Chapter 5

Education and Labor Market Outcomes in Urban West Africa

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Education in Sub-Saharan Africa is often seen as the main policy instrument in the fight against poverty. In practice, however, although education is an intrinsic component of development and well-being, its economic value is not clear, as urban unemployment in Sub-Saharan Africa is rising, especially among educated workers.

The mismatch between (increasing) investment in schooling on the one hand and actual labor market opportunities on the other represents a major challenge for policy makers. For years, the existence of significant rents in the formal sector (especially in the dominant public sector) were so high that it made sense for individuals to "queue" and to undervalue returns in the informal sector. Today, education no longer seems to guard against poverty and social exclusion. It is therefore critical to reappraise the external efficiency of investment in schooling in these countries.

Traditional studies of the external efficiency of education systems look at the impact of education on individuals after they leave school.[1] They examine two types of impacts, economic and social, which can be interpreted either from the individual or the collective standpoint. This chapter focuses solely on the economic and private dimensions of the efficiency of education.

The analysis of private returns to education is based on standard human capital theory, according to which earnings differentials between individuals result from differences in wage compensation for different human capital endowments. This theory suggests that investment in education is an explanatory factor in the distribution of individual earnings.

This principle has substantial implications for low-income countries, because it explains the existence of earnings differences between individuals in the labor market. From a policy viewpoint, if returns to education are high for individuals from poor households, poverty reduction policies designed to promote equal opportunities in access to schooling would be appropriate.

Numerous objections and criticisms have been made regarding the assumption that education—and hence productivity—is the main determinant of differences in individuals' earnings. Many authors have shown that traditional theories postulating the leveling of income levels by individuals with identical levels of human capital do not describe reality when markets are imperfect or segmented.

Markets in African countries are imperfect, and the nature of work contracts interferes significantly in the relationship between human capital endowments and earnings. There are four types of labor markets in developing countries: rural, public, private formal, and informal. Each type of market has its own characteristics, such as job seasonality and uncertainty about the level of demand, the nature of contracts, and the structure of wages and earnings. However, many studies on the link between education and labor market outcomes in Africa overlook the fact that the existence of different employment segments, especially in the rural and informal sectors, may have major implications regarding the role of education in labor market integration.[2]

This chapter analyzes the effects of education on remuneration in seven cities in the West African Economic and Monetary Union (WAEMU).[3] Using Phase 1 of the 1-2-3 surveys in these capitals, we broaden the scope and refine the indicators generally used to assess the efficiency of education for labor market integration in Sub-Saharan Africa, using the same method for each city.[4] In particular, we estimate the determinants of earnings, especially the effect of education. The data allow us to compare the returns to vocational versus general education at different levels of the schooling path, shedding light on the debate over whether general education or vocational training yields higher returns. The household survey data enable us to account for two persistent econometric problems: the possible sample selectivity biases introduced by endogenous sector choices and the possible endogeneity of the education variable in the earnings function.

The results show that returns to schooling generally increase once an endogenous education variable is accounted for. This effect is particularly strong in the informal sector. In most cities in the sample, the returns to education are highest in the public sector, followed by the formal private sector and then the informal sector. We also shed light on the finding that returns to education are convex in all cities and sectors, including the informal sector. We 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 chapter is organized as follows. The first section describes the econometric models. The second section analyzes and discusses the findings. The last section presents the conclusions and offers some policy recommendations.[5]

Econometric Methods

Our methodological approach consists of estimating different models to evaluate the impact of education (years of education, type of education [general versus vocational], level reached, and qualifications obtained) on earnings. The surveys enable us to estimate Mincer-type earnings models, taking account of the sample selection effects associated with individuals' participation and sector choices. In addition, the data allow us to address the possible endogeneity of the education variable in the earnings function using alternative techniques that make use of information on family background.

Earnings Equations with Selection Bias Correction

Let S_j be the sectoral situation ($j = 0$–3), where S_0 = no work, S_1 = public sector, S_2 = formal private sector, and S_3 = informal private sector. We can view S_j as a "response function" to a set of latent continuous variables S^*_j that measure the propensities to have the sectoral situations S_j:

$$S^*_{ij} = \beta_j' \mathbf{X}_i + \varepsilon_{ij} \tag{5.1}$$

and

$$Y_{ij} = \zeta_j' \mathbf{Z}_i + \eta_{ij,} \tag{5.2}$$

where S^*_{ij} measures the propensities of individual i to have the sectoral situation S_j; Y_{ij} denotes the income individual i earns by working in sector j, where $j = 1$ (public sector), 2 (formal sector), and 3 (informal sector); $\mathbf{X}_i$ and $\mathbf{Z}_i$ are vectors of observable individual characteristics (including education); β_j and ζ_j are vectors of parameters to be estimated; and ε_{jj} and η_{ij} are error terms. The aim is to estimate the coefficients ζ_j for each sector. Y_j is observed only if sector j is chosen; η_j and ε_j are therefore not independent. As a result, the ordinary least squares estimator is potentially biased.

In the first stage, multinomial logit models are used to compute the correction terms λ_{ij} from the predicted probability of individual i working in sector j. The generalized forms of the inverse Mills ratios are then introduced into the earnings equation for each sector j, yielding consistent estimators of β_j. Lee's method has been criticized because it relies on a strong assumption regarding the joint distribution of error terms of the equations of interest (see Vijverberg 1993; Dahl 2002; Bourguignon, Fournier, and Gurgand 2007). However, the alternative methods we tried (Dubin and McFadden 1984; Dahl 2002) did not appear more efficient given the small size of the sectoral subsamples.[6] We

therefore chose Lee's correction method, which has the advantage of providing an easier interpretation of the correction terms.

Another potential problem is that the multinomial logit may suffer from the independence of irrelevant alternatives (IIA) assumption, which in most cases is questionable. The Hausman-type tests performed for each city and sector provide overwhelming evidence that the IIA assumption was not violated, except in the informal sector in Bamako.[7]

In both Heckman's and Lee's procedure, identification is achieved using exclusion restrictions (that is, by the inclusion of additional regressors in the first-stage selection equations). In order to preserve comparability across countries as much as possible, we rely on the same exclusion restrictions for each city. However, after considering tests of appropriateness of the exclusion restrictions, we relaxed such constraints at the sector level (that is, we use different sets of identifying variables for selection into the informal sector and the formal sectors [public and private]).[8] In the formal sectors, we use six dummy variables describing the individual's relationship to the household head (child, spouse), together with the household's inverse dependency ratio (the number of working individuals divided by the total number of people in the household). For the informal sector, we excluded only the dependency ratio from the second-step regressions, where the individual's situation in the household often appeared significant. We tested the appropriateness of this identification strategy using Wald tests of joint significance of the identifying variables in the first stage and insignificance in the second stage for each sector in all cities (21 cases). The tests highlighted the appropriateness of this choice in 19 cases.[9] However, bearing in mind the methodological controversies surrounding the choice of identifying variables in general, we report summary results from uncorrected earnings functions (ordinary least squares) as well, which makes it easier to compare our results with the results of other studies.

Endogenous Education

It is widely recognized in the literature that using ordinary least squares to estimate the returns to education from cross-sectional data is potentially problematic. The standard concern is that education may be an endogenous variable—that is, correlated with the residual of the earnings function because of unobserved individual heterogeneity. To address this issue, researchers commonly use instrumental variables techniques, which involve finding variables that are uncorrelated with the individuals' unobserved heterogeneity but correlated with their education. The instrumentation is often based on household and demographic characteristics that are assumed to be uncorrelated with the error term of the earnings equation. These instruments, which are popular in analyses of developing country data, may capture various genetic and environmental influences (Sahn and Alderman 1988).[10]

We tackle the issue of endogeneity using various techniques. First, we use father's schooling and main occupation as instruments and adopt a control function approach (Garen 1984; Wooldridge 2005; Söderbom and others 2006). This method is adopted when the earnings-education profile is nonlinear in the estimated parameters. As our results show, the marginal effects of education are nonconstant (for details and discussion of the implementation of this method, see Kuépié, Nordman, and Roubaud 2009).

