market participation and labour remuneration in seven major West African cities of the WAEMU[4] (Abidjan, Bamako, Cotonou, Dakar, Lome, Niamey and Ouagadougou). Based on the first-hand, recent and comparable *1-2-3 surveys* in these seven capitals, we broaden the scope and refine the indicators generally used to assess the efficiency of education for labour market integration in SSA, using exactly the same method for each city. In particular, we estimate the determinants of earned income, especially the effect of education, whilst differentiating individuals according to the institutional sector to which they belong (public/formal private/informal private). Moreover, our data allow us to compare the returns to vocational versus general education at different levels of the schooling path which is one of the central aspects of education and vocational training literature i.e., the debate on whether it is general education or vocational training that has the highest returns. Finally, our household survey data enable us to address two persistent econometric problems when one wants to assess the causal impact of education on earnings.

Firstly, we tackle the issue of the possible endogenous sample selectivity biases regarding paid-work participation and sector choices by using appropriate procedures[5] when the first stage choice model has several modalities, namely enter the public, formal private or informal sectors versus non paid-work participation. Although the effect of education on earnings differs depending on the employment sector and the type of job held, it is also a determinant of individual choices made upstream, i.e. when the decision is made to enter the labour market, and especially sector choices. Hence, it is widely

[4] WAEMU: West African Economic and Monetary Union. The survey was not carried out in Guinea-Bissau.

[5] See the discussions in Bourguignon, Fournier and Gurgand (2004).

recognised that observable individual characteristics (such as human capital in general), but also unobservable individual characteristics, influence both decisions to participate and the level of individual earnings. Secondly, our data allow us to address the issue of the possible endogeneity of the education variable in the earnings function using different alternative techniques that make use of family background information. In addition, we rely on household fixed effects regressions as our data are rich enough to observe several individuals in the same household. This is a way to fully control for the individuals' family environment which may be viewed as their social capital. To our knowledge, this is the first time that such a comparative investigation of several African countries has been made based on surveys using identical sampling plans and questionnaires. Then, the comparative nature of our data gives our study a unique slant in that the effects of education can be studied in a uniform manner for all the countries.

Our results show that although education does not always guard against unemployment, it does increase individual earnings and opens the door for the most well-educated to get into the most profitable niches, which are found in the formal private and public sectors. We also shed light on convex returns to education in all the cities considered. Furthermore, not controlling for the endogeneity of education leads to biased estimated returns (either upward or downward depending on the city) which stresses the complexity of the mechanisms linking education and earnings across cities and sectors. We also bring some support to the idea according to which social capital may largely be at work in this relationship. Finally, a major contribution of this paper is to provide evidence of significant effects of education on individual earnings in the informal sectors of the major WAEMU cities, even at high levels of schooling.

The remainder of the paper is set out as follows. Section 2 describes the data and survey design. Section 3 presents our methodology and the econometric models. Section 4 analyses and discusses the findings. Section 5 presents our conclusion.

2. PRESENTATION OF THE DATA

Our data are taken from an original series of urban household surveys in West Africa, the *1-2-3 Surveys* conducted in seven major WAEMU cities (Abidjan, Bamako, Cotonou, Dakar, Lome, Niamey and Ouagadougou) from 2001 to 2002. The surveys were carried out by the relevant countries' National Statistics Institutes (NSIs), AFRISTAT and DIAL as part of the PARSTAT Project[6].

The surveys cover the economic city, i.e. the "administrative city" and all the small towns and villages directly attached to it and with which there are frequent exchanges. As suggested by its name, the *1-2-3 Survey* is a three-phase survey. The first phase concerns individuals' sociodemographic characteristics (including education and literacy) and labour market integration. The second phase covers the informal sector and its main productive characteristics. The third phase focuses on household consumption and living conditions. The same methodology and virtually identical questionnaires were used in each city, making for totally comparable indicators.

Our study uses solely the Phase 1 data. Phase 1 of the *1-2-3 Survey* is a statistical employment survey designed to:

- Provide the main indicators to describe the situation of individuals and households on the labour market. It covers household employment and economic activities, especially in the informal sector;
- Serve as a filter survey to identify a representative sample of informal production units, which are then surveyed in Phase 2.

[6] Regional Statistical Assistance Programme for multilateral monitoring sponsored by the WAEMU Commission.

The following presents a brief description of the sampling plan, the content of the questionnaires and the handling of the tricky question of income, which plays a key role in this study.

2.1. The sampling plan

The detailed methodology is described in Brilleau, Roubaud and Torelli (2004, 2005). The sampling plan chosen used the classic technique of two-stage area sampling. Primary and/or secondary stratification was conducted where possible. The primary sampling units were small area units: Enumeration Areas (*Zones de Dénombrement*), Census Districts (*Districts de Recensement*), segments or even Enumeration Sections (*Sections d'Enumération*), depending on the country. Each area unit contained an average of 200 households. In general, a full list of these units was available from the last population census. The survey periods were as follows: 2001 for Cotonou, Ouagadougou, Bamako and Lomé; and 2002 for Abidjan, Dakar and Niamey.

Following a stratification of the primary units based on socio-economic criteria, 125 primary units were sampled with probabilities proportional to their size. An exhaustive enumeration of the households in the selected primary units was then conducted. Following a stratification of the secondary units where possible, systematic random sampling was applied to sample approximately 20 households with equal probabilities in each primary unit.

The theoretical household samples were made up of 2,500 households in each of the seven cities, with the exception of Cotonou where the number was able to be raised to 3,000. A full 17,841 households actually answered the questionnaire. This corresponds to 93,213 individuals and 69,565 people aged ten and over (which is the potential labour force) for whom an individual questionnaire was completed. Table 1 in Appendix describes the theoretical and actual samples obtained for each city.

In general, sample size was much higher than that observed in most of the urban household surveys with the result that the findings are more reliable. The sampling strategy used meant that the standard estimator quality indicators could be rigorously calculated (see Brilleau, Roubaud and Torelli, 2005).

2.1.1. The questionnaires

The questionnaire was made up of two forms: a *household section* covering all the sociodemographic characteristics of each household member, housing conditions and the household's durable goods; and an *individual questionnaire* for each individual aged ten or over. The individual questionnaire was made up of six modules designed to define each person's labour market situation and therefore to measure, among other things, what is termed the "external" efficiency of education. For example, the following aspects can be studied: employment status (employed worker, unemployed, out of the labour force), the characteristics of the main job (job status, seniority, earnings, etc.) and of the employer businesses (institutional sector, line of business, size, etc.), the characteristics of the secondary job, and unemployment (length, type of job sought and mode). Also included were a certain number of career path elements (last job held and situation of the interviewee's father when he was 15 years old) and unearned income.

Although no specific module was included on education, this field was covered by a series of questions put to each household member[7] concerning: school attendance (current or past), the school level reached, the number of completed years of education, the qualifications obtained (differentiating between general and vocational education), the type of school attended in the last year of schooling (state, private denominational or private non-denominational), and the interviewee's father's level of education and work status. Summary statistics of the various variables at our disposable and used in

[7] See Brilleau, Roubaud and Torelli (2005) for a detailed description of the questionnaires.

the econometric analysis are reported in Table 3. Section 4 provides detailed descriptive analysis of the variables of interest for the entire population aged 15 and over in each city.

2.1.2. Constructing the income variable

It is not easy to study earnings in an African urban environment since a large majority of workers work in the informal sector where there are no accounts or pay slips and individuals are naturally reticent to disclose their incomes (this is not specific to Africa). Two strategies were adopted for the *1-2-3 Surveys* to at least partially overcome these problems:

- For non-wage earners (self-employed and employers), the interviewers were asked to help them reconstitute their earnings by recapping incomings and outgoings over a reference period to which the interviewee could relate. Following this exercise, non-wage earners' incomes were translated into a monthly sum in the questionnaire;
- The individuals who were unable or unwilling to disclose their exact earnings were asked to give a bracket, defined by multiples of the minimum wage in force.

This strategy produced the results reported in Table 2 in Appendix. On average, nearly half of all employed workers (48%) declared a precise income figure and over one-third (36%) gave a bracket. Less than 6% of workers gave no information. For both the workers who refused to disclose their earnings and those who gave only income brackets, earnings were imputed by an econometric estimation based on an income equation. An income model was first of all estimated for the employed workers who disclosed their precise earnings based on the individuals' characteristics. The explanatory variables for income are as follows: age, gender, schooling, socio-economic group, institutional sector, seniority, location, type of contract, number of hours worked, steady or irregular job, and type of payment. The values predicted from this model were imputed for all individuals who did not disclose their earnings and those who gave an income bracket. Random sampling was conducted for these latter individuals and the result added to the estimated income until the sum obtained came within the bracket declared by the interviewee. To test the sensitivity of our results to the use of estimated incomes, we also performed regressions on the sub-sample of individuals who declared precise incomes only. As our estimates were only marginally modified, and remained qualitatively unchanged as compared to estimates obtained from the full sample of individuals, we choose to pursue the following analysis using the full sample of individuals in order to avoid reducing drastically the sample sizes and therefore the precision of our estimates.

Full summary statistics of the variables used in the econometric analysis are reported in Table 3.

3. METHODOLOGICAL APPROACH

Our methodological approach consists of estimating different models to evaluate the impact of education in its different forms (years of education, type of school attended i.e. general versus vocational, level reached, and qualifications obtained) on (*i*) the conditions for labour market integration (participation and sector choices) and (*ii*) earned income. Our surveys enable us to estimate Mincer-type earnings models taking account of the sample selection effects associated with the individuals' participation and sector choices. In addition, our data allow us to address the issue of the possible endogeneity of the education variable in the earnings function using different alternative techniques that make use of family background information.

3.1. Modelling the sector choice

Let S_j be the different occupational situations (j = 0 to 3): S_0 = no work, S_1 = public sector, S_2 = formal private sector, S_3 = informal private sector. We can view S_j as a "response function" to a set of latent continue variables S^*_j which measures the propensities to have the occupational situations S_j.

For each individual *i,* let suppose that the propensity to have the occupational situation S_j is linearly linked to her(his) characteristics: $S^*_{ij} = \beta_j' X_i + \varepsilon_{ij}$ where X_i is a vector of observed individual characteristics (including education), β_j is a vector of parameters to be estimated and $\boldsymbol{\varepsilon}_{ij}$ is a random error term. The probability of individual *i* participating in sector S_j is equal to the probability that the propensity function of sector S_j for that individual being greater than that associated with the other sectors:

$$\text{Prob}(S^*_{ij} > S^*_{ik}) \text{ for } k \neq j;\ k = 0, 1, 2, 3 \quad (1)$$

By replacing S^*_{ij} and S^*_{ik} with their expression, we obtain:

$$\text{Prob}(\beta_j' X_i + \varepsilon_{ij} > \beta_k' X_i + \varepsilon_{ik}) = \text{Prob}(\beta_j' X_i - \beta_k' X_i > \varepsilon_{ik} - \varepsilon_{ij}) \text{ for } k \neq j;\ k = 0, 1, 2, 3 \quad (2)$$

The form of the participation equation will depend on the assumption adopted as regards the distribution of error terms. If we assume that the errors are independently and identically distributed with a Weibull distribution, then the difference between the errors follows a logistic distribution and the probability of individual *i* choosing sector s_j is expressed by:

$$Prob(S_{ij=}s_{j)} = \exp(\beta_j' X_i)/\Sigma_k \exp(\beta_k' X_i) \text{ with } k \text{ ranging from 0 to 3.} \quad (3)$$

For the model to be identifiable, we posit by convention $\beta_0=0$. The parameters of the estimates hence represent the effect of a given characteristic on the chances of being in a segment rather than not working[8]. A binary logit may also be deduced from the multinomial based on the assumption of two exclusive choices (k=0 or k=1).

3.2. Earnings equations with selection bias correction

Modelling the earnings functions follows on from the estimation of the sector choice equations and is therefore the next step.

Let's say, as above:

$$S^*_{ij} = \beta_j' X_i + \varepsilon_{ij} \quad (4)$$

and

$$Y_{ij} = \zeta_j' Z_i + \eta_{ij} \quad (5)$$

Y_{ij} denotes the income that individual *i* earns by working in sector *j* where j=1 (public sector), 2 (formal sector) and 3 (informal sector). Z_i is the vector of observable individual characteristics (including education), ζ_j is a vector of parameters to be estimated and η_{ij} is an error term. The aim is then to estimate the coefficients ζ_j for each sector. Y_j is only observed if sector *j* is chosen and, therefore, η_j and ε_j are not independent. In this case, the OLS estimator is potentially biased.

