

## Education and Employment in Sub-Saharan Africa: Some Evidence from Senegal\*

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**Abstract.** *This paper studies the education-employment nexus in the context of Senegal. Using the 2005 Senegal Household Survey, we find that households' heads with higher education (lower secondary level and above) are less likely to be self-employed but more likely to be working in the public sector. Disaggregation by gender and location (rural vs. urban) does not affect the results. Besides, female headed households with secondary education and above are more likely to be employed in the private sector. The results suggest the importance of steps for extensive promotion of education (especially for an upward revision of the level of compulsory education) in resolving the persistent unemployment problem and improving the job availability in the private sector.*

**Keywords:** education; employment; Sub-Saharan Africa; Senegal.

**JEL Codes:** I1, I21.

**REL Code:** 14K.

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## 1. Introduction

Senegal has witnessed a fairly high level of economic growth over the last decade, which has led to a substantial reduction in poverty (Azam et al., 2007). However, in order to bring poor households out of poverty, growth should accompany better work opportunities, as most individuals in the developing countries derive their income from selling their labor (Fox, Gaal, 2008). Provided such opportunities are created, what are the main factors that allow the households the possibility of grasping these jobs? Do all households have the same chance to benefit from the opportunities on offer?

We focus on the role of education and take Senegal as a study case using the 2005 household survey data. The West African country of Senegal has so far been one of the better performers in the race to achieve the Millennium Development Goals. Education is gradually spreading in the country. The country's primary completion rate jumped from about 40 percent in the early 1990s to 56 percent in 2008 (World Bank, 2010). Despite this healthy growth, educational disparities are widespread. For instance, children in rural areas are only half as likely to be in school than those in urban areas. Inequalities also exist on gender and regional level. Given such a situation, the job prospects for educated and uneducated Senegalese heads of households must also differ.

This paper attempts at analyzing this education-employment relationship<sup>(1)</sup>. Achieving higher education level is said to lead to increased employment opportunities. To what extent is this true for the case in Senegal?

To our knowledge, this is the first such study on this question in the context of Senegal. On the continent level, Castel et al. (2010) is a recent study studying the question in the case of the Southern African country of Malawi. Using data from the 2004-2005 Integrated Household Survey, they show that education is a major determinant of formal employment. Their results show that the higher the education level, the higher is the probability to be salaried and the lower the likelihood to be farmer, casual employee or self-employed. However, it is to be noted that their study combines the private and public sectors in one category, which they call "wage employment" sector. Glick and Sahn (1997) investigated the role of education in employment and earnings in Conakry, Guinea classifying the occupations into self-employment, private and public wage employment. Their results also show that more education is positively and significantly associated with the probability of entering the wages sector and negatively with the self-employment sector. Ackah et al. (2009), instead of focusing on a given city as in Glick and Sahn (1997), deal with the female participation in the labor force in Ghana. They show that the education levels and wage employment are positively and significantly related. However, their

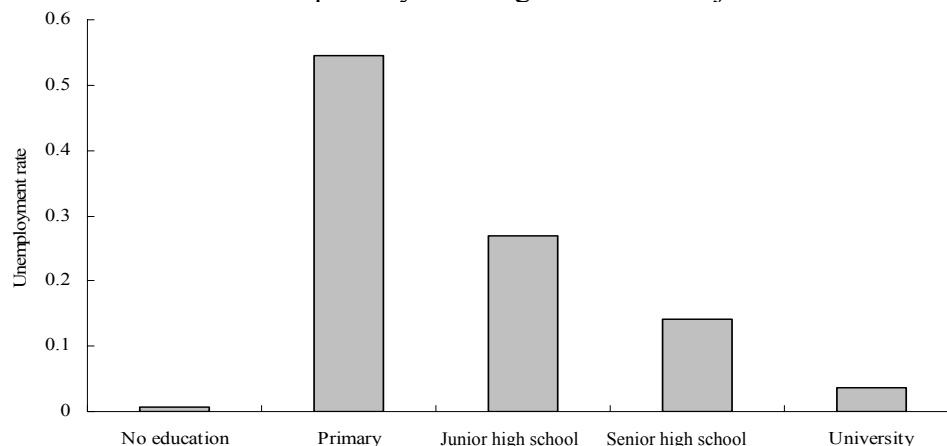
study takes into account only basic and secondary education. In this study, we take the analysis a step forward and take into account all education levels, male and female participation in the labor market, considering the population as a whole.