Following Blackburn and Neumark (1995), Lam and Schoeni (1993), and Ashenfelter and Zimmerman (1997), we also use family background information differently, introducing it directly into the earnings functions. Doing so is another way of applying the control function procedure (see Kuépié, Nordman, and Roubaud 2009).

All of these techniques are interesting, because the different hypotheses behind them may lead to common features in the results that can be considered relatively robust. Thus, even if endogeneity issues are not perfectly corrected, the similarity of results from the different methods should help convince readers of their soundness.

Impact of Education on Labor Market Outcomes

This section examines the effect of education on labor market insertion and inter-individual earnings differentials. In the first subsection, we present some figures on the link between labor market integration (unemployment, sector choice) and education. In the second subsection, we report results from pooled and sectoral earnings functions and examine summary results obtained with different econometric methodologies, considering in particular selectivity-corrected earnings functions and the education variable as an endogenous regressor. In the third subsection, we focus on the cross-country comparison, using a set of estimates deemed most reliable for each city and sector. In the last subsection, we provide an overview of the marginal returns to different qualifications.

Education, Unemployment, and Labor Market Insertion

The subsection presents findings on the efficiency of education in terms of exits from unemployment and integration into different labor market segments (formal versus informal). For the seven cities, the unemployment rate is lowest (15 percent) among people with the least education. It rises to 20–21 percent for people with levels ranging from completed primary schooling to completed secondary schooling.[11] It drops slightly (to 19 percent) for people who completed at least one year of higher education.

The fact that human capital is thin on the ground does not appear to protect people who have it against unemployment. This is particularly true in Lomé,

where unemployment increases strictly with the level of education (from 8 percent among people with no education to 23 percent among people with higher education). The trends are less linear in other cities. In most cases, unemployment tends first to increase with the level of education, before decreasing with completion of secondary school and entry into higher education. This pattern is particularly strong in Cotonou, Dakar, and Ouagadougou, where higher education somewhat reduces the extent of unemployment.

Findings from a logit of the probability of being unemployed (controlling for individual and household characteristics such as age, gender, migrant status, marital status, household per capita income, the individual's relationship to the head of household, and the household's dependency ratio) are similar to the findings of the descriptive analysis.[12] All else equal, individuals with little or no education appear to be less exposed to unemployment than individuals who have at least completed primary school, probably indicating lower job aspirations. Lomé shows a strong positive relation between unemployment and education. Abidjan and Cotonou also follow this trend. In the other cities, the link between unemployment and the 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 deterioration of African urban labor markets, the result of the failure (or absence) of urbanization policies to set in motion a drive to create skilled jobs. It is also a consequence of structural adjustment policies that reduced staff in the civil service. Evidence of the effect of these policies is found in the fact that among people 45–59, who entered the labor market before the urban boom and the full force of the structural adjustment plans was felt, higher education is associated with a low risk of unemployment in all seven cities.

Although being unemployed is an indicator of exclusion from the labor market, having a job does not always guard against precariousness (see chapters 1, 2, and 4). In the following subsections, we look at the link between education and the quality of the job held in addition to its impact on unemployment.

A quantitative analysis of the balance in the labor markets reveals the existence of significant unemployment against which human capital accumulation is no shield, especially among young people. An analysis of external efficiency should consider the correspondence between the level of education and job quality. Job quality is studied here in terms of the employment sector: public formal, private formal, and informal (for another approach, see chapter 2).

There is a very close link between the level of education and the employment sector. For the sample as a whole, 91 percent of employed workers who did not start or complete primary school work in the informal sector. Completed primary schooling brings the proportion in the informal sector down to 75 percent; completed middle school reduces it to 50 percent. Only 19 percent of people who entered higher education work in the informal sector. This pattern

holds for all cities except Lomé. In Lomé, the formal sector clearly supplants the informal sector as the level of education rises, but the correlation is weaker than in the other cities and a significant proportion of people with higher education (39 percent) work in the informal sector (95 percent of people who did not start or complete primary school work in the informal sector).

We decompose the formal sector into public and private formal sectors and then run a multinomial logit model to measure the net influence of education on sector allocation (table 5.1).[13] The results show that for all cities and school grades, an additional year of education tends to yield the maximum impact for integrating the public sector, followed by the private formal sector. In three cities (Bamako, Lomé, and Ouagadougou), additional years of higher education (more than 13 years of schooling) have no influence on the probability of integrating into the formal private sector. This result may reflect the incapacity of formal private firms to create highly qualified jobs for people with higher education.

The type of education also plays an important role in providing access to the formal sector. Only 37 percent of individuals who complete at least four years of vocational education—after which they receive an occupational proficiency certificate (the *Certificat d'aptitude professionnelle* [CAP])—work in the informal sector, as opposed to nearly 50 percent of individuals who reached an equivalent level in the secondary school system (that is, completed middle school without starting secondary school). Vocational education is more effective for integrating people into the formal sector than general education in Niamey, Dakar, Bamako, Cotonou, and Lomé. The share of workers with vocational training who work in the formal sector is 82 percent in Niamey, 71 percent in Dakar and Bamako, 58 percent in Cotonou, and 50 percent in Lomé. By way of comparison, the proportion of individuals who completed general studies at middle school and worked in the formal sector stood at 68 percent in Niamey, 55 percent in Dakar, 41 percent in Bamako, 44 percent in Cotonou, and 30 percent in Lomé. In Abidjan and Ouagadougou, vocational education shows no advantage over general education in terms of the chances of entering the formal sector.

Specifications of Earnings Functions

The earnings regressions assess the seven cities separately. The estimates are obtained using the log of hourly rather than monthly earnings to take account of the heterogeneity of working hours in different sectors. The additional explanatory variables in the models are migrant status (dummies for rural, urban, and foreign migrants); marital status (dummies for single, monogamous married, polygamous married, widowed, free union, divorced); and religion (dummies for Muslim and Christian).

In most studies, log earnings are assumed to be linear or quadratic in years of education. Here we seek to document the shape of the entire earnings-education

Table 5.1 Multinomial Logit Models of Impact of Education on Allocation of Labor to Public or Formal Private Sector in Seven Cities in West Africa, 2001/02