One of the ways of correcting this bias is to add a correction term to the earnings equation using Lee's method (1983). This technique is a generalisation of the Heckman (1979)'s two-stage procedure when the first-stage choice equation has several modalities. The generalised form of the inverse Mills ratio introduced into the earnings equation for each sector sub-sample yields consistent estimators and, in our case in particular, estimators of the effect of the education variable on the levels of individual earnings. However, this Lee correction method was questioned because it is based on strong restrictions regarding the joint distribution of error terms in the equations of interest (Dahl, 2002; Bourguignon, Fournier and Gurgand, 2004). Nevertheless, the alternative methods proposed by the previous authors were inconclusive in the case of our data. The Lee's method always performed better

[8] In our case, this category corresponds to the individuals who did not declare positive earnings for the reference month.

considering the small size of our sector sub-samples[9]. In this paper, we then use Lee's correction method and Bourguignon et al. (2004)'s Stata program to estimate our models.

Another potential problem is that the multinomial logit suffers from the Independence of Irrelevant Alternatives assumption (IIA), which in most cases is questionable. However, based on Monte-Carlo simulations, Bourguignon et al. (2004) conclude that "*selection bias correction based on the multinomial logit model seems a reasonable alternative to multinomial normal models when the focus is on estimating an outcome over selected populations rather than on estimating the selection process itself. This seems even true when the IIA hypothesis is severely at odds*". Then, using a multinomial logit model would not bias our results in the second stage regression, which allows us to be confident regarding this choice. This technique will constitute our baseline model that we shall be able to improve in the following way to account for the possible endogeneity of education.

3.3. Endogenous education

It is widely recognised that using OLS to estimate the returns to education from cross-section data is potentially problematic. The standard concern in the literature is that education may be an endogenous variable, i.e. correlated with the residual of the earnings function due to unobserved individual heterogeneity. To address this issue, one commonly uses instrumental variables techniques (IV) which imply finding variables that are uncorrelated with the individuals' unobserved heterogeneity but correlated with their education. The instrumentation is often based on households and demographic characteristics which are assumed uncorrelated to the error term of the earnings equation. These instruments, popular when using developing country data, may capture various genetic and environment influences (Sahn and Alderman, 1988). For example, Ashenfelter and Zimmerman (1997) use parental education, Butcher and Case (1994) exploit the presence of any sister within the family, and Card (1995) draws on geographic proximity to a four-year college as instruments.

Treating the endogeneity of education with IV may lead to downward estimation of the returns to education if schooling is positively correlated with the individuals' unobserved ability. For instance, Belzil and Hansen (2002) find a strong positive correlation between unobserved ability and unobserved taste for schooling, thus leading to substantial upward bias in the OLS estimates of the return to education. However, a more common finding in the empirical literature is that estimated returns rise as a result of treating education as an endogenous variable (see e.g. Card, 2001). In such case, OLS estimation suffers from the so-called attenuation bias caused by measurement errors in the reported years of schooling. Griliches (1997), Angrist and Krueger (1991) and Ashenfelter and Krueger (1994) suggest that the omitted ability biases in the OLS estimates are relatively small, but the downward bias due to measurement errors could be sizeable. Since there are potentially two effects playing in opposite directions (ability versus attenuation biases), an OLS estimate of the return to education can bias in either way, i.e. either overestimates or underestimates the true return, depending on the relative magnitudes of these biases (Li and Urmanbetova, 2002).

In this paper, we tackle the issue of endogeneity using different alternative techniques. Firstly, father's schooling and main occupation are used as instruments and we use a control function approach (Garen, 1984; Wooldridge, 2002; Söderbom et al., 2006). The method can be described in the following way. We first regress education (the number of years of completed schooling) on the set of instruments. Based on this regression, we estimate the residual $\hat{\lambda}$. In the second stage, we estimate the earnings functions in which $\hat{\lambda}$ is used as a 'control variable' for the unobserved heterogeneity component. This approach will produce consistent estimates of the parameters of interest provided standard conditions for identification hold, and provided the instruments are independent of $\hat{\lambda}$ and

[9] Indeed, based on Monte-Carlo simulations, Bourguignon et al. (2004) conclude that "*Lee's method is adapted to very small samples* (…)".

uncorrelated with the residual of the earnings function[10]. The control function method is adapted when the earnings-education profile is non-linear in the estimated parameters. Specifically, as discussed by Card (2001), the control function approach is more robust than 2SLS when slope parameters potentially co-vary with the unobserved factors of the model. In addition, even if all slope parameters are constant, 2SLS is likely to yield relative imprecise parameter estimates when the model is non-linear in the endogenous variable, namely education in our case. As show our results, the control function approach is worthwhile in our case since the marginal effect of education on earnings is found to be non-constant, with a convex profile. This is the reason why we prefer the control function approach instead of the 2SLS.

Secondly, following Blackburn and Neumark (1995) and Lam and Schoeni (1993), we directly introduce family background information (father's education and occupational status) into the earnings functions by assuming it may act as a proxy for the unobserved heterogeneity component. This is another way to apply the control function procedure. Indeed, individual education could be deemed endogenous if, for instance, the father has contributed to job access for his child or if father's education and/or work status are actually proxies for the individual's unobserved ability. This would be the case if there exist "genetic transmission" of ability or if parents with a lot of education (or with particular jobs) can help their children develop skills that are subsequently rewarded in the labour market. Using IV estimates relies on the assumption that such situations do not arise and that parental education variables can be considered as valid instruments. However, it is unclear whether parental education/work status should be used as instruments or as proxies for the unobserved ability component. In this paper, we shall attempt to use this information in both ways in order to check the robustness of our results to these different assumptions.

Lastly, our data allow us to rely on household fixed effects (HFE) regressions. This is a way to control for the individuals' *current* family environment which may be viewed as their social capital. Indeed, in Africa, individuals' social capital and networks are likely to strongly affect their access to employment, sector affiliation and, as a result, their reward of education. Moreover, if the current household features are correlated to individuals' abilities, then introducing HFE in the regressions is another way to purge unobserved ability bias in the returns to schooling. In the following, we assume that these household effects may be added to the previous IV earnings equations rather than are an alternative to the techniques aimed at correcting the potential endogeneity of education. Indeed, while IV methods may correct the endogenous education due for instance to unobserved ability, the HFE may capture other aspects believed to influence earnings, but not necessarily education, namely access to information for better jobs, i.e. the so-called "networks effects".

All these different techniques are interesting to perform because the different assumptions behind them may lead to common features in the results that we shall be able to consider as relatively robust. Thus, even if endogeneity issues are not perfectly corrected, the similarity of results from the different methods should help convincing us of their relative soundness.

In order to identify the HFE, we need to restrict our initial samples to sub-samples including at least two interviewed active occupied individuals in each household. On average, this reduces by 24% our initial samples of active individuals, i.e. those with positive earnings[11]. For the sake of comparison between the different alternative methods, we perform the other estimation techniques using the same restricted samples. These include, on the one hand, estimates stemming from simple OLS earnings functions (with no correction for endogenous sample selection), earnings functions using Lee's correction for selectivity and assuming exogenous education and, on the other hand, Lee's earnings functions with endogenous education including our different "controls" for unobserved heterogeneity

[10] As is discussed in Söderbom et al. (2006), however, 2SLS does not require independence between the instruments and the unobserved component of the earnings equation – just zero covariance – unlike the control function approach. Thus, 2SLS is less restrictive than the control function. Nevertheless, with 2SLS, identification is likely to be harder to achieve in practice. Indeed, in the case of flexible forms of education variable (dummy variables for each level), the interest of the control function approach over 2SLS is that we only need to add a univariate function in the first stage, rather than instrumenting for several variables corresponding to the various education degrees.

[11] For instance, in so doing, we drop 14% of individuals in the Senegalese sample and 35% in the Nigerien sample. The other cities lie within this bracket.

(father's education and occupation status and the control function approach). Finally, we use HFE in the control function regression.

4. ANALYSIS OF THE FINDINGS

Before reporting any result from the econometric analysis, it is useful to provide descriptive statistics of the main variables of interest. This examination is a necessary step if one wants a full picture of the incidence and external efficiency of education in the urban labour markets of the considered countries. We start by looking at the distribution of the stock of education in the seven cities. We then cast a glance at the efficiency of education in terms of exits from unemployment, integration into the different labour market segments (formal/informal). Results from the econometric analysis are then presented.

4.1. Overview of the level of education in the seven cities

4.1.1. Education remains a rare factor

Across all generations, the accumulation of educational capital remains low in all seven cities: the average number of years of completed schooling is only about 5 years, and over half of the individuals aged 15 years or over (55%) either never attended school or attended school but did not complete primary cycle. Yet people are only considered to be literate as adults when they have completed primary school. On this basis, we estimate the proportion of literate individuals aged 15 and over in the WAEMU cities in the early 2000s at 45%. Moreover, these literate individuals' level of education was extremely modest since nearly half of them did not go beyond the Secondary College (first four-year cycle of secondary education), and less than a quarter completed the second secondary cycle (total of seven years of secondary education), with the possibility of enrolment in higher education.

The distribution of individuals aged 15 and over by level of education in each of the cities taken separately is pyramid-shaped with a broad base and a very narrow summit. This is indicative of a high level of illiteracy (at least 44%) and high drop-out rates between and within the cycles.

Insert Figure 1 about here

Although the cities have a common curve, they also display differences. If we look at the base of the schooling pyramid, i.e. the individuals who did not start or complete primary school, Bamako, Niamey and Dakar are found to be the most disadvantaged from this point of view (Table 3 and Figure 1). Approximately 60% of the over-15s in these cities do not have the minimum level of schooling in terms of having completed primary school. Conversely, "only" 45% of the population lack this basic level in Cotonou and Lome. Ouagadougou and Abidjan are in intermediate positions with respectively 56% and 51% of the population who did not start or complete primary school. Abidjan has the highest proportion (13%) of individuals at the top of the educational pyramid (secondary school completed or higher education), ahead of Cotonou (11%). The other cities post percentages ranging from 7% to 8.5%.

Possession of the minimum human capital (i.e. at least completed primary schooling) also varies markedly by two demographic identification variables namely generation and gender (statistics not shown). Women are largely disadvantaged by gender in that nearly two-thirds (64%) did not complete primary school (as opposed to 45% of men). This rate rises to 68% in Dakar, Niamey and Bamako. Even in the cities with the longest-standing and most developed schooling (Cotonou and Lome), women remain largely on the fringes: 59% did not complete primary school.

When studied by generation, more under-35s (48%) have the minimum level of schooling than their elders aged 35 to 44 (44%) and especially those aged 45 and over (34%). This configuration reflects the steady development of the education system in the African countries. Yet the schooling dynamic is not the same everywhere. At one end of the scale, there are the cities with a long tradition of schooling. At the other end of the spectrum are those where the development of schooling has been stepped up more recently. The first group comprises Lome, Abidjan and Cotonou where, even among the individuals aged 45 to 59, a not-inconsiderable proportion (at least 45%) has the minimum level of schooling. In the second group (Bamako, Niamey and, to a certain extent, Ouagadougou), over 60% of the over-35s do not have the minimum level of schooling. Dakar stands out for its stagnation (at around 60%) in the proportion of individuals without the minimum grounding in education across all generations (15 to 59 years old).

However, the performance of the education systems over time is less negative. Despite more numerous age groups and an unfavourable economic context, the rate of schooling has increased constantly since the countries became independent. The Sahel countries are making up for their initial handicap, whereas in all the countries the gap between boys and girls is tending to decrease. Nonetheless, it is possible that this quantitative democratisation is offset by deterioration in the quality of teaching.

A last point worth mentioning about the educational landscape of the major WAEMU cities is the low weight of vocational education, which never exceeds 2% of the over-15s with the notable exception of Mali where it comes to 6%. This is characteristic of an education system in which vocational training is left by the wayside.

4.2. Labour market integration and unemployment

The ILO defines as unemployed any person who has not worked in the week preceding the survey and who is actively seeking work. The *1-2-3 Surveys* add a second definition to this strict notion of unemployment: a broader concept of unemployment that takes the ILO definition and adds in all those who are not actively seeking a job, but are prepared to work should the opportunity arise. This broader definition of unemployment raises the number of unemployed from 460,500 to 673,000 individuals for all the WAEMU cities together. We feel it better reflects the real situation on the African urban labour markets, which typically have low rates of wage earners (only 36% of employed workers in all the cities considered are salaried employees) and no operational institutions to register job seekers and help them to find a job.

4.2.1. A mixed bag of correlations between unemployment and level of education

Taking all the WAEMU cities together, the unemployment rate is the lowest (14.6%) among those individuals without the minimum level of schooling. It rises to 20%-21% for those with levels ranging from completed primary schooling to completed secondary schooling. It then drops slightly (19%) among those individuals who have completed at least one year of higher education. Lastly, the fact that human capital is thin on the ground does not appear to protect those who have it against unemployment. This is particularly true in Lome where unemployment increases strictly with the level of education (from 8% for those with no education to 23% for those with higher education). The trends are less linear in the other cities. In most cases, unemployment tends first to increase with the level of education, but then decrease with the completion of secondary school and entry into higher education studies. This is particularly the case in Cotonou, Dakar and Ouagadougou where higher education somewhat reduces the extent of unemployment.