The rest of the paper is organized as follows. Section 2 briefly gives an overview of the characteristics of the Senegalese labor market. Section 3 presents the empirical strategy followed in the paper. Section 4 shows the empirical results and the last section concludes and suggests some policy recommendations.

## 2. Characteristics of the Senegalese labor market

Senegal has implemented various plans and programs aimed at promoting employment [See Morisset (2007) for a list of the main programs dedicated to employment promotion]. However, those programs seem to mainly help the beneficiaries of such project and a few educated individuals, and have not reached their objective in terms of extensive job creation (Morisset, 2007). The unemployment rate is still hovering around 30 percent.

Figure 1 depicts the profile of unemployment with respect to education levels of the heads of households. Considering the educated heads of households, the data show that the higher the education level, the lower is the share of the unemployed. For example, in 2005, 5% of the university graduates, 15% of the senior high school graduates, 25% of the junior high school graduates and 55% of the primary school graduates were jobless.

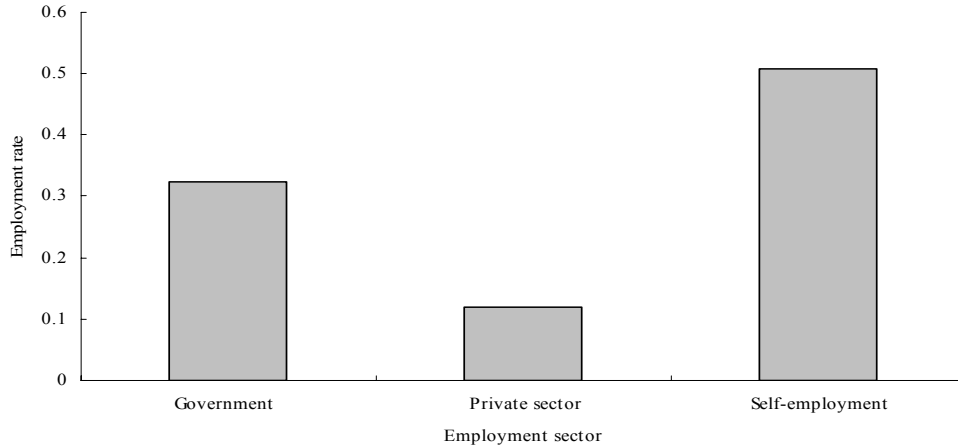


Source: ESPS (2005).

**Figure 1.** *Unemployment rate and education levels*

Figure 1, however, shows that the unemployment rate among the non-educated household heads is apparently very low (2 percent). These findings are more or less in line with the results of the descriptive statistics in Castel et al. (2010): inactivity is lowest among illiterates and university graduates and highest among school graduates. This low unemployment rate of the uneducated heads of households probably hides factors such as the underreporting of unemployment figures, recurrent underemployment and the significant occurrence of non-compensated housework in the Senegalese society. This is illustrated by the role of the self-employment sector (Figure 2).

Figure 2 presents the employment status according to the main employment sectors, namely the public sector, the private sector and the self-employed. The data show that in 2005, the highest share of the population (52 percent) was self-employed. This includes those involved in the substantial informal economy. Besides, 32% of the active population was employed by the government. The public sector still plays a great role in the economic activities in Senegal. The private sector is small and hardly employs 10 percent of the heads of households. The preponderance of the self-employment sector is also noticed in Glick and Sahn (1999); however, the private and public sectors seem to have almost the same number of workers (mainly because of sampling problem).



Source: ESPS (2005).

**Figure 2.** *Employment rate by sector*

Other characteristics of the Senegalese labor market also need to be mentioned. Unemployment is more likely to affect the youth, the women and people living in rural areas (Morisset, 2007). Why is this the case, and what is the probability of an educated Senegalese head of household of finding a job in a particular sector, in the presence of such a high jobless level. We take up these questions in the next section.

### 3. Empirical strategy

#### 3.1. Econometric specification

First, we empirically examine the effects of the education levels and characteristics of the heads of households on the probability of being employed (the reference being the unemployed). Subsequently, we restrict the sample to employed heads of households to see the extent to which their education levels and characteristics can explain the probability of being employed in the public sector, private sector or being self-employed (the base group being employed in international development agencies).

To investigate the relationship between education and employment status (and the employment sector) of the household heads, we adopt the following general econometric model:

$$Y_{ij}^* = \beta_0 + \beta_1 \times EDU + \sum_{j=2}^k \beta_j \times x_{ij} + \varepsilon_{ij}, \quad (1)$$

where  $Y_{ij}^*$  is the latent dependent variable standing for the employment status or employment sector.  $EDUC$  is the highest education level completed by the head of household.  $x$  is a vector representing the set of other covariates considered, namely age, gender, marital status, family size, location and provincial dummies.