	Abidjan		Bamako		Cotonou		Dakar		Lomé		Niamey		Ouagadougou	
Variable	**Public**	**Formal private**	**Public**	**Formal private**	**Public**	**Formal private**	**Public**	**Formal private**	**Public**	**Formal private**	**Public**	**Formal private**	**Public**	**Formal private**
Years of education														
0–6 (*primaire*)	0.266***	0.165***	0.259***	0.102***	0.305***	0.183***	0.328***	0.190***	0.265***	0.204***	0.267***	0.195***	0.320***	0.215***
	(3.36)	(6.04)	(5.65)	(3.21)	(4.98)	(4.36)	(8.32)	(8.79)	(4.44)	(3.83)	(7.31)	(5.84)	(8.80)	(6.24)
7–9 (*collège*)	0.558***	0.243***	0.489***	0.195***	0.417***	0.282***	0.409***	0.250***	0.333***	0.220***	0.518***	0.242***	0.573***	0.374***
	(6.74)	(5.63)	(6.36)	(2.92)	(6.72)	(5.59)	(8.46)	(7.01)	(5.64)	(4.16)	(8.54)	(4.07)	(11.14)	(6.87)
10–13 (*lycée*)	0.449***	0.183**	0.593***	0.445***	0.335***	0.327***	0.365***	0.235***	0.525***	0.382***	0.343***	0.331***	0.383***	0.265***
	(4.51)	(2.38)	(6.54)	(4.84)	(3.98)	(4.35)	(5.09)	(3.72)	(6.46)	(4.89)	(4.05)	(3.57)	(4.62)	(2.76)
13+	0.402***	0.326***	0.179**	0.076	0.420***	0.305***	0.319***	0.280***	0.132**	0.070	0.158**	0.121*	0.159**	0.096
	(4.70)	(4.18)	(2.28)	(0.91)	(7.03)	(5.34)	(4.67)	(4.30)	(2.10)	(1.08)	(2.39)	(1.72)	(2.33)	(1.22)
Potential experience														
Potential experience	0.210***	0.096***	0.208***	0.088***	0.125***	0.040**	0.169***	0.077***	0.148***	0.068***	0.100***	0.056***	0.155***	0.139***
	(6.14)	(5.73)	(8.84)	(4.48)	(5.45)	(2.20)	(8.14)	(6.11)	(5.67)	(3.16)	(5.24)	(2.83)	(7.75)	(6.36)
(Potential experience)^2/100	–0.297***	–0.129***	–0.244***	–0.132***	–0.129***	–0.038	–0.197***	–0.081***	–0.157***	–0.069*	–0.109***	–0.092***	–0.169***	–0.179***
	–(4.35)	–(4.37)	–(6.61)	–(4.34)	–(3.36)	–(1.27)	–(5.64)	–(4.24)	–(3.51)	–(1.85)	–(3.88)	–(3.02)	–(5.23)	–(5.04)
Gender														
Woman	–0.701***	–1.058***	–0.536*	–1.319***	–0.508***	–0.550***	–0.395**	–0.768***	–0.743***	–1.010***	–0.299	–0.633***	–0.405**	–0.541**
	–(2.86)	–(8.11)	–(1.94)	–(5.38)	–(2.74)	–(3.71)	– (2.50)	–(7.22)	–(3.57)	–(5.12)	–(1.37)	–(3.20)	–(1.97)	–(2.55)
Pseudo R^2	0.285		0.287		0.268		0.231		0.227		0.259		0.289	
Number of observations	4,259		4,015		4,397		5,291		3,911		3,575		4,192	

Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries in the West African Economic and Monetary Union (WAEMU) conducted in 2001/02 by the Observatoire économique et statistique d'Afrique Subsaharienne (AFRISTAT); Développement, Institutions et Mondialisation (DIAL); and national statistics institutes.
Note: The base category is the informal sector. The additional explanatory variables are migrant 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). Figures in parentheses are student statistics.
* significant at the 10 percent level, ** significant at the 5 percent level, *** significant at the 1 percent level.

profile. We therefore adopt a more flexible approach, specifying education as a piecewise linear spline function (see below) that allows the strength of the relationship between education and earnings to vary across different parts of the educational distribution. We distinguish four levels of education: primary, lower secondary (*collège*), upper secondary (*lycée*), and tertiary. The education variables introduced have the form $s_k(e)$, where e is years of completed schooling at the k level (k: 1,…,4):

$$s_1(e)=\begin{cases} e & e\le 6 \\ 6 & e\le 6, \end{cases} \quad s_2(e)=\begin{cases} 0 & e\le 6 \\ e-6 & 6<e\le 10 \\ 4 & e>10, \end{cases}$$

$$s_3(e)=\begin{cases} 0 & e\le 10 \\ e-10 & 10<e\le 13 \\ 3 & e>13, \end{cases} \quad s_4(e)=\begin{cases} 0 & e\le 13 \\ e-13 & e>13. \end{cases} \tag{5.3}$$

Table 5.2 reports the pooled earnings functions estimates across sectors using Heckman's two-step approach and endogenous education with the control function method. The use of a single model for all gainfully employed individuals provides only the average effect of education on earnings, masking specific education effects in each employment sector. Where differences in these effects across sectors are small, a pooled model is sufficient to be able to draw conclusions about each labor market segment. Where these effects vary widely, the returns to education must be estimated separately for each sector.

Tables 5.3–5.5 report the estimates corrected for potential endogenous sector selection (using Lee's method).[14] To ease reading, given the number of countries studied and the set of alternative estimation techniques, we also present a synthesis table (table 5.6) reporting the average marginal returns to schooling using different methods.[15] Before turning to the comments on the returns to human capital, we briefly discuss the results obtained with different estimation strategies.[16]

Ordinary least squares versus selectivity-corrected earnings functions. Using a pooled population of paid-work participants across the three sectors, the selection-correction terms stemming from a probit equation of paid-work participation in the first stage are generally insignificant, except in Abidjan at the 1 percent level (this finding means that the mechanism of allocation of paid-work participants versus nonparticipants is not random and affects earnings significantly). Paid-work participation is associated with unobserved characteristics that are negatively correlated with earnings. If sample selectivity is not accounted for, ordinary least squares estimates would yield biased estimates of the returns to observed characteristics, notably human capital.

Table 5.2 **Earnings Functions with Endogenous Education and Selectivity Correction in All Sectors in Seven Cities in West Africa, 2001/02**
(*dependent variable: log of hourly earnings*)

Variable	Abidjan	Bamako	Cotonou	Dakar	Lomé	Niamey	Ouagadougou
Years of education							
0–6 (*primaire*)	0.037***	0.058***	0.080***	0.092***	0.064***	0.052***	0.103***
	(3.44)	(5.34)	(9.24)	(9.00)	(4.82)	(4.23)	(9.66)
7–9 (*collège*)	0.112***	0.104***	0.077***	0.106***	0.102***	0.158***	0.182***
	(6.92)	(4.78)	(5.42)	(6.92)	(5.80)	(7.44)	(11.55)
10–13 (*lycée*)	0.187***	0.171***	0.174***	0.134***	0.215***	0.182***	0.201***
	(7.62)	(6.13)	(7.98)	(5.85)	(8.41)	(6.21)	(8.76)
13+ (higher education)	0.166***	0.138***	0.141***	0.166***	0.154***	0.103***	0.157***
	(7.99)	(6.44)	(8.46)	(8.80)	(4.90)	(6.23)	(8.42)
Experience							
Potential experience	0.014**	0.029***	0.011*	0.033***	0.025***	0.028***	0.044***
	(2.31)	(5.10)	(1.78)	(5.65)	(3.80)	(4.47)	(7.73)
Potential experience squared/100	–0.002	–0.036***	–0.008	–0.040***	–0.030***	–0.030***	–0.052***
	(0.22)	(4.33)	(0.81)	(4.59)	(2.79)	(3.44)	(6.34)
Seniority in current job	0.027***	0.025***	0.024***	0.028***	0.032***	0.030***	0.030***
	(4.76)	(5.03)	(4.87)	(5.65)	(5.76)	(5.60)	(5.82)
Seniority in current job squared/100	–0.058***	–0.033**	–0.040**	–0.041***	–0.053***	–0.047***	–0.040**
	(2.94)	(2.23)	(2.43)	(2.96)	(2.83)	(2.88)	(2.49)
Gender							
Woman	–0.325***	–0.190***	–0.330***	–0.264***	–0.229***	–0.249***	–0.210***
	(7.48)	(3.49)	(8.92)	(6.69)	(4.42)	(4.81)	(5.20)