Findings from a logit of the probability of being unemployed[12] controlling for individual and household characteristics such as age, gender, migratory status, marital status, household's per capita

[12] These findings are not presented to save space but are available on request from the authors.

income, how the individual is related to the head of household and the household's dependency ratio, are similar to those of the descriptive analysis. *Ceteris paribus*, individuals without the minimum level of schooling appear to be less exposed to unemployment that those who have at least completed primary school, probably indicating lower job aspirations for the former. Lome shows a strong positive relation between unemployment and education. Cotonou and Abidjan also follow this trend. In the other cities, the link between unemployment and level of education takes the bell shape observed previously. The fact that investment in human capital does not always open the door to employment reflects the state of deterioration on the African urban labour markets. This deterioration is due to the failure (or absence) of urbanisation policies unable, for whatever reason, to set in motion a drive to create skilled jobs. It is also a consequence of the structural adjustment policies whose credo was, among other things, to reduce staff in the civil service. This explanation is all the more plausible in that among the individuals aged 45 to 59, who entered the labour market before the urban boom and before the full force of the structural adjustment plans was felt, higher education is synonymous with a low risk of unemployment across all the countries.

Although being unemployed is an indicator of exclusion from the labour market, having a job does not always guard well against precariousness. In the following, we look at the link between education and the quality of the job held in addition to its impact on unemployment.

4.3. The "qualitative" balance on the urban labour markets: the match between education and job

A quantitative analysis of the balance on the labour markets reveals the existence of not-inconsiderable unemployment against which human capital accumulation is no shield, especially among young people. An analysis of external efficiency should also consider the correspondence between level of education and job quality. Job quality is studied here in terms of the employment sector: public formal, private formal and informal.

4.3.1. Close correspondence between level of education and institutional sector

There is a very close link between level of education and employment sector. In all of the cities, virtually all of the employed workers (91%) who did not start or complete primary school work in the informal sector. Complete primary schooling brings the proportion in the informal sector down to 75% and the fact of having completed middle school further reduces it to 50%. Only 19% of the individuals who entered higher education work in the informal sector. Give or take a few fluctuations, this configuration holds for all the cities except Lomé. Although, in the Togolese capital, the formal sector clearly supplants the informal sector as the level of education rises, this trend is slower than in the other cities and a not-inconsiderable proportion (39%) of people with higher education work in the informal sector. However, it is worth noting that this city also displays a phenomenon whereby 95% of individuals who did not start or complete primary school work in the informal sector. Even when controlling for a certain number of factors (those described previously) using a multinomial logit model of sector participation (not shown but available on request from the authors), the link between level of education and employment sector barely changes, regardless of the city considered.

Although the level of education plays an important role in access to the modern sector, the type of education also has an important effect. For example, only 37% of the individuals with vocational training[13] work in the informal sectors as opposed to nearly 50% of their counterparts who reached an equivalent level in the secondary system (having completed at least middle school without reaching secondary school). When the cities are taken separately, vocational education is found to be a better instrument for integration into the modern sector than general education in Niamey, Dakar, Bamako,

[13] Individuals who completed at least four years of vocational education and who therefore obtained at least the Occupational Proficiency Certificate (CAP).

Cotonou and Lome. Approximately 82% of the Nigerian capital's workers with vocational training work in the formal sector, as opposed to 71% in Dakar and Bamako, 58% in Cotonou and 50% in Lomé. By way of comparison, the proportion of people who had completed general studies at middle school and worked in the formal sector stood at 68% in Niamey, 55% in Dakar, 41% in Bamako, 44% in Cotonou and 30% in Lome. However, in Abidjan and Ouagadougou, vocational education shows no advantage over general education in terms of the chances of entering the formal sector.

4.4. The impact of education on earnings

We now investigate the effect of education on inter-individual earnings differentials using the methods described in Section 3. First, let us note that the average monthly earned income for individuals aged 15 and over in the WAEMU cities is 63,000 CFA francs (96 euros in 2006)[14]. There are some substantial differences between cities (see Table 3). A worker in Abidjan earns an average 78,000 CFA francs (119 euros) per month whereas a worker in Dakar earns 67,000 CFA francs (102 euros) per month and a worker in Lome earns a mere 35,000 CFA francs (53 euros) per month. The other cities are in intermediate positions with earned incomes of 49,000 to 59,000 CFA francs.

At this aggregate level, there appears to be no clear link between the level of earnings and the level of human capital as measured by education. For example, Lome paradoxically posts the lowest average earnings and the highest average number of years of education. Conversely, workers are much better paid in Abidjan and Dakar where average levels of education are lower than in Lomé. However, there is a very close link at the individual level between level of education and earned income. For instance, across all the cities, incomes range from 39,000 CFA francs for those lacking minimum basic knowledge (not up to standard or incomplete primary schooling) to 122,000 CFA francs for those who completed second secondary cycle. Entry into higher education prompts a huge quantitative leap with earnings virtually doubling (from 122,000 to 228,000 CFA francs, i.e. 186 to 348 euros). Taken separately, each city follows this same earned income curve: steady growth through to the end of secondary school followed by a surge at higher education level.

Breakdown by sector also reveals substantial earnings inequalities. For example, public-sector workers earn an average of 145,000 CFA francs (221 euros) per month, which is approximately three and a half times more than informal sector workers who scrape by with just 40,000 CFA francs (61 euros) per month. Formal private sector workers are also winners on the labour market with 122,000 CFA francs per month. This bipolar configuration is found in all the cities studied: high earnings in the public sector, followed closely by the formal private sector (except in Abidjan where public-sector earnings are far higher – one and a half time – than that of the formal private sector), while the informal sector lags far behind these high yields.

4.4.1. Returns to exogenous education

The descriptive analyses above show the huge variability in earned incomes in the major West African cities: variability by city, level of education and employment sector. Yet although these analyses find a close link between investment in education and earnings, it is hard and tricky to deduce the intrinsic efficiency of investment in human capital on the labour markets considered. Isolating this efficiency entails first controlling for a certain number of factors that could affect remuneration. In the earnings regressions, we account for the individuals' migratory status, marital status, religion, job seniority, potential experience, gender and employment sector. Moreover, a not-inconsiderable proportion (approximately 40% in all the cities) of the potentially working population aged 15 and over is either out of the labour force or unemployed. Although this decision to not work is not random, any estimate of returns to education not taking into account non-participation is potentially biased.

[14] Income in terms of Purchasing Power Parity (PPP). Dakar's PPP factor was taken as the reference.

In this section, we report the results obtained using the selection-correction models using the methods advocated in Section 3 on the seven (unrestricted) samples of the WAEMU cities. In these estimates, education is assumed exogenous but we will relax this assumption later on. The estimates are performed using the log of hourly rather than monthly earnings to take account of the heterogeneity of working hours in different sectors. In addition, the probable segmentation of the labour market calls for an estimation of models by employment sector. The findings of all these exercises are presented in Tables 4 to 8 in the Appendix.

Whichever city is considered, we find a non-constant rate of returns to education in each city, the quadratic term of education being always significant and positive at the 1% level[15]. These convex marginal returns mean that education has a growing impact on remunerations in the urban labour markets. In Figure 2, we represent the evolution of the predicted earnings according to the years of completed schooling. We observe that the predicted earnings are relatively constant until the 8th year of education, and sharply increase after the 12th year of schooling indicating that the convex profile is, to a large extent, due to the surge of income observed when individuals make the transition from secondary to higher education.

Insert Figure 2 about here

This result goes against the traditional model of human capital accumulation whereby the marginal return to education is assumed to be constant or even decreasing. This convexity has already been observed by Söderbom et al. (2006) on samples of employees in manufacturing firms in English-speaking Africa (Kenya and Tanzania) but never, to our knowledge, on representative samples of urban areas in Africa. This result is important because the idea that primary education is an effective instrument to fight against poverty is based partly on the hypothesis of a concave earnings function, which states that education is more profitable for the first years of schooling. Recommendations for policies aimed at promoting primary education in Sub-Saharan Africa were drawn up on the basis of this premise (Psacharopoulos and Patrinos, 2002).

The non-linear nature of the relationship between years of education and remuneration means that it is impossible to estimate a single marginal return. Instead, we have to estimate an average marginal return, i.e., for instance, a marginal return corresponding to the average number of years of education. This estimate finds that Ouagadougou has the highest returns to education, at nearly 10.3%. Next in line are Lome (8.5%), Niamey and Abidjan (8%), Cotonou (7.8%) and Dakar (7.2%). At the bottom of the scale, the average return in Bamako is just 6%.

In addition, our estimates confirm a certain number of findings noted by other studies. For example, women in all the cities earn, other things being equal, from 29% (in Niamey) to 48% (in Bamako) less than men. Likewise, the informal sector pays a lot less than the formal private sector[16], which pays slightly less than the public sector[17]. Finally, the selection-correction terms stemming from a probit equation of paid-work participation in the first stage are significant in the cases of Cotonou, Abidjan and Bamako only (at the 1% level, with negative signs for the formers and a positive effect for the latter). For these cities, this means that the mechanism of allocation in the two groups (paid-work participants versus non-participants) is not random and affects earnings significantly. In the case of Mali, paid-work participation is associated with unobserved characteristics that are positively correlated to earnings. Be sample selectivity not accounted for, OLS estimates would then yield biased estimates of the returns to schooling. We return to this point later.

[15] We instigated whether our findings are sensitive to functional form by considering the effects of modelling the earnings-education profile as a third-order polynomial (i.e. a cubic) instead of a quadratic form. The results are not shown and available on request. The squared and cubed education effects are jointly insignificant at the 10% level in three cases (Benin, Senegal and Togo) out of seven. We therefore preferred to use a quadratic form in order to preserve the comparability across cities and to save on degrees of freedom.

[16] The difference between private formal and informal sectors range from 23% in Bamako to 62% in Ouagadougou.

[17] With deviations varying from some 3% in Bamako and Niamey to about 20% in Abidjan and Lome.

By estimating the magnitude of the returns to schooling using pooled samples including male and female individuals aged 15 and over, we rely on two important, and potentially restrictive, assumptions. Firstly, by pooling the data across genders, we constraint the returns to labour market characteristics to be identical for males and females. This might be a problem as women often have less continuous work participation than men and, as a result, may value their human capital differently on the labour market. However, as we correct for sample selection in work participation, this problem is probably not too severe since in so doing we tackle, though partially, the gender selectivity issues related to work participation[18]. Still, it is interesting to check whether the rewards for human capital, in particular for education, differ across genders. We then perform separate regressions for males and females (the estimates are not shown and available on request). Our results show that the returns to schooling are generally higher for men except in Abidjan where they are equal for males and females. The highest gap is found in Lome where men benefit from 10.6% versus 6.2% for women. More often, however, these differences are less than two percentage points (in Niamey, Bamako and Ouagadougou) and are statistically insignificant at the usual confidence interval.

Insert Table 5 about here

Secondly, considering young and old individuals in the same regressions, or more generally individuals belonging to different age cohorts, is potentially problematic if these two categories receive different rewards for their observed work characteristics due to differentiated labour market conditions at the time they got their job. Pooling these individuals implies that there is no generation effect in the return to human capital. As this assumption does not necessarily hold, we relax it by estimating earnings functions with crossed age effects. In Table 5, we introduce into the previous earnings functions the same covariates crossed with a dummy indicating whether the individual is above 30 years old (old). If the set of estimates associated with the crossed variables is significantly different from zero, this means that one must reject the assumption of equal rewards of individual characteristics for young and "old" workers. Since we are more specifically interested in the return to education, we perform a F-test of joint significance of the linear and squared crossed education-age coefficients. The results are reported at the bottom of Table 5. They indicate that generation effects are not significant when looking at the returns to education in three cases (Cotonou, Niamey and Lome). In the four other cases (Ouagadougou, Abidjan, Bamako and Dakar), there are significant differences in the earnings-education profiles across the two cohorts since we can reject at the 1% level the hypothesis that the crossed education effects are jointly zero. If we compute the returns at the sample mean of education in the four abovementioned cases, we observe that the rewards are higher for young individuals in the cases of Ouagadougou and Dakar (respectively, 11.3% versus 9.5% and 9% versus 6.5%) while this is the opposite in Abidjan (6.3% versus 8.7%). However, Bamako exhibits no important differences at the sample mean (5.4% versus 5.9%). More specifically, in the cases of Bamako, Ouagadougou and Abidjan, the significant negative signs on the coefficients of the crossed squared education term indicate that the convex earnings-education profile previously observed is more acute for young workers than for their elder counterparts. Hence, in Bamako, the significant difference in the marginal returns to education across cohorts stems from differentiated rewards at higher levels of schooling.