Specifically, we test two econometric models. The first model is related to the probability of being employed (unemployment being the base category). It is specified as follows:

$$\text{Pr ob}(Y = 1 / X) = \Phi(X' \beta) \quad (2)$$

where  $\text{Pr ob}(Y=1/X)$  is the probability of being employed given the education levels ( $EDU$ ) and other characteristics of the household heads ( $x$ ),  $X$  comprising  $x$  and  $EDU$ .  $\Phi$  is the cumulative distribution function of the standard normal distribution. This model is estimated through a probit model given the binary nature of the dependent variable.

The second model is dedicated to estimate the probability of being employed in the public, private, or self-employment sector (employment in international development agencies being the base category). The second econometric model can be formulated as follows:

$$P_{ij} = \Pr(V_j > V_k) \quad \text{for all } j \neq k \quad (3)$$

where  $P_{ij}$  is the probability that the household head  $i$  is employed in sector  $j$ . The household head can choose any sector  $k$  ( $k = 1, 2, 3, 4$ ) with 1 = the private sector, 2 = the public sector, 3 = the self-employment sector and 4 = international development agencies.  $V$  is the indirect utility function of individual  $i$  in labor market  $j$  and is defined as:

$$V_{kj} = \beta_j \times X_i + u_{ij}.$$

We use equations (2) and (3) for the purpose of our empirical investigations.

### 3.2. Data and selected variables

The study relies on the Senegal Poverty Monitoring Report conducted in 2005 (SPMR-2005) known as ESPS-2005 (Enquête de Suivi de la Pauvreté au Sénégal). Data were collected for the whole country and covered 13600 households in the 11 regions of Senegal, i.e. 8564 in the urban area and 5036 in rural area. The ESPS-2005 is the first survey conducted in the framework of the global program for monitoring and assessment of the poverty reduction strategies. It aims at devising relevant and easy-to-collect indicators for a regular appraisal of poverty reduction in Senegal. The information collected is related to education, health, employment, household assets and amenities, access to basic community services, public opinion vis-à-vis life conditions and expectations from the government. The data also relate to the priorities and solutions for poverty reduction as well as the population's perception of the institutions. The survey consequently provides a large series of variables permitting the estimation of various valuable indicators at different geographical levels for different social categories (ESPS, 2005).

The variables used are all self-explanatory and do not need much explanation. The dependent variables considered are the employment status of the head of the household indicating whether the individual is employed or not. Furthermore, the sectors of employment (public, private and self-employed) are also specified. The educational variables describe the highest education level completed by the household head (primary, junior high, senior high and university education). Other variables considered are the age, gender, marital status, family size and location of the household. Eleven dummies for the regions (provinces) of Senegal are taken into consideration. The regions are Dakar (taken as the base), Diourbel, Fatick, Kaolack, Kolda, Louga, Matam, Saint-Louis, Thies, Tambacounda and Ziguinchor.

### 3.3. Sample description

Table 1 provides descriptive statistics (mean values and standard deviations) for some of the pertinent variables in our dataset. We mainly focus on education and labor participation related variables.

The statistics indicate that 74% of the household heads work, most of them being self-employed (51%). The proportion of self-employed is higher for female headed households (66%) and rural residents (77%). With respect to the education levels completed, the table shows that the percentage of educated household heads drops from 42% in the case of primary education to 12% for tertiary education. Urban residents and male headed households seem to have higher proportions of education completion.

It needs to be noted that most of the heads of households considered are male (83%). Besides, the average family size is 8 persons which is characteristic of the large families in Sub-Saharan Africa. Table 1 also shows that the average age of the household head is 46 years. Furthermore, most of the heads of the households considered in our sample are living in urban areas (83%).

A description of the employment status and employment sector by education levels is given in Table 2. It shows 88.6% of the household heads with university degree are employed and among them 71.9% are in the public sector and 10.9% in the self-employment sector. Besides, 68.3% of the household heads with primary education are employed and among them 9% are in the public sector and 78.6% in the self-employment sector.