Sector							
Public sector	0.675***	0.281***	0.383***	0.469***	0.610***	0.420***	0.640***
	(14.24)	(5.75)	(9.13)	(11.14)	(10.99)	(9.41)	(15.83)
Formal private sector	0.476***	0.229***	0.229***	0.407***	0.418***	0.397***	0.591***
	(15.03)	(4.59)	(5.64)	(11.83)	(7.39)	(8.49)	(13.16)
Corrections							
Control variable (residuals of education regression)	–0.007	–0.030***	–0.028***	–0.037***	–0.023*	–0.015	–0.038***
	(0.74)	(3.70)	(3.81)	(4.02)	(1.90)	(1.60)	(4.79)
Inverse Mills ratio	–0.240***	0.058	–0.092	0.004	–0.026	0.035	0.055
	(3.86)	(1.06)	(1.49)	(0.07)	(0.36)	(0.58)	(1.03)
Constant	–2.023***	–2.480***	–2.296***	–2.506***	–2.967***	–2.759***	–3.214***
	(19.41)	(23.18)	(21.30)	(20.02)	(24.76)	(20.51)	(28.63)
Number of observations	4,011	3,821	4,184	4,364	3,496	3,069	3,665
Pseudo R^2	0.51	0.38	0.41	0.42	0.38	0.46	0.55

Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).
Note: The additional explanatory variables in the models are migrant status (dummies for rural, urban, and foreign migrants); marital status (dummies for single, monogamous married, polygamous married, widowed, free union, divorced); and religion (dummies for Muslim and Christian). The inverse Mills ratio is derived from a probit estimation of labor market participation for each city (with a dummy variable of strictly positive earnings as the dependent variable) comprising age and its square, gender, years of education, migrant status, marital status, religion, and one identifying variable (the dependency ratio). The reference category is a man working in the informal sector. Figures in parentheses are student statistics. Standard errors are bootstrapped with 500 replications.
* significant at the 10 percent level, ** significant at the 5 percent, *** level significant at the 1 percent level.

Table 5.3 **Earnings Functions with Endogenous Education and Selectivity Correction in the Public Sector in Seven Cities in West Africa, 2001/02**
(*dependent variable: log of hourly earnings*)

Variable	Abidjan	Bamako	Cotonou	Dakar	Lomé	Niamey	Ouagadougou
Years of education							
0–6 (*primaire*)	0.090**	0.085**	0.063	0.069*	–0.016	0.031	0.095***
	(1.97)	(2.32)	(1.44)	(1.72)	(0.21)	(1.10)	(3.08)
7–9 (*collège*)	–0.048	0.131***	0.125**	0.034	–0.024	0.127***	0.139***
	(0.81)	(2.58)	(2.28)v	(0.74)	(0.35)	(3.42)	(3.51)
10–13 (*lycée*)	0.138**	0.157***	0.182***	0.112**	0.094	0.148***	0.141***
	(2.43)	(3.50)	(3.56)	(2.41)	(1.21)	(3.91)	(3.86)
13+ (higher education)	0.099***	0.135***	0.141***	0.127***	0.075*	0.094***	0.124***
	(2.80)	(5.33)	(3.76)	(3.89)	(1.82)	(4.37)	(5.75)
Experience							
Potential experience	–0.012	0.069***	0.041	0.015	–0.022	0.058***	0.058***
	(0.45)	(3.59)	(1.33)	(0.59)	(0.62)	(5.36)	(3.50)
Potential experience	0.064	–0.091***	–0.017	0.007	0.062	–0.078***	–0.063**
squared/100	(1.25)	(2.76)	(0.31)	(0.18)	(1.04)	(4.39)	(2.25)

Gender							
Woman	–0.017 (0.20)	–0.072 (1.07)	–0.003 (0.03)	–0.105 (1.19)	0.281* (1.88)	–0.081 (1.37)	–0.058 (0.97)
Corrections							
Control variable (residuals of education regression)	–0.006 (0.26)	–0.015 (1.04)	–0.008 (0.51)	–0.015 (0.97)	0.033 (1.13)	0.011 (0.86)	–0.007 (0.59)
Inverse Mills ratio	0.493** (2.42)	–0.184 (1.03)	–0.100 (0.29)	0.249 (0.92)	0.711* (1.88)	0.016 (0.12)	0.003 (0.01)
Constant	–0.176 (0.21)	–3.235*** (4.77)	–2.679** (2.00)	–1.089 (1.09)	0.253 (0.18)	–2.427*** (5.79)	–2.716*** (3.95)
Number of observations	306	459	411	483	313	597	595
Pseudo R^2	0.44	0.38	0.46	0.38	0.45	0.47	0.53

Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).
Note: The additional explanatory variables in the models are migrant status, marital status, and religion. The Lee ratio is derived from a multinomial logit model of sector choices (with, as reference category, nonpaid work participation) comprising age and its square, gender, years of education, migrant status, marital status, religion, and identifying variables (namely, dummies on the individual's relationship to the head of household and the dependency ratio). Figures in parentheses are student statistics. Standard errors are bootstrapped with 500 replications.
* significant at the 10 percent level, ** significant at the 5 percent level, *** significant at the 1 percent level.

Table 5.4 **Earnings Functions with Endogenous Education and Selectivity Correction in the Formal Private Sector in Seven Cities in West Africa, 2001/02**
(*dependent variable: log of hourly earning*)

Variable	Abidjan	Bamako	Cotonou	Dakar	Lomé	Niamey	Ouagadougou
Years of education							
0–6 (*primaire*)	0.040*	0.101***	0.057	0.084***	0.070	0.094***	0.127***
	(1.72)	(2.88)	(1.57)	(3.58)	(1.17)	(2.61)	(3.86)
7–9 (*collège*)	0.116***	0.184***	0.139***	0.089***	0.050	0.182***	0.114***
	(4.32)	(3.38)	(3.93)	(3.39)	(0.91)	(3.51)	(2.66)
10–13 (*lycée*)	0.218***	0.113	0.124**	0.141***	0.260***	0.171**	0.247***
	(5.84)	(1.45)	(2.54)	(4.18)	(3.55)	(2.52)	(4.79)
13+ (higher education)	0.214***	0.261***	0.175***	0.169***	0.184***	0.115**	0.205***
	(6.83)	(5.44)	(6.06)	(5.94)	(3.17)	(2.41)	(3.66)
Experience							
Potential experience	0.040***	0.020	0.019	0.032**	0.041*	0.053***	0.042**
	(3.26)	(0.98)	(1.51)	(2.39)	(1.76)	(3.05)	(1.97)
Potential experience squared/100	–0.027	0.012	0.011	–0.022	–0.026	–0.045	–0.036
	(1.26)	(0.34)	(0.50)	(1.04)	(0.62)	(1.48)	(1.06)

Gender							
Woman	–0.083 0.040*	0.036 0.101***	–0.039 0.057	–0.058 0.084***	0.031 0.070	–0.422** 0.094***	–0.016 0.127***
Corrections							
Control variable (residuals of education regression)	–0.008 (0.53)	–0.068*** (2.98)	–0.021 (1.31)	–0.029* (1.88)	0.015 (0.39)	0.009 (0.39)	–0.042** (2.07)
Inverse Mills ratio	0.070 (0.62)	0.345 (1.18)	–0.093 (0.56)	0.203 (1.04)	–0.122 (0.44)	–0.328 (1.38)	0.050 (0.21)
Constant	–1.930*** (5.77)	–2.081*** (3.02)	–2.362*** (4.64)	–1.778*** (3.39)	–3.186*** (3.75)	–3.491*** (5.48)	–2.708*** (3.30)
Number of observations	854	455	529	957	307	414	346
Pseudo R^2	0.46	0.32	0.36	0.32	0.35	0.46	0.48

Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).
Note: The additional explanatory variables in the models are migrant status, marital status, and religion. The Lee ratio is derived from a multinomial logit model of sector choices (with nonpaid work participation as the reference category) comprising age and its square, gender, years of education, migrant status, marital status, religion, and identifying variables (namely, dummies on the individual's relationship to the head of household and the dependency ratio). Figures in parentheses are student statistics. Standard errors are bootstrapped with 500 replications.
* significant at the 10 percent level, ** significant at the 5 percent level, *** significant at the 1 percent level.