The use of a single model to all gainfully employed individuals can only observe the average effect of education on earnings owing to specific effects found in each employment sector. In the case in which these specific effects differ little from one sector to the next (i.e. education acts in the same way in the informal, formal private and public sectors), an overall model suffices to be able to draw conclusions applicable to each of the labour market segments. Where these effects vary a great deal, it is also

[18] A fair option would have been to work on the samples of men only. However, when looking at the results, this seems to us to be exaggerating the impact on the qualitative aspect of our study that produces considering both genders in the regressions. Besides, this option would lead to drastically reduce the sample sizes (by half) and, as a result, the precision and representativeness of the estimates by sector since women tend to work massively in the informal sector (86% of active women).

essential to estimate the returns to education separately for each sector. These estimates corrected for potential selectivity bias using Lee's method are reported in Tables 6, 7 and 8[19].

Insert Tables 6, 7 and 8 about here

As expected, the models' explanatory power goes in descending order from public employment, to private employment, then to informal employment, with R^2 decreasing on average from 0.47, 0.37 to 0.25 respectively for each of the three sectors. This hierarchy is consistent with the predictions of the standard human capital model, as this is better suited to accounting for the heterogeneity of earnings in the public sector where wages are based on a set scale that takes these criteria (education, experience) explicitly into account. On the other hand, in the informal sector, apart from the probability of greater measurement errors, other factors not taken into account in our equation, such as the amount of capital, are likely to have a significant impact on earnings.

Chow tests for the joint equality of coefficients across sectors show that the decomposition by institutional sector is justified. Indeed, we find highly contrasting configurations. First, in the informal sectors of most cities (except that of Bamako and Niamey), the selectivity correction terms are significant and negative at the 1% level indicating that informal sector participation is associated with unobserved characteristics that are negatively correlated to earnings differentials. This effect is less clear, however, in the formal private sector and even more in the public sector which highlights a higher heterogeneity of the selectivity effects across cities (either negative or positive, and significant in only two cases out of seven).

Insert Figure 3 about here

To synthesize the results for education, Figure 3 represents histograms of the marginal returns to education by sector and city. In five cities out of seven, the estimates show that the public sector is the sector in which education is given the most value, with a marginal return (at the sample mean of education) of between 9.6% (in Dakar) and 13.8% (in Lome). This reflects, to a great extent, the salary scales for civil servants, which are determined according to diploma and length of service. The modern private sector comes next (except in Niamey and Lome where it is the most rewarding) and, finally, the informal sector, with the exception of the capital of Burkina Faso where the informal sector seems to give more value to the benefits of schooling than the formal private sector (7.4% versus 6.6%). As is claimed in Söderbom et al. (2006), in the public sector, earnings are determined by a number of factors orthogonal to productive ability and so the returns to education have a different interpretation in this sector than in the private ones.

We also performed sectoral earnings functions with crossed age effects as in Table 5 (these are not shown and available upon request). Table 9 provides an overview of the returns obtained. We find that while the returns are always higher for old workers in the formal private sector (except in the case of Bamako), education is often given more value in the informal sector for the youngest (with the exceptions of Abidjan and Bamako). In the public sector, however, there is less clear pattern and the differences are never statistically significant[20].

Insert Table 9 about here

4.4.2. Returns to endogenous education

Following the methods described in section 3, we now turn to additional results tackling the potential problem of endogeneity of education in the earnings function. In what follows, we should interpret the estimates as robustness checks of the returns to schooling presented previously, and not as

[19] We drop the tenure variable from the set of covariates in the sectoral estimates as seniority in the current job makes less sense in the informal sector.

[20] Note however that some sub-sample sizes of age groups invite us to consider the results with cautious.

representative ones, since we make use of restricted samples which are now unrepresentative of the main WAEMU cities. However, specific tests of equality of the mean characteristics between the restricted and unrestricted samples allow us to assume that the conclusions we may draw from the estimates using the restricted samples could well be generalised to the entire populations of paid-work participants[21].

Insert Table 10 about here

The marginal returns to education obtained using the different alternative estimation techniques for the three sectors are reported in Table 10. Let us first note that correcting for selectivity effects using Lee's approach refines the estimated returns to education as compared to estimates obtained using simple OLS. The correction is even more important in the public sector where the marginal return to education tends to decrease once endogenous sample selectivity is accounted for (with the exception of Dakar). Compared to selectivity corrected returns, introducing the father's characteristics (three dummies for his level of education and three dummies for his work status i.e. self-employed, unqualified wage-employee, and executive or manager), we observe that the returns to education are essentially unchanged. In fact, the father's characteristics are never statistically significant in the earnings functions (with the exception of earnings in the formal private sector in Lome and in the public sector in Dakar). Therefore, such results cast doubt on the validity of using the father's characteristics as proxies for the ability of his child. The father's characteristics may be better used as instruments. For this reason, we proceed to use the father's characteristics as instruments to correct for the omitted heterogeneity bias employing the control function (CF) method described in section 3. Based on the first stage regressions where education is regressed on all exogenous variables, we test for the joint significance of the coefficients on father's characteristics. For all the specifications, we can reject the hypothesis that these coefficients are jointly zero. From the CF estimates of the returns to schooling, several interesting patterns emerge.

First, in 15 cases out of 21 (three sectors for seven cities), the results suggest that treating education as an endogenous variable increases the estimated returns. This finding is even more true in the public and in the informal sector where, with the exceptions of the public sector in Ouagadougou and Niamey and the informal sector in Abidjan, the returns to schooling are systematically enhanced once endogeneity is accounted for. This may be explained by the fact that estimation techniques treating education as exogenous suffer from the so-called attenuation bias caused by measurement errors in the reported years of schooling. However, in the formal private sector, this pattern is less clear since in Abidjan, Niamey and Lome, the returns decrease as a result of controlling for endogeneity of education. In such cases (together with the public sector of Niamey and the informal sector in Abidjan), we would be in presence of positive correlations between schooling and the individuals' unobserved ability. Finally, to summarise, the findings from the CF estimates is in favour of the hypothesis of endogeneity of education, which never seems to be firmly rejected by the data[22].

Lastly, we add the household fixed effects (HFE) to the control function regressions. Our purpose is to fully capture other aspects believed to influence earnings, namely access to information for better jobs or the so-called networks effects (see section 3). In so doing, the problem is that we reduce the number of degrees of freedom in the models, especially in the cases of the public and private sectors where the sample sizes are small. This may explain why the significance of the different returns is severely reduced. This means that we should interpret these results with cautious, especially those of the public and private sector estimates. What the results highlight, however, is that accounting for household

[21] We performed Hotelling's T-squared test of whether the set of means of the overall individual characteristics is equal between the restricted and unrestricted samples. These tests always reject at the 1% level the null hypothesis that the characteristics are equal. However, when looking at specific tests for the variables of interest (education and earnings) the conclusions are less definite. Tests of equality of the means of hourly earnings between the restricted and unrestricted samples show that we cannot reject the null hypothesis of equality at the 10% level in five cases (Cotonou, Abidjan, Bamako, Lome and Niamey). As for education, the tests cannot reject the null in three cases (Abidjan, Bamako and Niamey) but the difference for the other cities is very small (always less than a year). Finally, if the restricted and unrestricted samples cannot be considered as similar in terms of individual characteristics, the specific tests on the main variables of interest are somehow reassuring in that there is no – or only a weak – difference in education and earnings between individuals in the restricted and unrestricted samples.

[22] The only exception might be the case of the public sector in Ouagadougou.

heterogeneity is essential when estimating the returns to schooling[23]. For instance, in the informal sector, where the estimates are the most robust due to the large sample sizes, we find that the returns to education are quite systematically modified (but not always in the same direction). This important result supports the idea according to which social capital may largely be at work in the relationship between education and labour market outcomes in the urban labour markets of these African countries.

4.4.3. Returns to qualifications

The fact that the earnings function is convex prompted us to make more detailed analyses, measuring the returns to different levels of instruction and not just to an average rate. To do so, we estimate the marginal returns to holding a diploma, thus accounting for the quality of the school career and the potential filter effects that might be attached to obtaining a diploma (Arrow, 1973; Spence, 1973). Besides, taking account of the previous results, we control for the endogeneity of education using the CF method (on the unrestricted samples) which is well adapted when the earnings-education profile is non-linear in the estimated parameters.

Returns to qualifications can be studied in at least two ways. One way is to directly consider the regression model coefficients. In this case, the coefficient associated with each qualification dummy is interpreted as the rate of increase in earnings between individuals with no qualifications (the reference in the regressions) and individuals with the qualification considered. Another way is to calculate the marginal returns obtained by subtracting from the considered qualification's coefficient (qualification d) the value of the coefficient for the qualification immediately below it (qualification d-1). For example, the marginal returns to a *baccalauréat* plus two years of higher education (BAC+2) are calculated by finding the difference between the coefficient for the BAC+2 and the coefficient for just the *baccalauréat* alone. The returns to a primary certificate (CEP) are calculated as the difference compared to the "no diploma" category, that of the middle school certificate (BEPC) compared to the CEP, that of the BAC compared to the BEPC, etc. The marginal returns hence correspond to the increases in earnings generated by the acquisition of the successive qualifications. In this paper, we choose to interpret the marginal returns since they measure the additional value of each qualification rather than the value compared with "no qualifications", which can almost always only ever be positive.

Insert Figures 4, 5 and 6 about here

The various sectoral earnings functions are not presented to save space but are available upon request[24]. Instead, we report histograms of the marginal returns to the various qualifications for each sector in Figure 4 to 7. Not surprisingly, the effect of each qualification on remuneration is positive overall with a huge quantitative leap for higher education, as already shown by the descriptive analyses. The most striking result is that, depending on the capitals, a certain number of diplomas do not have positive intrinsic marginal returns. This situation either reflects the inadequacy of the training considered with respect to the labour market, or the fact that certain diplomas do not in fact target the labour market but are solely aimed at giving access to higher levels of education. Although the latter hypothesis can be put forward to explain the low marginal profitability of a few diplomas in the public sectors of the seven capitals (like the short higher education courses in Bamako, Niamey, Ouagadougou, and Dakar, Figure 4), the fact that for a large number of diplomas additional earnings are nil or negative in the formal private sector (Figure 5) suggests, as we stressed in the introduction, that many of the training schemes set up by the State do not correspond to the needs of the labour market in this sector.

Insert Figure 7 about here

[23] F-tests of the joint significance of the HFE all reject the hypothesis of joint nullity at the 1% level.
[24] We neglect the potential generation effects in the regressions for the sake of simplicity.

None of the capitals escapes from this lack of connection between the level of training revealed by the diploma and the remuneration obtained on the formal private labour market. In the informal sector (Figure 6), the marginal earnings seem to be more coherent with the level of training acquired than in the formal private sector (but less than in the public sector). This result goes against the idea that the informal sector does not enhance the value of educational capital. Furthermore, the profitability of education in the informal sector is illustrated in a spectacular way by the income bonus received by individuals when they have a vocational diploma (in particular the BEP, Figure 7), in a sector where the returns to vocational training very often exceed those that the same diploma can procure in the formal private sector. Moreover, vocational education qualifications are often found to be more profitable than general education qualifications when compared with the number of years required to obtain them. For example, although it generally takes one year less to obtain the vocational certificate (BEP) than to obtain the *baccalauréat*, the BEP seems to be as profitable as the baccalaureate in all the cities (some differences of returns being insignificant at 10%, results not shown). The returns to the BEP are even found to be significantly over 30% higher than the returns to the *baccalauréat* in the formal private sector of Cotonou, and in the informal sectors of Bamako and Lome.

5. CONCLUSION

The purpose of this paper was to study the effects of education on urban labour market participation and earnings in seven major cities of the WAEMU (Abidjan, Bamako, Cotonou, Dakar, Lome, Niamey and Ouagadougou). Based on the unique and comparable *1-2-3 surveys* in these seven capitals, we find that although education does not always guard against unemployment, it does increase individual earnings in these labour markets by opening the door for the most well-educated to get into the most profitable niches, which are found in the formal private and public sectors. Apart from this relatively predictable result, our analyses helped refine the indicators generally used in SSA to assess the efficiency of education for labour market integration and highlight the complexity of the mechanisms involved in enhancing the value of education in the urban labour markets of SSA.