Table 1

	Descriptive statistics, general														
	Pooled			Male			Female			Urban			Rural		
	Observation	Mean	Standard deviation	Observation	Mean	Standard deviation	Observation	Mean	Standard deviation	Observation	Mean	Standard deviation	Observation	Mean	Standard deviation
Employed	4344	0.741	0.438	3630	0.779	0.415	714	0.550	0.498	3621	0.738	0.440	723	0.757	0.429
Employed in the public sector	3313	0.321	0.467	2906	0.334	0.472	407	0.221	0.416	2750	0.360	0.480	563	0.130	0.336
Employed in the private sector	3313	0.119	0.324	2906	0.125	0.331	407	0.076	0.266	2750	0.129	0.335	563	0.073	0.260
Self-employed	3313	0.511	0.500	2906	0.490	0.500	407	0.663	0.473	2750	0.458	0.498	563	0.773	0.419
Primary school	4344	0.420	0.494	3630	0.518	0.490	714	0.401	0.500	3621	0.399	0.490	723	0.524	0.500
Junior high school	4344	0.254	0.435	3630	0.281	0.431	714	0.247	0.453	3621	0.265	0.442	723	0.195	0.396
Senior high school	4344	0.152	0.359	3630	0.153	0.364	714	0.125	0.331	3621	0.165	0.371	723	0.086	0.280
University	4344	0.121	0.326	3630	0.130	0.344	714	0.041	0.198	3621	0.136	0.343	723	0.044	0.206
Male	4344	0.836	0.371	3630	-	-	714	-	-	3621	0.821	0.383	723	0.907	0.290
Age	4344	46.491	12.430	3630	47.022	12.574	714	43.793	11.303	3621	46.743	12.379	723	45.231	12.616
Married	4344	0.852	0.356	3630	0.907	0.291	714	0.571	0.495	3621	0.840	0.367	723	0.909	0.288
Family size	4344	8.128	5.270	3630	8.317	5.454	714	7.167	4.082	3621	7.954	5.175	723	8.994	5.644
Urban resident	4344	0.834	0.373	3630	0.819	0.385	714	0.906	0.292	3621	-	-	723	-	-

Table 2

	Descriptive statistics, employment by education level											
	Primary school			Junior high school			Senior high school			University		
	Observation	Mean	Standard deviation	Observation	Mean	Standard deviation	Observation	Mean	Standard deviation	Observation	Mean	Standard deviation
Employed	1825	0.683	0.466	1102	0.712	0.453	659	0.835	0.372	526	0.886	0.318
Employed in the public sector	1287	0.093	0.291	812	0.329	0.470	561	0.561	0.497	475	0.714	0.453
Employed in the private sector	1287	0.089	0.284	812	0.145	0.353	561	0.173	0.379	475	0.101	0.302
Self-employed	1287	0.786	0.411	812	0.475	0.500	561	0.201	0.401	475	0.109	0.313



## 4. Results

### 4.1. Aggregated estimates

The marginal effects of education on employment status for the full sample are summarized in Table 3. Table B.1 presents the marginal effects of the other independent variables included in the regressions. Column (1) shows the results related to the probability to be employed while columns (2)-(4) show the probability to be employed in the public/private sector or to be self-employed.

The principal finding of Table 3 is that in general junior high school and university graduates are more likely to be employed, the probability being significant for university education. Looking at the employment sector, the results show that high school and university graduates are more likely to be employed in the public sector but less likely to get involved in self-employment activities. Higher public sector employment is mainly due to the increase in public investment made possible thanks to improved budgetary situation (Wodon, 2007). The public sector is still the main job provider. The probability is highest for university education. In contrast, individuals with primary education are more likely to be self-employed. This is explained by the fact that there are almost no public jobs with primary school certificate as the minimum requirement. In most of the low grade public jobs, the lowest education level required is junior high school diploma.

The results also show that elder household heads have a lower probability to be employed. In addition, the geographical location (urban/rural) and gender seem to partly explain the employment status of the heads of the households, justifying the need for disaggregation of the sample.

Table 3

**Marginal effects of education on employment (full sample)**

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	-0.05 (0.03)	-0.09* (0.04)	-0.02 (0.03)	0.10** (0.05)
Junior high school	-0.04 (0.03)	0.21*** (0.05)	0.04 (0.03)	-0.23*** (0.04)
Senior high school	0.05 (0.03)	0.44*** (0.05)	0.06 (0.03)	-0.46*** (0.03)
University	0.11*** (0.03)	0.58*** (0.04)	-0.02 (0.03)	-0.52*** (0.02)
Number of observations	4344	3313	3313	3313
Log likelihood	-2120.52	-3031.29	-3031.29	-3031.29

**Notes:** Standard errors are in parentheses. \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively.

#### 4.2. By-gender disaggregated estimates

Table 4 summarizes the marginal effects of the education levels on the employment status for the disaggregated (male vs. female) sample. The results related to the impact of the other variables are presented in the appendix (Tables B.1 and B.2). The results confirm the findings of the aggregated sample and show some additional evidence.