Table 5.5 Earnings Functions with Endogenous Education and Selectivity Correction in the Informal Sector in Seven Cities in West Africa, 2001/02
(*dependent variable: log of hourly earnings*)

Variable	Abidjan	Bamako	Cotonou	Dakar	Lomé	Niamey	Ouagadougou
Years of education							
0–6 (*primaire*)	0.029*	0.050***	0.081***	0.090***	0.060***	0.059***	0.093***
	(1.88)	(3.92)	(7.66)	(7.26)	(3.96)	(3.36)	(6.26)
7–9 (*collège*)	0.122***	0.067**	0.073***	0.093***	0.110***	0.138***	0.167***
	(4.64)	(2.55)	(4.54)	(3.99)	(5.49)	(4.07)	(6.67)
10–13 (*lycée*)	0.122***	0.184***	0.205***	0.130***	0.196***	0.208***	0.231***
	(2.74)	(3.75)	(5.43)	(2.88)	(5.13)	(3.44)	(4.63)
13+ (higher education)	0.225***	0.036	0.144***	0.151**	0.144**	0.141**	0.194***
	(4.10)	(0.49)	(3.40)	(2.31)	(2.39)	(2.44)	(3.54)
Experience							
Potential experience	0.022***	0.031***	0.012*	0.044***	0.030***	0.023***	0.046***
	(3.00)	(5.32)	(1.93)	(7.78)	(4.80)	(3.15)	(7.47)
Potential experience squared/100	–0.011	–0.034***	–0.008	–0.051***	–0.031***	–0.015	–0.048***
	(1.01)	(4.24)	(0.89)	(6.43)	(3.24)	(1.49)	(5.69)

Gender							
Woman	–0.491***	–0.254***	–0.442***	–0.320***	–0.331***	–0.269***	–0.310***
	(8.57)	(4.34)	(10.09)	(7.82)	(5.86)	(4.27)	(5.49)
Corrections							
Control variable (residuals of education regression)	0.006	–0.020*	–0.031***	–0.033***	–0.027**	–0.029*	–0.032**
	(0.39)	(1.74)	(3.43)	(2.67)	(2.01)	(1.80)	(2.38)
Inverse Mills ratio	0.233***	–0.062	0.125*	–0.018	0.047	0.054	–0.049
	(3.08)	(1.06)	(1.77)	(0.29)	(0.59)	(0.78)	(0.72)
Constant	–1.778***	–2.256***	–2.101***	–2.386***	–2.811***	–2.483***	–2.995***
	(13.61)	(17.81)	(17.60)	(19.14)	(20.07)	(13.96)	(21.99)
Number of observations	2,859	2,929	3,250	3,423	2,930	2,233	2,771
Pseudo R^2	0.25	0.24	0.26	0.20	0.22	0.17	0.31

Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).
Note: The additional explanatory variables in the models are migrant status; marital status; the individual's relationship to the head of household (dummies for head of household, spouse, son/daughter, father/mother, other relatives); and religion. The Lee ratio is derived from a multinomial logit model of sector choices (with nonpaid work participation as the reference category) comprising age and its square, gender, years of education, migrant status, marital status, the individual's relationship to the head of household, religion, and one identifying variable (namely, the dependency ratio). Figures in parentheses are student statistics. Standard errors are bootstrapped with 500 replications.
* significant at the 10 percent level, ** significant at the 5 percent, *** level significant at the 1 percent level.

Table 5.6 Marginal Returns to Education in Seven Cities in West Africa, Using Alternative Estimation Techniques, 2001/02

Sector	Abidjan	Bamako	Cotonou	Dakar	Lomé	Niamey	Ouagadougou
All sectors							
Ordinary least squares	0.033***	0.033***	0.058***	0.059***	0.044***	0.038***	0.069***
Selectivity corrected (Lee's method)	0.031***	0.033***	0.059***	0.059***	0.045***	0.039***	0.070***
Selectivity corrected + father's characteristics	0.031***	0.029***	0.053***	0.056***	0.041***	0.035***	0.065***
Selectivity corrected + control function	0.037***	0.058***	0.080***	0.092***	0.064***	0.052***	0.103***
Number of observations	4,011	3,821	4,184	4,364	3,496	3,069	3,665
Public sector							
Ordinary least squares	0.206***	0.114***	0.163***	0.118***	0.245***	0.142***	0.136***
Selectivity corrected (Lee's method)	0.133**	0.145***	0.175***	0.094**	0.129*	0.140***	0.136***
Selectivity corrected + father's characteristics	0.144***	0.154***	0.178***	0.093**	0.120*	0.139***	0.137***
Selectivity corrected + control function	0.138**	0.157***	0.182***	0.112**	0.094	0.127***	0.141***
Number of observations	306	459	411	483	313	597	595

Formal private sector							
Ordinary least squares	0.112***	0.143***	0.104**	0.077***	0.056	0.181***	0.075**
Selectivity corrected (Lee's method)	0.108***	0.138***	0.111**	0.065***	0.063	0.191***	0.065*
Selectivity corrected + father's characteristics	0.107***	0.115**	0.099**	0.063***	0.064	0.195***	0.069*
Selectivity corrected + control function	0.116***	0.184***	0.124***	0.089***	0.050	0.182***	0.114***
Number of observations	854	455	529	957	307	414	346
Informal sector							
Ordinary least squares	0.030***	0.035***	0.054***	0.062***	0.035***	0.034***	0.067***
Selectivity corrected (Lee's method)	0.033***	0.034***	0.057***	0.061***	0.037***	0.035***	0.066***
Selectivity corrected + father's characteristics	0.034***	0.030***	0.052***	0.059***	0.033***	0.032***	0.061***
Selectivity corrected + control function	0.029*	0.050***	0.081***	0.090***	0.060***	0.059***	0.093***
Number of observations	2,859	2,931	3,250	3,423	2,930	2,233	2,771

Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).
Note: Earnings functions include the set of characteristics reported in tables 5.3–5.5. Estimates are computed at the sample mean using the piecewise linear spline earnings function in tables 5.2–5.5.
* significant at the 10 percent level, ** significant at the 5 percent level, *** significant at the 1 percent level.

The same picture emerges from the sectoral estimates, which also report only a few significant selectivity terms (Abidjan and Lomé for the public sector, Cotonou and Abidjan for the informal sector; see tables 5.3–5.5).

Exogenous versus endogenous education. We use the father's characteristics as instruments by means of the control function method. Using the first-stage regressions, in which education is regressed on all exogenous variables, we test for the joint significance of the coefficients of father's characteristics, a necessary condition for consistency of the estimates. For all cities, we can safely reject the hypothesis that these coefficients are jointly zero.[17] Several interesting patterns emerge from the control function estimates of the returns to schooling (see tables 5.2–5.5).

Using the control function approach, we can directly identify the correlation between the endogenous variable (education) and its unobserved determinants. A significant parameter estimate of the control variable (residuals of the education regression) means that the unexplained variation in the education variable also affects variation in earnings. An insignificant parameter means that we cannot accept the hypothesis of endogeneity. Table 5.7 presents the *p*-values for *t*-tests associated with each control variable in the different specifications.

For all cities, we cannot reject the hypothesis of exogeneity of education in the public sector.[18] By contrast, we reject exogeneity in the informal sector in all cities except Abidjan. In the formal private sector, we obtain mixed results, rejecting exogeneity in Bamako, Dakar, and Ouagadougou (instrumentation for the private sector in Bamako appeared dubious, however). In Abidjan, the unexplained variation of schooling never significantly affects variation in earnings.