Whereas traditional theories assume constant or concave marginal returns to education, which ensure immediate, high profitability from the first years of schooling, the data from the *1-2-3 surveys* helped bring to light convex returns to education. In the cases of Bamako, Ouagadougou and Abidjan, the convex earnings-education profile observed is more acute for young workers than for their elder counterparts. These results mean that stimulating access to primary education is only effective in reducing poverty if the individuals concerned by this type of initiative can continue their studies in order to take full advantage of the high marginal returns related with long studies. However, this poses the delicate question of managing the flows of students leaving the general secondary and higher education cycles, which could certainly benefit from an in-depth review on the (too) general content of the schooling programmes, in order to readapt them to the labour market demands.

Our study tackles two recurrent econometric issues when one wants to assess the effect of education on individual earnings. First, we find that endogenous sample selectivity related to informal sector participation is, in most cities, associated with unobserved characteristics that are negatively correlated to earnings differentials. This effect is less clear, however, in the formal private sector and even more in the public sector which emphasize a higher variability of the selectivity effects across cities. Second, in most cities, the assumption of exogeneity of the education variable can be rejected, and our results cast doubt on the validity of using the father's characteristics as proxies for the ability of his child. Using a control function approach instead, with father's education and work status as instruments, we find that the returns to schooling are often enhanced. This effect is particularly true in the public and informal sectors but its magnitude depends on the city considered. Not controlling for the endogenous education may also lead to upward-biased estimates of the returns to schooling in some cities which, to sum up, sheds light on the complexity of the mechanisms linking education and earnings across cities and sector affiliation. Moreover, making use of household fixed effects regressions, we bring some support to the idea according to which social capital may largely be at

work in the relationship between education and labour market outcomes in the urban labour markets of these African countries.

Finally, a major contribution made by this study is to have shown that educational capital, even at high levels, provides a substantial growth in earnings in the informal sector in most of the cities studied[25]. This result has strong political implications: in African towns, there is currently an explosion in the numbers of highly qualified young people who are unable to find jobs to fit their skills in the formal sectors. If their schooling helps them, in the informal sector, to be more productive (probably thanks to innovation and adaptability) than their counterparts who have little or no education, the household and government investments made for their education are not in vain. Given that the informal sector has created over 80% of urban jobs in West Africa in recent years (Brilleau et al., 2005), concentrating public investments in employment in this sector with really attractive policies for the most qualified people could be, at least in the short term, a serious alternative to the lack of employment observed in the formal public and private sectors. Such a policy, coupled with continued support to primary and post-primary education, could also pay off in the medium to long term by generating the accumulation required for the modern economy to take off in the African cities.

[25] Of course, the informal sector's heterogeneity in this respect deserves consideration, notably the possible co-existence of different employment segments within the informal activity with own specific features. We leave this for future research.

APPENDIX

Table 1: PARSTAT Survey Sampling

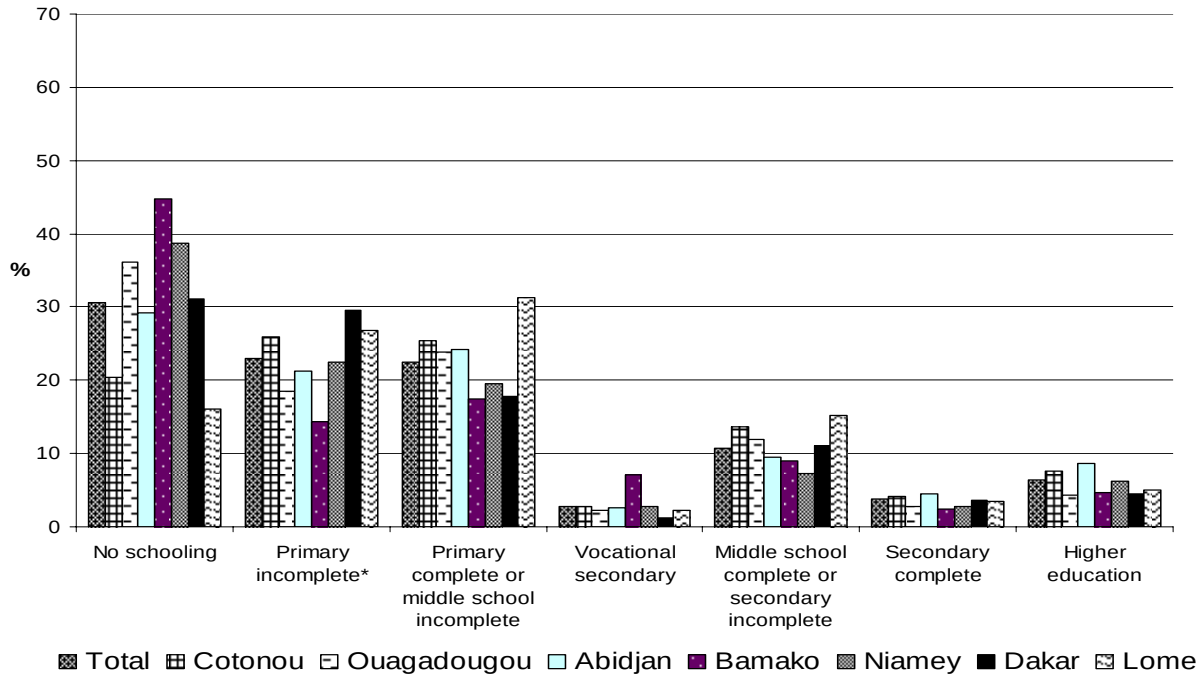
	Cotonou	Ouagadougou	Abidjan	Bamako	Niamey	Dakar	Lome	Total
Total number of primary units	464	713	2,483	993	368	2,041	129	7,191
Number of primary units in the sample	125	125	125	125	125	125	125	875
Initial number of households in the sample	3,000	2,500	2,500	2,500	2,500	2,500	2,500	18,000
Final number of households in the sample	3,001	2,458	2,494	2,409	2,500	2,479	2,500	17,841
Number of individuals in the sample (inc. visitors)	11,574	13,756	11,352	13,002	14,557	19,065	9,907	93,213
Number of individuals aged ten and over in the sample	8,967	10,295	8,682	9,061	10,141	14,871	7,548	69,565

Source: 1-2-3 surveys, Phase 1 (Employment), 2001-2002, National Institutes of Statistics, AFRISTAT, DIAL.

Table 2: Method of Declaring the Variable Relating to Income from the Main Job (%)

	Cotonou	Ouagadougou	Abidjan	Bamako	Niamey	Dakar	Lome	Total
Detailed income	51.2	42.5	53.2	54.3	42.1	38.3	55.0	48.1
Income bracket	32.3	44.4	34.1	35.2	32.9	41.5	31.2	36.2
Unpaid worker	14.6	7	9.8	4.1	11.5	11.6	12.3	10.3
Income not disclosed	2.0	6.1	2.9	6.4	13.4	8.7	1.5	5.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Figure 1: Distribution of Individuals Aged 15 and Over by Education Level and City



Source: 1-2-3 surveys, Phase 1 (Employment), 2001-2002, National Institutes of Statistics, AFRISTAT, DIAL; authors' calculations. * Did not reach the last year of that level of schooling.

Table 3: Summary Statistics of the Samples of Paid-Work Participants

	Cotonou (Benin)		Ouagadougou (Burkina Faso)		Abidjan (Côte d'Ivoire)		Bamako (Mali)		Niamey (Niger)		Dakar (Senegal)		Lome (Togo)	
Observations (individuals with positive earnings)	4398		4211		4262		4032		3601		5434		3916	
Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Hourly earnings in PPA	0.29	0.47	0.29	0.71	0.49	0.98	0.36	1.00	0.36	0.90	0.44	1.11	0.22	0.47
Log hourly earnings in public sector	-0.77	0.81	-0.70	0.77	0.00	0.72	-0.66	0.74	-0.75	0.81	-0.42	0.74	-0.96	0.89
Log hourly earnings in formal private	-1.17	0.82	-1.01	0.92	-0.72	0.96	-1.23	1.09	-1.13	1.09	-0.89	0.89	-1.40	1.04
Log hourly earnings in informal sec.	-2.04	0.93	-2.36	1.01	-1.81	0.97	-1.95	1.05	-2.03	0.98	-1.75	0.96	-2.40	0.99
Dummy for woman	0.52		0.41		0.44		0.44		0.36		0.43		0.52	
Age in years	35.92	11.58	34.98	12.23	33.32	10.69	35.00	12.44	36.90	12.26	35.08	12.44	33.89	11.01
Dummy for above 30 years old	0.61		0.58		0.53		0.59		0.66		0.57		0.56	
Dummy for being native	0.45		0.41		0.28		0.43		0.36		0.58		0.40	
Dummy for urban migrant	0.27		0.36		0.43		0.31		0.28		0.25		0.35	
Dummy for rural migrant	0.19		0.12		0.07		0.18		0.25		0.11		0.12	
Dummy for foreign migrant	0.10		0.10		0.21		0.07		0.10		0.03		0.14	
Dummy for monogamous married	0.55		0.50		0.44		0.48		0.52		0.38		0.47	
Dummy for polygamous married	0.16		0.14		0.04		0.20		0.15		0.15		0.13	
Dummy for free union	0.02		0.02		0.07		0.00		0.00		0.00		0.03	
Dummy for single	0.21		0.29		0.38		0.28		0.25		0.40		0.28	
Dummy for divorced	0.03		0.01		0.03		0.01		0.03		0.04		0.06	
Dummy for widowed	0.03		0.04		0.03		0.02		0.04		0.03		0.04	
Dummy for Christian	0.81		0.42		0.45		0.03		0.03		0.07		0.52	
Dummy for Muslim	0.10		0.57		0.43		0.96		0.97		0.93		0.11	
Dummy for other religion	0.09		0.01		0.12		0.01		0.00		0.00		0.37	
Completed years of education	5.92	5.14	4.47	5.10	5.30	5.21	4.13	5.16	4.80	5.52	4.75	4.90	6.09	4.59
Dummy for no schooling	0.55		0.62		0.57		0.67		0.65		0.67		0.48	
Dummy for primary certificate (CEP)	0.22		0.18		0.20		0.14		0.14		0.14		0.30	
Dummy for middle school cert. (BEPC)	0.10		0.09		0.07		0.04		0.05		0.09		0.12	
Dummy for occupational proficiency certificate (CAP)	0.02		0.02		0.01		0.03		0.02		0.01		0.01	
Dummy for vocational certificate (BEP)	0.00		0.01		0.01		0.05		0.02		0.01		0.01	
Dummy for *baccalauréat* (BAC)	0.02		0.02		0.03		0.01		0.02		0.03		0.02	

Table 3: Summary Statistics of the Samples of Paid-Work Participants (Contd.)

	Cotonou (Benin)		Ouagadougou (Burkina Faso)		Abidjan (Côte d'Ivoire)		Bamako (Mali)		Niamey (Niger)		Dakar (Senegal)		Lome (Togo)	
Observations (individuals with positive earnings)	4398		4211		4262		4032		3601		5434		3916	
Variables	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Dummy for two years of higher education (DEUG/DUT/BTS)	0.01		0.01		0.03		0.01		0.01		0.01		0.01	
Dummy for over two years of higher ed.	0.05		0.04		0.05		0.04		0.06		0.03		0.03	
Potential experience in years (age-education-6)	23.99	12.50	24.50	13.82	22.04	11.50	24.88	13.14	26.18	14.35	24.26	13.35	21.82	12.16
Seniority in the current job in years	8.13	8.34	6.68	7.48	6.32	6.73	8.04	8.20	8.71	8.61	9.96	8.23	6.12	7.32
Dummy for father executive or manager	0.12		0.06		0.10		0.12		0.08		0.09		0.10	
Dummy for father wage-employee	0.16		0.15		0.16		0.11		0.13		0.22		0.19	
Dummy for father self-employed	0.48		0.53		0.56		0.55		0.53		0.39		0.50	
Dummy for father with no schooling	0.52		0.79		0.65		0.64		0.79		0.44		0.45	
Dummy for father with 1-5 years of ed.	0.21		0.07		0.19		0.14		0.07		0.03		0.21	
Dummy for father with 6-9 years of ed.	0.15		0.05		0.07		0.04		0.04		0.07		0.16	
Dummy for father with 10-25 y. of ed.	0.13		0.05		0.07		0.07		0.05		0.06		0.12	
Dummy for household head	0.51		0.44		0.49		0.43		0.54		0.29		0.52	
Dummy for head's spouse	0.28		0.26		0.18		0.28		0.20		0.14		0.23	
Dummy for head's child	0.12		0.17		0.10		0.14		0.16		0.28		0.12	
Dummy for head's parent (father/mother)	0.00		0.01		0.00		0.01		0.01		0.01		0.00	
Dummy for head's other parent	0.07		0.11		0.16		0.09		0.08		0.24		0.10	
Dummy for head's not parent person	0.01		0.01		0.04		0.01		0.01		0.02		0.02	
Dummy for head's domestic	0.02		0.01		0.03		0.04		0.01		0.02		0.02	
Inverse dependency ratio (working indiv. / indiv. in the household)	1.41	1.33	1.03	0.88	1.28	1.13	0.93	0.85	0.94	1.04	1.09	1.13	1.39	1.05
Dummy for working in the public sector	0.10		0.15		0.08		0.11		0.18		0.09		0.09	
Dummy for working in the formal private sector	0.12		0.08		0.21		0.11		0.13		0.18		0.08	
Dummy for working in the informal sector	0.78		0.77		0.72		0.78		0.69		0.73		0.83	

Source: 1-2-3 surveys, Phase 1 (Employment), 2001-2002, National Institutes of Statistics, AFRISTAT, DIAL; authors' calculations. The figures are weighted by the sampling ratio of the surveys.