Specifically, female household heads have a higher probability to be employed in the private sector and the impact is significant at 1% for all education levels, senior high school having the highest coefficient. This can be explained by the fact that the private sector mainly comprises services (telecommunications, tourism, etc.) requiring relatively low skills. Women are commonly employed for such low-skilled jobs (e.g as cooks, waitresses, janitors, and hairdressers). With respect to the public sector, the impact of education starts to be significant for women only from senior high school while for men it is from the junior high school that we observe a positive association between education and public sector employment. The marginal effects are higher for female than male with regard to self-employment. Unsurprisingly, female education has a higher marginal effect due the relatively higher opportunities in the private sector available to women. Women heads of household tend to be autonomous and enterprising (IMF, 2007). Furthermore, in an attempt to empower women and increase the female participation in the country's economic activity, the government established Loan Project for Women (2000-2005) dedicated to finance women-led micro-projects and to promote feminine entrepreneurship (Thiam, 2008). This program and other such measures (for example, the National Fund for Promoting Women's Entrepreneurship) may have helped to bring more women in the private sector. In contrast, in the public sector, the coefficients are higher for males than for the females.

Table 4

##### Marginal effects of education on employment (men vs. women)

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	-0.05 [-0.01]	-0.08* [-0.12]	-0.02 [0.82***]	0.10** [0.04]
Junior high school	-0.04 [0.05]	0.23*** [0.09]	0.03 [0.98***]	-0.23*** [-0.27]
Senior high school	0.03 [0.22**]	0.45*** [0.43**]	0.05 [0.99***]	-0.44*** [-0.65***]
University	0.08*** [0.33***]	0.59*** [0.40*]	-0.03 [0.98***]	-0.51*** [-0.66***]
Number of observations	3630[714]	2906[407]	2906[407]	2906[407]
Log likelihood	1572.57[-467.64]	-2694.41[-283.19]	-2694.41 [-283.19]	-2694.41 [-283.19]

**Notes:** \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively. Marginal effects for women are represented in the brackets. Figures in the brackets at the bottom of the table are the corresponding values for women.

Our results share some of the findings of Glick and Sahn (1997) in the sense that we find post-elementary education to be negatively associated with self-employment in Senegal [in Glick and Sahn (1997), all the education levels are associated with self-employment]. A difference with their study is that the coefficients associated with their education indicators are higher. This is probably because their study only focuses on Guinea's capital Conakry, where both the education availability and employment opportunities are higher than the country as a whole. The results also show that the age of the head of the household is only significant in the case of male headed households.

#### 4.3. Disaggregated estimates by location (rural vs. urban)

The results of the disaggregated sample with respect the rural/urban sample are summarized in Table 5, while those related to the impact of other variables are presented in the appendix (Tables C.1 and C.2). Again, the crucial role played by education is confirmed and the results are similar as those obtained with the aggregated sample. Household heads with secondary and tertiary education are more likely to be employed in the public sector but less likely to be self-employed in both urban and rural areas. The reason is that there has been a public investment boom in recent years, leading to creation of new work opportunities in the sector (Wodon, 2007). The marginal effect is higher for urban than rural household heads in self-employment and university graduates in the public sector.

Other recent studies have similarly concluded that location (urban vs. rural) plays an important role in labor participation. For example, Castel et al. (2010) show that households in rural areas are less likely to be in the wage employment sector and more likely to be in farming. Ackah et al. (2009) also show that urban residents are more likely to find work. However, these studies do not disaggregate the full sample into urban and rural, so their results can not be adequately compared with our findings.

Our study also finds evidence for a negative association between urban residency and self-employment, and a positive relationship with private and public sector employment.

Table 5

**Marginal effects of education on employment (urban vs. rural)**

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	-0.15*** [0.05]	-0.10* [-0.07*]	-0.03 [0.02]	0.15*** [0.00]
Junior high school	-0.13*** [0.06]	0.22*** [0.05]	0.02 [0.10]	-0.19*** [-0.21**]
Senior high school	-0.03 [0.08]	0.44*** [0.27**]	0.05 [0.09]	-0.41*** [-0.50***]
University	0.03 [0.21***]	0.56*** [0.67***]	-0.04 [0.06]	-0.46*** [-0.76***]
Number of observations	3612[715]	2750[563]	2750[563]	2750[563]
Log likelihood	-1727.19[-360.08]	-2655.60[-292.53]	-2655.60 [-292.53]	-2655.60 [-292.53]

**Notes:** \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively. Marginal effects for the rural area are represented in the brackets. Figures in the brackets at the bottom of the table are the corresponding values for rural areas.