When exogeneity of education is rejected, we place more confidence in the instrumental variables estimates, at least the ones based on the control function

Table 5.7 Endogeneity Tests of Education in the Earnings Functions in Seven Cities in West Africa, by Sector, 2001/02

City	All sectors	Public sector	Formal private sector	Informal sector
Abidjan	0.46	0.80	0.60	0.69
Bamako	0.00	0.30	0.00	0.08
Cotonou	0.00	0.61	0.19	0.00
Dakar	0.00	0.33	0.06	0.01
Lomé	0.06	0.26	0.70	0.04
Niamey	0.11	0.39	0.70	0.07
Ouagadougou	0.00	0.56	0.04	0.02

Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).
Note: The null hypothesis is that education is exogenous in the earnings function. Figures show *p*-values of the *t*-test.

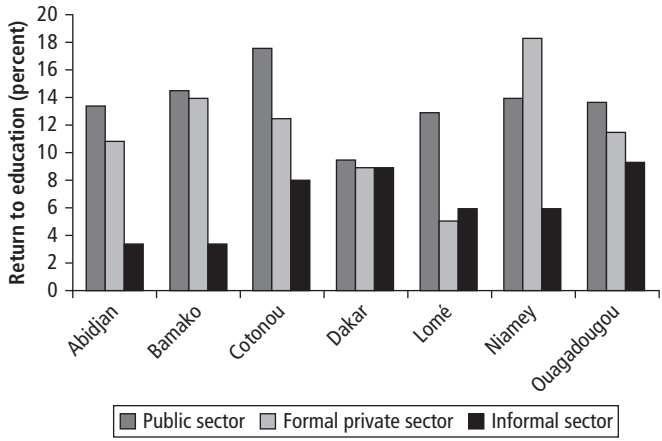
approach. Motivations for this choice can be found in Kuépié, Nordman, and Roubaud (2009).

Cross-Country Comparison

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. As expected, the models' explanatory power declines as one moves from the public sector (pseudo $R^2 = 0.44$ to the formal private sector [0.39] and the informal sector [0.23]). This hierarchy is consistent with the predictions of the standard human capital model, which is better suited to accounting for the heterogeneity of earnings in the public sector, where wages are based on a set scale that takes education and experience explicitly into account. In the informal sector, apart from the probability of greater measurement errors, factors not taken into account in our equation, such as the amount of physical capital, are likely to have a significant impact on earnings.

To synthesize the results for education, we present histograms of the marginal returns to education by sector and city at the sample means of education (figure 5.1). In six out of seven cities, the return to education is highest in the public sector, with a marginal return ranging from 9.4 percent (in Dakar) to 17.5 percent (in Cotonou). This finding reflects, to a great extent, the salary scales for civil servants, which are determined based on diploma and length

Figure 5.1 Marginal Returns to Education in Seven Cities in West Africa, by Sector, 2001/02



Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).
Note: Returns are calculated at the sample mean. Estimates are based on results reported in table 5.6. Returns are for the exogenous education variable for the public sector of all cities and for the private sectors of Abidjan and Bamako.

of service. The formal private sector comes next (except in Niamey, where it ranked first), followed by the informal sector (except in Lomé, where returns to education are higher in the informal sector [6 percent] than in the formal private sector [5 percent], and in Dakar, where the marginal returns across sectors are roughly the same in the two sectors).

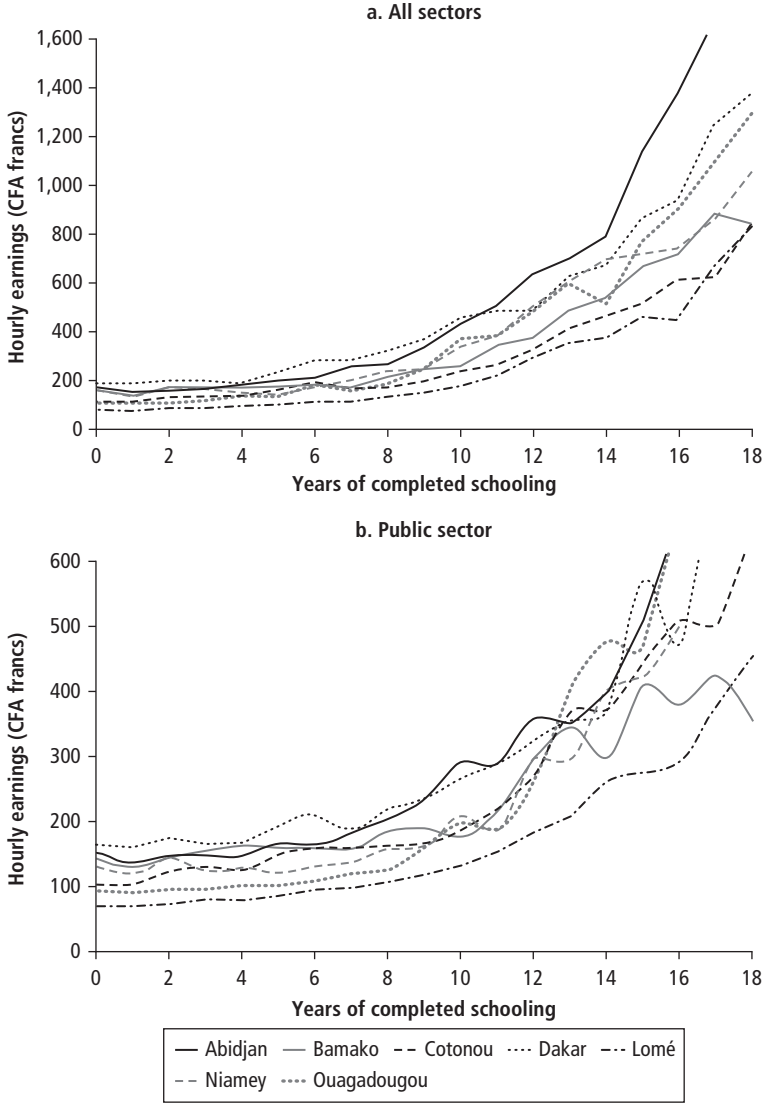
Convexity of returns. The results show strong evidence that earnings are nonlinear in education, with a convex profile. For all the regressions reported in tables 5.3–5.6, we can reject the linear model at the 10 percent level or lower.[19] Convex marginal returns mean that education has a growing impact on remuneration. In almost all cases, a completed year of *lycée* (10–13 years completed) provides a greater return than a year of *collège* (7–9 years), especially in the private sectors.

In figure 5.2, we present predicted earnings in each sector based on years of completed schooling. For all sectors, earnings are roughly constant until about the 8th year of education and sharply increase around the 11th year, with small differences across cities. This rise in earnings occurs slightly earlier for informal sector workers (about the eighth year of schooling). These patterns indicate that, to a large extent, the convex profile reflects the surge in income observed when individuals make the transition from secondary to higher education in the formal sectors and the completion of *collège* in the informal sector.

These results are inconsistent with the traditional model of human capital accumulation, in which the marginal return to education is assumed to be constant or decreasing. Schultz (2004) highlights this convexity, using household surveys for six African countries (Burkina Faso, Côte d'Ivoire, Ghana, Kenya, Nigeria, and South Africa); Söderbom and others (2006) observe it in samples of employees of manufacturing firms in Kenya and Tanzania. To our knowledge, this feature of Africa's labor markets has not been documented before at the sectoral level using representative samples from urban Africa.