Table 4: Selectivity Corrected Earnings Functions (all Sectors)

Dependent variable: log of hourly earnings

	Cotonou (Benin)	Ouagadougou (Burkina Faso)	Abidjan (Côte d'Ivoire)	Bamako (Mali)	Niamey (Niger)	Dakar (Senegal)	Lome (Togo)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Completed years of education	0.043***	0.071***	0.011	0.022**	0.048***	0.045***	0.020*
	(5.47)	(8.19)	(1.45)	(2.39)	(4.54)	(5.40)	(1.94)
(Completed years of education)^2	0.003***	0.003***	0.006***	0.004***	0.003***	0.003***	0.005***
	(5.59)	(6.34)	(10.65)	(6.83)	(6.02)	(4.93)	(6.66)
Potential experience	0.013**	0.045***	0.025***	0.044***	0.031***	0.042***	0.030***
(age – years of education – 6)	(2.42)	(8.54)	(5.10)	(7.40)	(6.64)	(9.70)	(5.19)
(Potential experience)^2/100	-0.009	-0.052***	-0.019**	-0.053***	-0.031***	-0.048***	-0.034***
	(1.05)	(6.89)	(2.33)	(6.05)	(4.92)	(7.64)	(4.12)
Seniority in current job	0.024***	0.028***	0.029***	0.027***	0.033***	0.028***	0.032***
	(4.90)	(5.85)	(4.60)	(5.66)	(6.13)	(6.52)	(5.43)
(Seniority in current job) ^{2}/100	-0.041***	-0.038***	-0.066***	-0.042***	-0.054***	-0.043***	-0.056***
	(2.66)	(2.61)	(3.02)	(2.69)	(3.15)	(3.63)	(3.01)
Woman	-0.449***	-0.422***	-0.387***	-0.481***	-0.289***	-0.337***	-0.350***
	(16.75)	(12.11)	(12.79)	(14.94)	(8.06)	(12.39)	(9.96)
Public sector	0.382***	0.659***	0.687***	0.267***	0.454***	0.468***	0.618***
	(8.93)	(15.88)	(14.48)	(5.69)	(10.56)	(11.72)	(9.24)
Formal private sector	0.242***	0.625***	0.485***	0.236***	0.426***	0.423***	0.429***
	(6.39)	(14.19)	(14.36)	(4.07)	(8.79)	(11.54)	(6.76)
Selection correction							
Inverse Mills ratio	-0.153***	-0.052	-0.141***	0.149***	0.027	0.011	-0.045
	(2.77)	(1.30)	(3.41)	(2.94)	(0.52)	(0.27)	(0.77)
Constant	-2.196***	-3.186***	-2.194***	-2.636***	-2.810***	-2.554***	-2.962***
	(23.61)	(35.65)	(21.69)	(23.93)	(27.58)	(26.70)	(26.09)
Observations	4182	3663	4011	4011	3817	3068	3491
Adjusted R-squared	0.41	0.54	0.50	0.36	0.45	0.41	0.37

Note: The additional explanatory variables in the models are migratory status (dummies for rural, urban or foreign migrants), marital status (dummies for single, monogamous married, polygamous married, widowed, free union, divorced) and dummies for religion (Muslim, Christian). The inverse Mills ratio is derived from a probit estimation of labour market participation for each city (with, as dependent variable, a dummy variable of strictly positive income) comprising age and its squared, gender, years of education, migratory status, marital status, religion and two identifying variables namely how the individual is related to the head of household and the dependency ratio. The Student statistics are given in parenthesis. Standard errors are bootstrapped and robust to heteroskedasticity. *, ** and *** indicate respectively that the coefficient is significant at the 10%, 5% and 1% level. The reference category is a male working in the informal sector.

Figure 2: Predicted Earnings Based on Results in Table 4

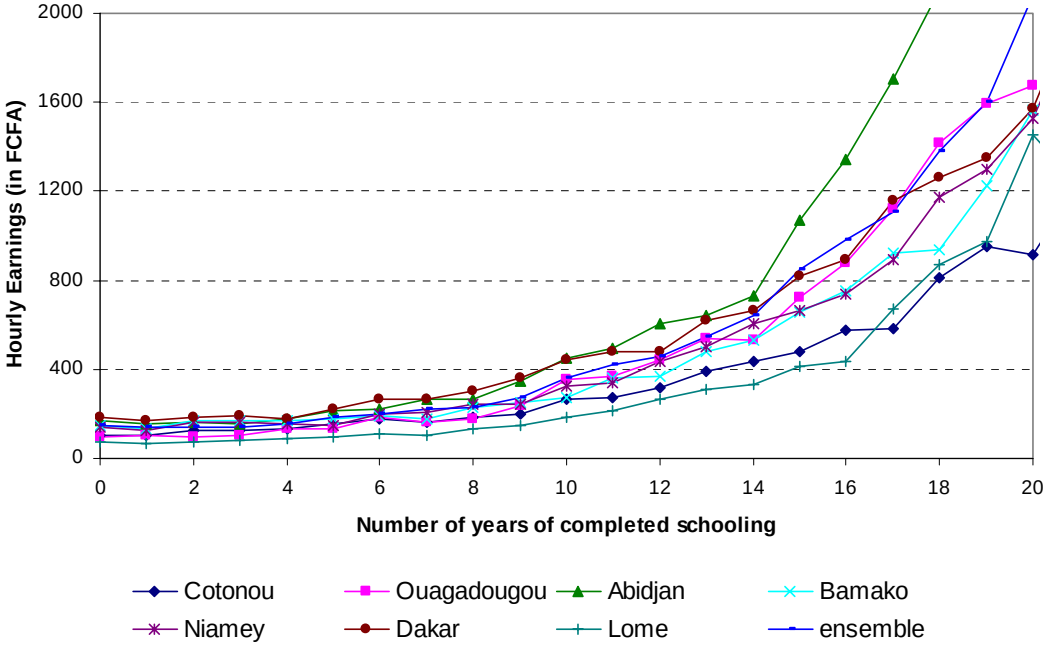


Table 5: Selectivity Corrected Earnings Functions, with Crossed Effects of Generation

Dependent variable: log of hourly earnings

	Cotonou (Benin)		Ouagadougou (Burkina Faso)		Abidjan (Côte d'Ivoire)		Bamako (Mali)		Niamey (Niger)		Dakar (Senegal)		Lome (Togo)	
	X	X*OLD	X	X*OLD	X	X*OLD	X	X*OLD	X	X*OLD	X	X*OLD	X	X*OLD
OLD (above 30 years old)	-0.181		1.337***		-0.281		0.559*		-0.100		0.735***		-0.307	
	(0.61)		(5.90)		(1.31)		(1.96)		(0.39)		(3.43)		(1.20)	
Completed years of education	0.061***	-0.022	0.053***	0.028	-0.014	0.048***	0.010	0.021	0.045**	0.005	0.071***	-0.037**	-0.003	0.040
	(4.55)	(1.25)	(3.70)	(1.47)	(1.22)	(2.65)	(0.72)	(1.16)	(2.42)	(0.26)	(5.46)	(2.10)	(0.14)	(1.62)
(Completed years of education)^2	0.002**	0.001	0.006***	-0.005***	0.008***	-0.004***	0.006***	-0.004***	0.004***	-0.001	0.002**	0.001	0.006***	-0.002
	(2.06)	(0.70)	(6.46)	(4.42)	(9.67)	(3.31)	(5.89)	(2.77)	(3.60)	(0.84)	(2.17)	(0.68)	(5.22)	(1.50)
Potential experience	-0.002	0.024	0.084***	-0.074***	0.024	0.007	0.041**	-0.019	0.034	0.009	0.067***	-0.041*	0.044***	-0.013
	(0.09)	(0.89)	(4.35)	(3.55)	(1.33)	(0.36)	(1.98)	(0.86)	(1.26)	(0.35)	(3.14)	(1.88)	(2.88)	(0.75)
(Potential experience)^2/100	0.074	-0.093	-0.118*	0.107	0.007	-0.028	0.017	-0.045	-0.032	-0.014	-0.078	0.047	-0.082	0.050
	(0.89)	(1.13)	(1.77)	(1.61)	(0.12)	(0.46)	(0.30)	(0.78)	(0.32)	(0.14)	(1.10)	(0.67)	(1.46)	(0.88)
Seniority in current job	0.011	0.018	0.057***	-0.033**	0.045***	-0.021	0.071***	-0.044**	0.028*	0.002	0.028	-0.000	0.045***	-0.009
	(0.70)	(1.17)	(4.54)	(2.40)	(2.79)	(1.28)	(4.43)	(2.45)	(1.77)	(0.12)	(1.44)	(0.01)	(3.59)	(0.63)
(Seniority)^2/100	-0.026	-0.029	-0.159**	0.135*	-0.097	0.045	-0.427***	0.392***	0.042	-0.089	-0.012	-0.026	-0.249***	0.185*
	(0.23)	(0.26)	(2.08)	(1.75)	(0.66)	(0.31)	(3.20)	(2.93)	(0.34)	(0.70)	(0.12)	(0.26)	(2.60)	(1.96)
Woman	-0.414***	-0.056	-0.253***	-0.291***	-0.406***	0.027	-0.381***	-0.172***	-0.299***	-0.006	-0.306***	-0.048	-0.344***	-0.006
	(9.64)	(0.87)	(5.45)	(5.21)	(10.57)	(0.48)	(7.46)	(2.91)	(4.20)	(0.08)	(7.44)	(1.08)	(7.92)	(0.09)
Public sector	0.243**	0.164	0.561***	0.127*	0.494***	0.252**	0.402***	-0.128	0.506***	-0.057	0.613***	-0.158	0.618***	-0.009
	(2.38)	(1.56)	(9.57)	(1.80)	(5.95)	(2.39)	(3.41)	(0.96)	(6.27)	(0.60)	(7.01)	(1.51)	(4.98)	(0.07)
Formal private sector	0.207***	0.054	0.591***	0.018	0.459***	0.048	0.114	0.165	0.282***	0.214**	0.443***	-0.034	0.351***	0.102
	(3.22)	(0.75)	(11.81)	(0.23)	(9.99)	(0.76)	(1.23)	(1.47)	(4.04)	(2.15)	(7.64)	(0.43)	(4.33)	(0.92)
Selection correction														
Inverse Mills ratio	-0.163***		-0.026		-0.130***		0.164***		0.040		0.034		-0.069	
	(3.11)		(0.53)		(3.20)		(3.40)		(0.75)		(0.81)		(1.41)	
Constant	-2.177***		-3.807***		-2.164***		-2.835***		-2.895***		-2.963***		-2.865***	
	-0.163***		-0.026		-0.130***		0.164***		0.040		0.034		-0.069	
Joint F-test of nullity of education coefficients (value)	2.04		27.6***		15.6***		14.6***		1.05		11.8***		3.1	
Observations	4184		3665		4010		3821		3065		4364		3495	
Adjusted R-squared	0.41		0.55		0.51		0.37		0.45		0.41		0.38	

Note: The additional explanatory variables in the models are migratory status, marital status, two dummy variables for religion and their crossed age effects. The inverse Mills ratio is derived from a probit estimation of labour market participation for each city (described at the bottom of Table 4). The Student statistics are given in parenthesis. Standard errors are bootstrapped and robust to heteroskedasticity. *, ** and *** indicate respectively that the coefficient is significant at the 10%, 5% and 1% level.

Table 6: Selectivity Corrected Earnings Functions in the Public Sector

Dependent variable: log of hourly earnings

	Cotonou (Benin)	Ouagadougou (Burkina Faso)	Abidjan (Côte d'Ivoire)	Bamako (Mali)	Niamey (Niger)	Dakar (Senegal)	Lome (Togo)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total completed years of education	0.057*	0.104***	0.108***	0.051**	0.073***	0.045**	0.065
	(1.82)	(6.97)	(3.77)	(2.02)	(3.62)	(2.08)	(1.27)
(Completed years of education)^2	0.003**	0.001	0.001	0.002*	0.002**	0.002**	0.003
	(2.18)	(1.09)	(0.67)	(1.81)	(2.07)	(2.31)	(1.58)
Potential experience	0.046***	0.054***	0.020	0.055***	0.055***	0.032***	0.037*
	(2.74)	(5.99)	(1.38)	(4.38)	(5.82)	(4.02)	(1.70)
(Potential experience)^2/100	-0.029	-0.056***	0.014	-0.069***	-0.070***	-0.020	-0.031
	(0.88)	(3.03)	(0.40)	(2.85)	(4.33)	(1.35)	(0.76)
Woman	-0.082	-0.036	0.014	-0.081	-0.068	-0.139**	0.088
	(0.86)	(0.50)	(0.25)	(1.19)	(1.00)	(2.05)	(0.92)
Selection correction							
Inverse Mills ratio	-0.234**	0.034	0.212***	-0.037	-0.008	0.087	-0.113
	(2.38)	(0.48)	(3.28)	(0.68)	(0.19)	(1.23)	(0.84)
Constant	-2.105***	-2.738***	-2.377***	-2.434***	-2.579***	-1.907***	-2.493***
	(7.07)	(15.95)	(9.68)	(12.04)	(13.71)	(9.62)	(6.10)
Observations	411	595	306	459	597	483	313
Adjusted R-squared	0.47	0.53	0.45	0.38	0.46	0.38	0.43

Note: The additional explanatory variables in the models are migratory status, marital status and two dummy variables for religion. The inverse Mills ratio is derived from a multinomial logit model of sector choices (with, as reference category, non-paid work participation) comprising age and its squared, gender, years of education, migratory status, marital status, religion and two identifying variables namely how the individual is related to the head of household and the dependency ratio. The Student statistics are given in parenthesis. The standard errors are bootstrapped and robust to heteroskedasticity. *, ** and *** indicate respectively that the coefficient is significant at the 10%, 5% and 1% level.

Table 7: Selectivity Corrected Earnings Functions in the Formal Private Sector

Dependent variable: log of hourly earnings

	Cotonou (Benin)	Ouagadougou (Burkina Faso)	Abidjan (Côte d'Ivoire)	Bamako (Mali)	Niamey (Niger)	Dakar (Senegal)	Lome (Togo)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total completed years of education	-0.016	-0.024	-0.007	-0.013	0.125***	0.028	0.004
	(0.60)	(0.58)	(0.33)	(0.48)	(3.08)	(1.31)	(0.09)
(Completed years of education)^2	0.005***	0.005***	0.007***	0.005***	0.001	0.003***	0.007***
	(4.45)	(4.53)	(8.51)	(3.44)	(0.61)	(4.11)	(3.72)
Potential experience	0.001	0.008	0.039**	0.011	0.044*	0.035***	0.032*
	(0.08)	(0.35)	(2.28)	(0.71)	(1.95)	(2.93)	(1.90)
(Potential experience)^2/100	0.038*	0.009	-0.026	0.016	-0.025	-0.029	-0.012
	(1.85)	(0.27)	(0.96)	(0.68)	(0.72)	(1.56)	(0.40)
Woman	0.011	0.020	-0.116	-0.137	-0.242**	-0.166**	0.119
	(0.19)	(0.20)	(1.62)	(1.10)	(1.97)	(2.51)	(0.94)
Selection correction							
Inverse Mills ratio	-0.233***	-0.461**	-0.042	-0.251***	0.086	-0.098	0.003
	(2.86)	(2.37)	(0.33)	(6.72)	(0.40)	(0.97)	(0.08)
Constant	-1.038***	-0.903	-1.860***	-1.407***	-3.139***	-1.737***	-2.809***
	(2.64)	(1.04)	(3.06)	(4.32)	(3.96)	(3.96)	(7.80)
Observations	529	346	854	455	414	957	307
Adjusted R-squared	0.37	0.49	0.45	0.32	0.45	0.32	0.35

Note: The additional explanatory variables in the models are migratory status, marital status and two dummy variables for religion. The inverse Mills ratio is derived from a multinomial logit model of sector choices (with, as reference category, non-paid work participation) comprising age and its squared, gender, years of education, migratory status, marital status, religion and two identifying variables namely how the individual is related to the head of household and the dependency ratio. The Student statistics are given in parenthesis. The standard errors are bootstrapped and robust to heteroskedasticity. *, ** and *** indicate respectively that the coefficient is significant at the 10%, 5% and 1% level.

Table 8: Selectivity Corrected Earnings functions in the Informal Private Sector

Dependent variable: log of hourly earnings

	Cotonou (Benin)	Ouagadougou (Burkina Faso)	Abidjan (Côte d'Ivoire)	Bamako (Mali)	Niamey (Niger)	Dakar (Senegal)	Lome (Togo)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Completed years of education	0.027***	0.034**	-0.009	0.023*	0.015	0.030***	0.007
	(2.77)	(2.31)	(0.85)	(1.71)	(0.89)	(2.65)	(0.51)
(Completed years of education)^2	0.003***	0.006***	0.006***	0.003***	0.005***	0.002**	0.005***
	(3.67)	(5.28)	(7.21)	(3.39)	(3.90)	(2.45)	(4.74)
Potential experience	0.018***	0.050***	0.020***	0.042***	0.031***	0.032***	0.036***
	(3.49)	(7.48)	(3.18)	(8.05)	(4.81)	(3.14)	(6.37)
(Potential experience)^2/100	-0.014**	-0.051***	-0.008	-0.044***	-0.024***	-0.031**	-0.038***
	(2.05)	(6.09)	(0.85)	(6.41)	(2.79)	(2.29)	(4.12)
Woman	-0.580***	-0.567***	-0.421***	-0.553***	-0.381***	-0.256***	-0.451***
	(17.09)	(14.27)	(10.72)	(12.61)	(7.77)	(4.30)	(12.20)
Selection correction							
Inverse Mills ratio	-0.118***	-0.042***	-0.184***	-0.021	-0.012	-0.297***	-0.062***
	(3.22)	(3.51)	(7.37)	(0.69)	(0.59)	(3.12)	(4.37)
Constant	-1.820***	-2.978***	-1.600***	-2.289***	-2.519***	-1.572***	-2.707***
	(12.30)	(20.95)	(11.44)	(18.23)	(16.35)	(4.78)	(24.20)
Observations	3250	2771	2859	2931	2233	3423	2930
Adjusted R-squared	0.25	0.29	0.25	0.21	0.16	0.19	0.21

Note: The additional explanatory variables in the models are migratory status, marital status and two dummy variables for religion. The inverse Mills ratio is derived from a multinomial logit model of sector choices (with, as reference category, non-paid work participation) comprising age and its squared, gender, years of education, migratory status, marital status, religion and two identifying variables namely how the individual is related to the head of household and the dependency ratio. The Student statistics are given in parenthesis. The standard errors are bootstrapped and robust to heteroskedasticity. *, ** and *** indicate respectively that the coefficient is significant at the 10%, 5% and 1% level.

Figure 3: Marginal Returns to Education by Sector of Activity, Based on Results in Tables 6, 7 and 8

(calculated at the sample mean)

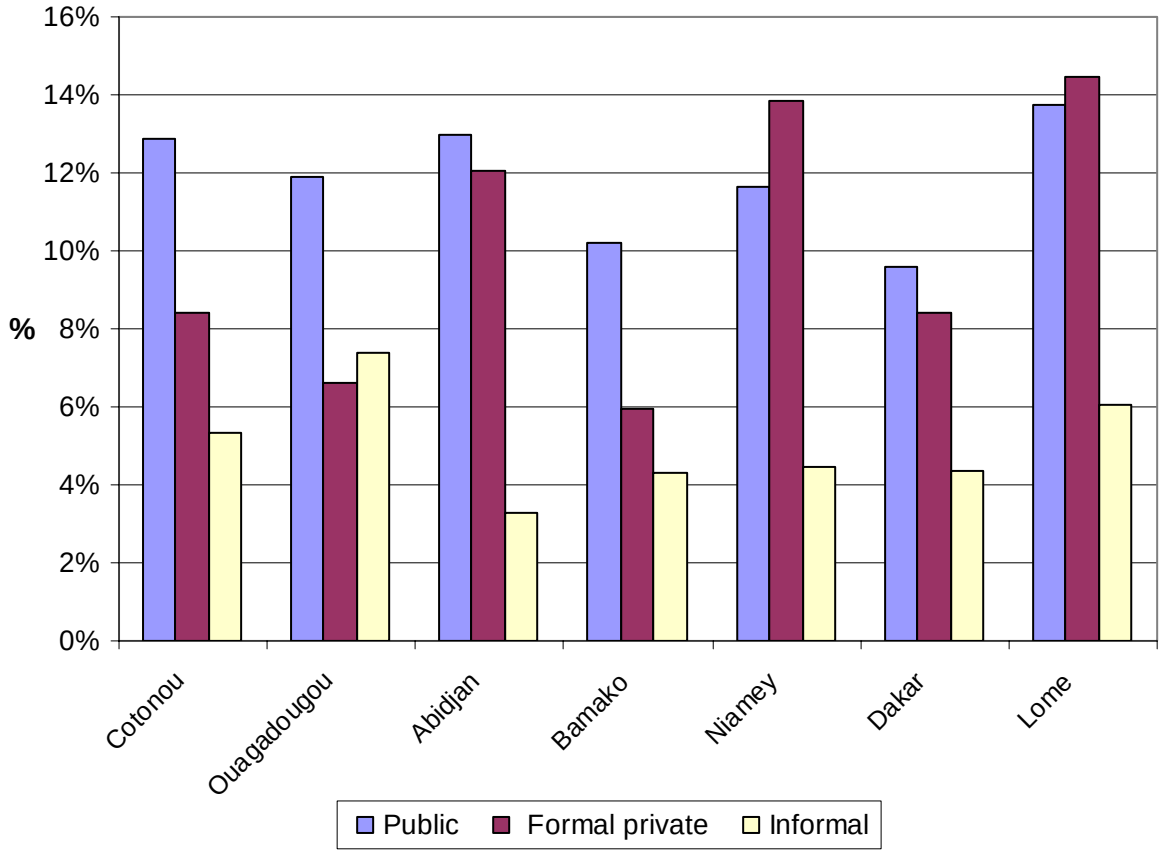


Table 9: Overview of the Marginal Returns to Education by Sector and Cohort (computed at the sample mean)

	Cotonou (Benin)	Ouagadougou (Burkina Faso)	Abidjan (Côte d'Ivoire)	Bamako (Mali)	Niamey (Niger)	Dakar (Senegal)	Lome (Togo)
Public sector							
Young	0.103	0.149	0.173	0.102	0.103	0.105	0.080
	61	*135*	*36*	*59*	*107*	*77*	*48*
Old	0.134	0.110	0.126	0.101	0.120	0.098	0.158
	350	*460*	*270*	*400*	*489*	*406*	*265*
Total	0.130	0.119	0.132	0.101	0.117	0.099	0.146
	411	*595*	*306*	*459*	*596*	*483*	*313*
Test of difference young-old	0.70	2.66	1.08	1.61	1.25	0.45	3.14
Formal private sector							
Young	0.030	-0.043	0.092	0.080	0.127	0.049	0.081
	164	*124*	*325*	*130*	*150*	*339*	*97*
Old	0.084	0.032	0.119	0.066	0.133	0.084	0.159
	365	*222*	*529*	*325*	*264*	*618*	*210*
Total	0.068	0.005	0.109	0.070	0.131	0.072	0.134
	529	346	854	455	414	957	307
Test of difference young-old	3.57	5.53*	2.39	2.00	0.63	4.53*	2.50
Informal sector							
Young	0.066	0.103	0.032	0.045	0.070	0.069	0.067
	1 458	*1295*	*1496*	*1365*	*831*	*1664*	*1428*
Old	0.049	0.057	0.044	0.047	0.028	0.037	0.060
	1792	*1476*	*1362*	*1566*	*1398*	*1759*	*1501*
Total	0.057	0.078	0.038	0.046	0.044	0.052	0.063
	3250	*2771*	*2858*	*2931*	*2229*	*3423*	*2929*
Test of difference young-old	4.27	8.86**	5.16**	4.35	2.00	5.49**	4.76*

*, ** and *** indicate respectively significant difference at the 10%, 5% and 1% level. The number of corresponding observations is in italic.