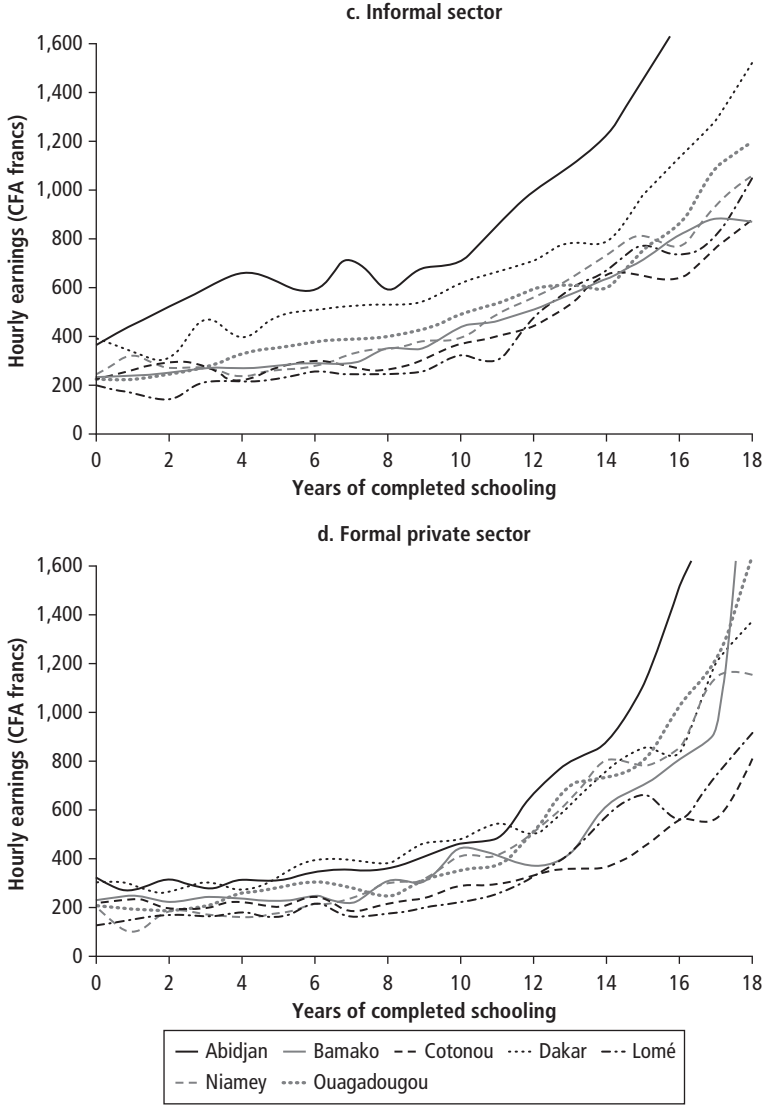
This result is important, because it has been advocated that not accounting for the high proportion of workers in the informal sector may lead to overestimates of the returns to primary education and underestimates of the returns to higher education (Bennell 1996). Convexity is revealed here in all sectors, including the informal sector. In our estimates, the marginal return to primary education is lower than the returns to secondary and higher education in all sectors, and the return to primary school is lower in the informal sector (6.6 percent) than in the formal private sector (7.2 percent). Similarly, the average return to a year of *lycée* is higher in the informal sector (18.3 percent) than in the formal (public and private) sector (on average, 15.5 percent). Hence, not accounting for earnings in the informal sector indeed yields an overestimation of the returns to primary education, as Bennell (1996) predicted, as well as possibly an underestimation of returns to higher levels of education.[20]

Figure 5.2 Estimated Hourly Earnings in Seven Cities in West Africa, by Sector, 2001/02



(continued next page)

Figure 5.2 (continued)



Sources: Based on Phase 1 of the 1-2-3 surveys of selected countries (see table 5.1 for details).

Observing increasing returns to education by levels is important, because the idea that primary education is an effective instrument for fighting poverty is based partly on the hypothesis of a concave earnings function—that is, the notion that investing in education is more profitable during 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, among others (Psacharopoulos and Patrinos 2004).

Various arguments have been posited to explain convexity in the returns to schooling (Bennell 1996, 2002; Schultz 2004). One is that primary education has been overexpanded, reducing the returns relative to higher levels. Another is that over time the quality of primary school has declined, reducing returns (Behrman, Ross, and Sabot 2008). The slowdown in formal sector growth, which may have reduced the demand for educated labor and perhaps affected less educated individuals more strongly, has also been mentioned.

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 qualification and not just to average years. To do so, we estimated the marginal returns to holding a diploma, thus accounting for the quality of the school career. In the private sector, we controlled for the endogeneity of schooling using the control function method (except in Abidjan and Bamako).

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) and individuals with a particular qualification. 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 return to a *baccalauréat* plus two years of higher education (BAC+2) is the difference between the coefficient for the BAC+2 and the coefficient for the *baccalauréat* alone. The return to a primary certificate (*Certificat d'études primaires* [CEP]) is the difference in average earnings between someone with a CEP and someone with no diploma, the return to the middle school certificate (*Brevet d'études du premier cycle du second degré* [BEPC]) is the difference in average earnings between someone with a BEPC and someone with a CEP, and so forth. Marginal returns hence correspond to the increases in earnings generated by the acquisition of the next level of qualifications. In this study, we rely on marginal returns, because they measure the additional value of each qualification rather than the value compared with "no qualifications" which is almost always positive.

Kuépié, Nordman, and Roubaud (2009) report the results of this exercise using histograms of the marginal returns to various qualifications for each sector. Not surprisingly, the effect of each qualification on earnings is positive overall, with a huge quantitative leap for secondary and higher education, as already shown using continuous variables for schooling. The most striking result is that, depending on the city, some diplomas (such as the *baccalauréat*) do not yield positive marginal returns. This situation reflects either the inadequacy of the training considered with respect to the labor market or the fact that certain diplomas have no value in the labor market but are aimed solely at providing access to higher levels of education. This hypothesis might explain the low marginal profitability of some diplomas in the public sector. But the fact that for many diplomas, additional earnings are nil or negative in the formal private sector suggests that many training schemes do not correspond to the needs of the labor market in this sector.

This lack of connection between the level of training revealed by a diploma and the remuneration obtained in the formal private labor market is evident in all of the cities studied. Marginal earnings seem to correspond more closely to the level of training in the informal sector than in the formal private sector (but less than in the public sector). This result is inconsistent with the idea that the informal sector does not value educational capital. The profitability of education in the informal sector is illustrated by the earnings premium received by individuals with vocational diplomas (in particular the *Brevet d'études professionnelles* [BEP]). In fact, returns to vocational training in the informal sector often exceed returns in the formal private sector. Vocational education qualifications are also often more profitable than general education qualifications, which take longer to obtain. For example, although it generally takes one year less to obtain a BEP (on average 11.6 years) than to obtain the *baccalauréat* (on average 13.0 years), the BEP is often more profitable than the *baccalauréat*, especially in the informal sector. The returns to the BEP are more than 40 percent higher than the returns to the *baccalauréat* in the formal private sector of Cotonou and in the informal sectors of Ouagadougou, Bamako, Niamey, and Lomé. The same result holds if we compare the premium for obtaining the CAP (a vocational certificate equivalent to completed primary school) versus the BEPC (a general certificate of completed primary education).

Conclusion

Using a series of comparable labor force surveys in urban West Africa, we estimate the impact of education on labor market outcomes among representative samples of workers in seven economic capitals. The data provide a unique cross-country comparison using the same variables and methodology for each city.