Table 10: Marginal Returns to Education Using Alternative Estimation Techniques (computed at the sample mean)

	Cotonou (Benin)	Ouagadougou (Burkina Faso)	Abidjan (Côte d'Ivoire)	Bamako (Mali)	Niamey (Niger)	Dakar (Senegal)	Lome (Togo)
Public sector							
OLS	0.122***	0.123***	0.130***	0.089***	0.119***	0.104***	0.119***
Selectivity corrected (Lee's method)	0.044**	0.092***	0.099***	0.081***	0.117***	0.130***	0.111***
Selectivity corrected + father's characteristics	0.048**	0.093***	0.096***	0.075***	0.118***	0.129***	0.110***
Selectivity corrected + Control Function (CF)	0.064*	0.093***	0.102***	0.096***	0.104***	0.151***	0.122*
Selectivity corrected + CF + HFE	0.119	0.060	0.022	0.155	0.075	0.302	0.122
Observations	*289*	*433*	*238*	*341*	*351*	*371*	*209*
Formal private sector							
OLS	0.117***	0.128***	0.127***	0.112***	0.141***	0.092***	0.149***
Selectivity corrected (Lee's method)	0.141***	0.125***	0.124***	0.087***	0.143***	0.068***	0.163***
Selectivity corrected + father's characteristics	0.144***	0.119***	0.128***	0.080***	0.142***	0.072***	0.178***
Selectivity corrected + Control Function (CF)	0.153**	0.173***	0.113***	0.147***	0.137***	0.104***	0.102***
Selectivity corrected + CF + HFE	-0.028	-0.025	0.102	0.347	0.034	0.020	-0.210
Observations	*351*	*246*	*616*	*294*	*240*	*775*	*216*
Informal sector							
OLS	0.064***	0.074***	0.047***	0.042***	0.047***	0.073***	0.066***
Selectivity corrected (Lee's method)	0.072***	0.056***	0.032***	0.055***	0.010	0.068***	0.064***
Selectivity corrected + father's characteristics	0.066***	0.048***	0.033***	0.051***	0.004	0.064***	0.063***
Selectivity corrected + Control Function (CF)	0.092***	0.075***	0.017***	0.074***	0.037	0.104***	0.089***
Selectivity corrected + CF + HFE	0.054**	0.075	0.054	0.069***	0.090	0.097***	0.069***
Observations	*2298*	*2162*	*2171*	*2273*	*1513*	*2993*	*2154*

Note: HFE for Household Fixed Effects. The earnings models are performed on restricted samples including at least two active occupied individuals in each household. They include the same set of characteristics as those of Table 6, 7 and 8. The standard errors are bootstrapped and robust to clustering. *, ** and *** indicate respectively education coefficients jointly significant at the 10%, 5% and 1% level.

Figure 4: Marginal Returns to Qualifications in the Public Sector

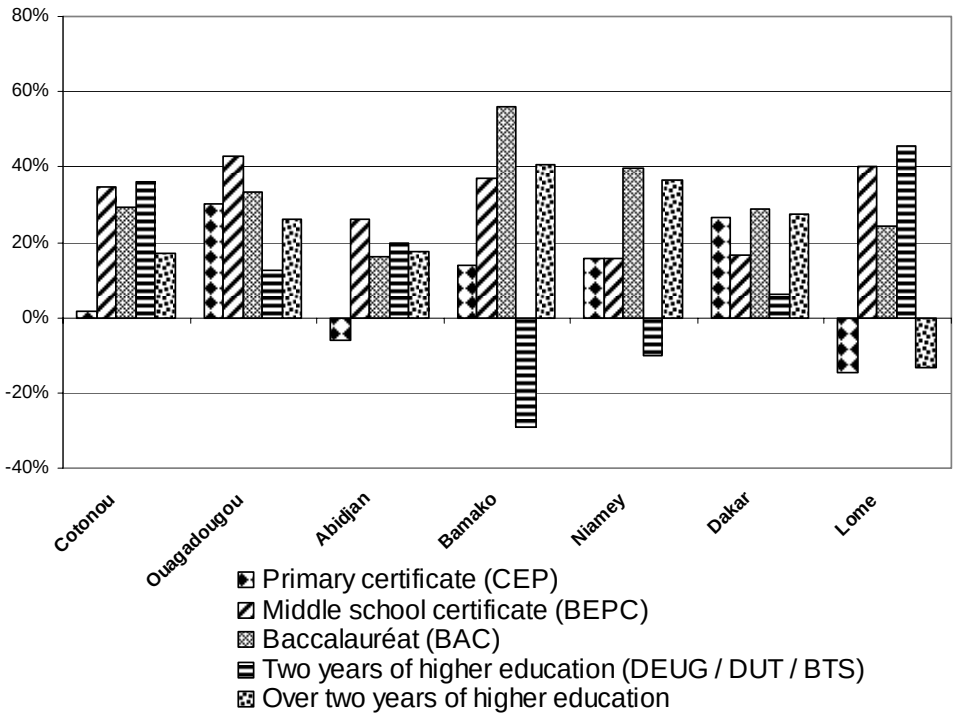


Figure 5: Marginal Returns to Qualifications in the Formal Private Sector

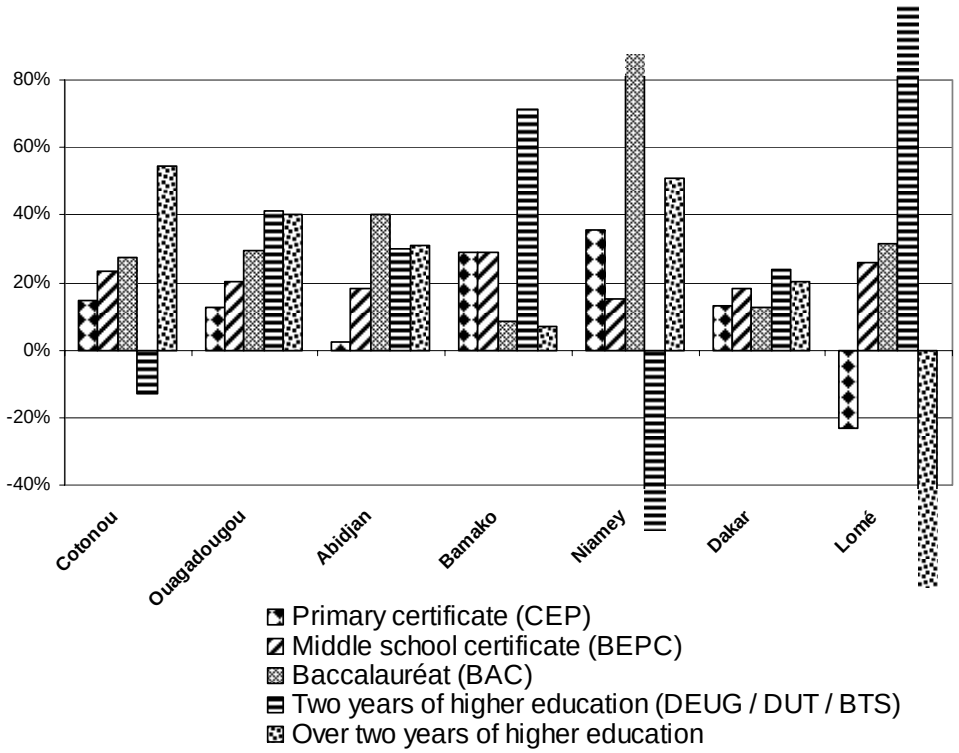


Figure 6: Marginal Returns to Qualifications in the Informal Private Sector

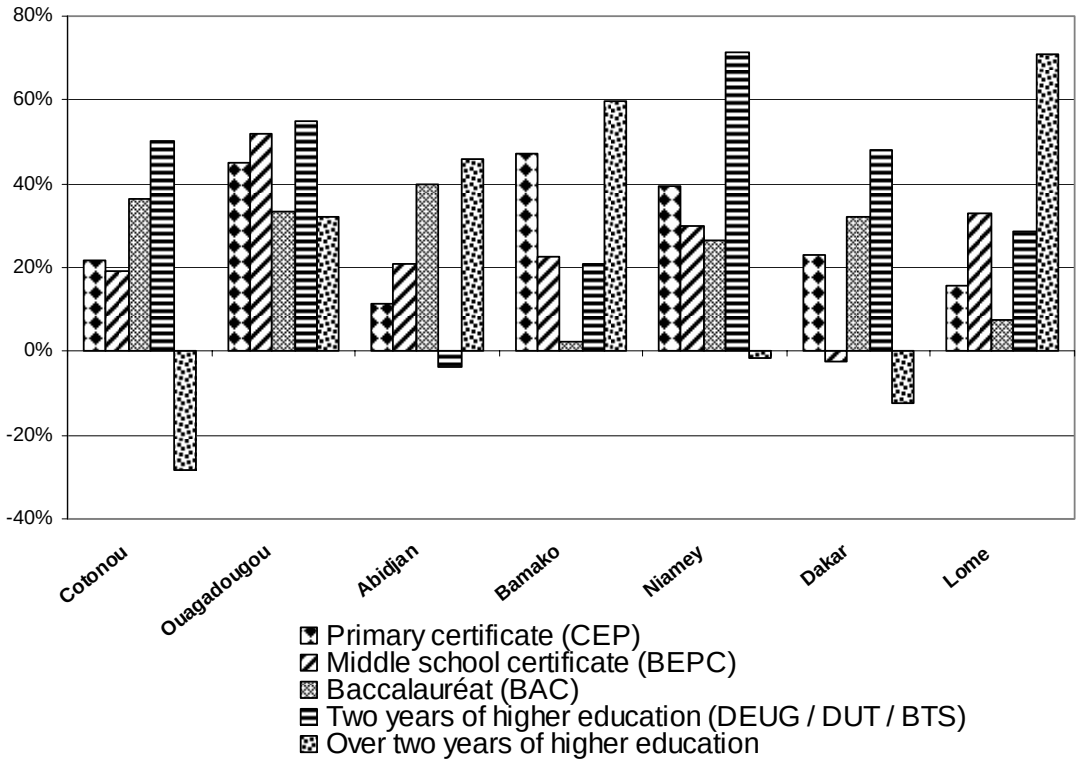
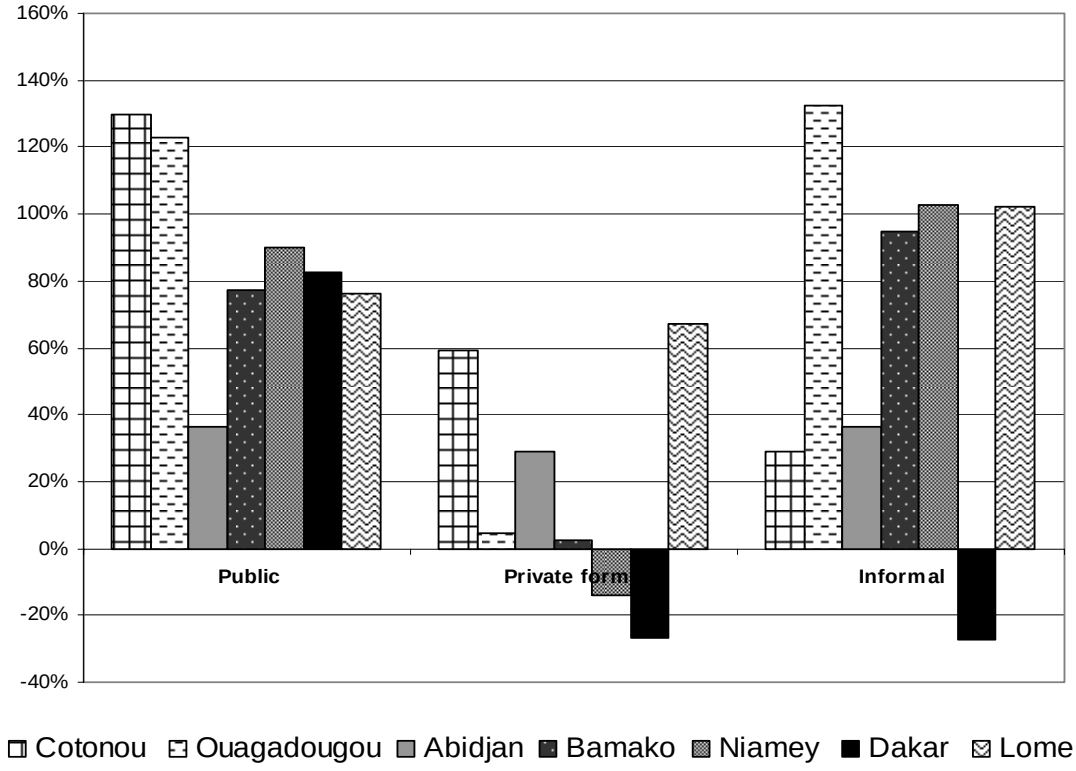


Figure 7: Returns to the Vocational Certificate (BEP*) Across Sectors



*BEP: Brevet d'Études Professionnelles

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