We tackle two recurrent econometric issues that arise in assessing the effect of education on individual earnings. First, we address the issue of endogenous sector allocation (public, formal private, and informal sectors) in the earnings functions estimates and provide evidence that correcting for this sample selectivity refines the returns to education in all cities and sectors. Second, for most cities, we reject the assumption of exogeneity of the education variable, except in the public sector. Using the workers' family background as an instrument for education, we find that the returns to schooling usually increase once endogeneity is accounted for. This effect is particularly strong in the informal sector.

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 of West Africa reveal convex returns in all sectors, including the informal sector. This finding casts doubts on the suitability of estimating average marginal returns and calls for disaggregated estimates at each level of the educational path. We provide evidence that the convex profile reflects the surge in income observed when individuals make the transition from secondary to higher education in the formal sectors; for informal sector workers, it mainly reflects completion of the first secondary cycle. In Abidjan, Bamako, Dakar, and Lomé, the earnings-education profile observed is particularly convex for young workers, especially in the informal sector.

Even at high levels, education substantially increases earnings in informal sector jobs in most of the cities studied.[21] To our knowledge, these features of Africa's labor markets have never before been documented at the sectoral level using representative samples of urban areas.

Convexity of the returns to schooling means that stimulating access to primary education is effective in reducing poverty only if primary school graduates can continue their studies in order to take full advantage of the high marginal returns associated with many years of education. Management of the flows of students completing general secondary and higher education could benefit from an in-depth review of the (too) general content of schooling programs, with an eye toward adapting it to the needs of the labor market. In the meantime, to increase the returns to low levels of schooling, improving primary school quality should remain at the top of any agenda for education.

That said, unemployment is growing in West African cities, especially among educated workers. This mismatch between (increasing) investment in schooling and actual labor market opportunities represents a major challenge. Would an increase in education generate its own demand? Or would more educated people simply add to the pool of disenfranchised and disillusioned workers, whose only hope is to migrate and find employment elsewhere? If our findings provide insight into the question of where specific bottlenecks

arise on the labor demand side, they also provide evidence of the existence of significant returns to education in the informal sector that may counterbalance the incentive for job queuing. More specifically, if schooling helps workers in the informal sector be more productive (probably thanks to innovation and adaptability), then household and government investments in their education are not being made in vain. Given that the informal sector has created more than 80 percent of urban jobs in West Africa in recent years, concentrating public investments in employment in this sector with attractive policies for the most qualified people could represent a serious alternative to the lack of employment observed in the formal sectors, at least in the short term. Coupled with continued support to primary school quality and postprimary education, such a policy could also pay off in the medium to long term by generating the human capital accumulation required for the modern economy to take off in African cities.

Notes

1. By way of comparison, analyses of the internal efficiency of education systems concern 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 while they are still in the system, looking for the most cost-effective situations (Mingat and Suchaut 2000).
2. See Kuépié, Nordman, and Roubaud (2009) for further development of this point and for additional or more complete analyses of the findings presented in this chapter.
3. The cities are Abidjan, Côte d'Ivoire; Bamako, Mali; Cotonou, Benin; Dakar, Senegal; Lomé, Togo; Niamey, Niger; and Ouagadougou, Burkina Faso. Although Abidjan and Cotonou are not administrative capitals, we refer to them as capitals because they are the most important economic centers in their countries (Cotonou is also the seat of government).
4. For a description of the 1-2-3 surveys, see box O.1 in the overview.
5. For a presentation of descriptive statistics (education, earnings, and so forth), see chapter 1.
6. Based on Monte Carlo simulations, Bourguignon, Fournier, and Gurgand (2007) conclude that Lee's method is adapted to small samples.
7. Bourguignon, Fournier, and Gurgand (2007, p. 192) argue that correcting for selection bias based on the multinomial logit model is 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 true even when the IIA hypothesis is severely at odds." As we are interested primarily in results in the second-stage regression, this argument allows us to be confident regarding the choice of a multinomial logit.
8. The results of the probits and multinomial logits are not reported, in order to save space. They are available on request from the authors.

9. The exceptions were the formal private sectors in Niamey and Dakar, where the appropriateness of the excluding conditions in the second stage was rejected (at the 10 percent level in Niamey and the 1 percent level in Dakar). In these two cases, we then tried to restrict the number of exclusions, using as identifying variables only a dummy variable indicating whether the respondent was the household head (together with the dependency ratio). The test was satisfied, and the results in the second step did not differ from the results obtained previously. We hence report the results including the full set of exclusions in order to ensure perfect comparability across countries. For all cities and sectors, Wald tests of joint significance of the instruments in the first stage never rejected the null hypothesis at the 1 percent level. The second-stage equation is still identified without excluding conditions for the need of the tests, as identification relies on the distributional assumption of Lee's model (see Bourguignon, Fournier, and Gurgand 2007).
10. 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 proximity to a four-year college as instruments.
11. These figures are slightly different from the figures presented in chapter 1 because of changes in education brackets.
12. These findings are available from the authors upon request.
13. The same set of control variables used for the analysis of unemployment is used here.
14. We drop the tenure variable from the set of covariates in the sectoral estimates, because seniority in the current job makes less sense in the informal sector.
15. Assuming that the marginal return to education varies across educational levels but is constant within each cycle, the marginal return to education around the sample's education mean is defined as follows:

    $R = \sum_{k=1}^{4} \alpha_k I(\overline{educ} \in C_k)$, where α_k is the estimated coefficients of the k education variables corresponding to the four cycles, I(.) is the indicator function, $\overline{educ}$ is the average years of schooling, and C is the educational group.
16. Interested readers should see Kuépié, Nordman, and Roubaud (2009).
17. In 18 out of 21 cases, Sargan tests on overidentifying restrictions cannot reject at the 10 percent level the null hypothesis that the instruments are valid. The three cases where validity is not supported are the formal private and informal sectors of Bamako and the public sector of Niamey, suggesting that uncorrected education returns be considered in these cases. The results of these tests are available upon request.
18. Tests for exogeneity based on Hausman tests confirm these findings.
19. We investigated whether our findings are sensitive to functional form by considering the effects of modeling the earnings-education profile as second- and third-order polynomials. The quadratic function systematically produced significant squared education coefficients; the cubic form appeared less appropriate in the majority of cases.
20. These cross-country averages mask some country specificities.
21. The heterogeneity of the informal sector in this respect, notably the possible coexistence of different employment segments with specific features, deserves consideration (see chapter 4).

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AFRICA DEVELOPMENT FORUM

Urban Labor Markets in Sub-Saharan Africa

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1 2 3 4 16 15 14 13

ISBN (paper): 978-0-8213-9781-7
ISBN (electronic): 978-0-8213-9782-4
DOI: 10.1596/978-0-8213-9781-7

Cover image: ©Michelle Saint-Léger, IRD, 2013.
Cover design: Debra Naylor, Naylor Design, Inc.

Library of Congress Cataloging-in-Publication Data
Vreyer, Philippe De.
Urban labor markets in sub-Saharan Africa/Philippe De Vreyer and François Roubaud.
p. cm.
Includes bibliographical references and index.
ISBN 978-0-8213-9781-7 — ISBN 978-0-8213-9782-4 (electronic)
1. Labor market—Africa, Sub-Saharan. 2. Africa, Sub-Saharan—Economic conditions. 3. City dwellers—Employment—Africa, Sub-Saharan. I. Roubaud, François. II. World Bank. III. Title.
HD5837.A6V74 2013
331.120967—dc23

2012050217

The French translation of this book is copublished by Agence Française de Développement and Institut de Recherche pour le Développement (IRD). The IRD, a French public research institute emphasizing interdisciplinarity, has focused its research for more than 65 years on the relationship between man and its environment in Africa, Asia, Latin America, the Mediterranean, and the French tropical overseas territories. Its research, training, and innovation activities are intended to contribute to the social, economic, and cultural development of southern countries. For further information: www.editions.ird.fr.