## 5. Concluding remarks

This paper investigated the extent to which the differences in education levels are associated with the differences in employment opportunities. The empirical setting was the 2005 Senegalese Household Survey.

The main finding is that individuals with secondary and university education have higher probability to be employed in public sector but lower probability to be self-employed. This result holds for several disaggregations of the data by gender and geographical location (rural/urban). Besides, female educated heads of household are more likely to be employed in the private sector. Given the overwhelming probability of the educated households' heads obtaining a public or private sector job, as compared to the limited chance for the uneducated, these results highlight a potential unfulfilled demand for the better educated in the Senegalese job market. The market can still absorb more skilled workers, implying that there is a need for increased emphasis on human capital accumulation in the country.

The results of the study are indicative and can help to analyze the employment profile of the Senegalese households. However, to find whether the association between education and employment is causal, it is necessary to have panel data which could take into consideration the temporal dimension of the variables. This remains a future research prospect.

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## Note

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- (1) Although, a classification based on the agriculture versus non-agriculture sector is possible, this study mainly focuses on the employment in the three sectors (public, private and self-employment).

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## Appendix

Table A.1

## Aggregated estimates, the marginal effects

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	-0.05 (0.03)	-0.09* (0.04)	-0.02 (0.03)	0.10** (0.05)
Junior high school	-0.04 (0.03)	0.21*** (0.05)	0.04 (0.03)	-0.23*** (0.04)
Senior high school	0.05 (0.03)	0.44*** (0.05)	0.06 (0.03)	-0.46*** (0.03)
University	0.11*** (0.03)	0.58*** (0.04)	-0.02 (0.03)	-0.52*** (0.02)
Male	0.26*** (0.02)	0.05** (0.03)	0.05*** (0.01)	-0.15*** (0.03)
Age	-0.01*** (0.00)	0.00*** (0.00)	-0.00* (0.00)	-0.00** (0.00)
Married	0.04** (0.02)	0.04 (0.03)	0.01 (0.02)	-0.05 (0.03)
Family size	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Urban	0.02 (0.02)	0.17*** (0.02)	0.03** (0.01)	-0.25*** (0.03)
Diourbel	0.05* (0.03)	0.29*** (0.05)	-0.08*** (0.01)	-0.08* (0.05)
Fatick	0.10*** (0.02)	0.20*** (0.04)	-0.10*** (0.01)	0.04 (0.04)
Kaolack	0.04 (0.03)	0.20*** (0.04)	-0.09*** (0.01)	0.06 (0.04)
Kolda	-0.03 (0.03)	0.25*** (0.04)	-0.08*** (0.01)	-0.04 (0.04)
Louga	0.05* (0.03)	0.01 (0.04)	-0.06*** (0.01)	0.11*** (0.04)
Matam	-0.04 (0.04)	0.21*** (0.05)	-0.10*** (0.01)	0.10* (0.05)
Saint-Louis	0.06** (0.02)	0.11*** (0.04)	-0.01 (0.02)	-0.04 (0.04)
Tambacounda	0.02 (0.03)	0.20*** (0.04)	-0.07*** (0.01)	-0.02 (0.04)
Thies	0.00 (0.03)	0.12*** (0.04)	-0.03** (0.02)	-0.04 (0.04)
Ziguinchor	0.03 (0.02)	0.11*** (0.04)	-0.09*** (0.01)	0.11*** (0.04)
Observations	4344	3313	3313	3313
R2	0.146	0.206	0.206	0.206
Log likelihood	-2120.52	-3031.29	-3031.29	-3031.29

Notes: \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively.

Table B.1

**Disaggregated estimates by gender, the marginal effects (female)**

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	-0.01 (0.12)	-0.12 (0.12)	0.82*** (0.09)	0.04 (0.16)
Junior high school	0.05 (0.12)	0.09 (0.14)	0.98*** (0.02)	-0.27 (0.17)
Senior high school	0.22** (0.11)	0.43** (0.18)	0.99*** (0.00)	-0.65*** (0.12)
University	0.33*** (0.09)	0.40* (0.21)	0.98*** (0.01)	-0.66*** (0.09)
Age	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Married	-0.01 (0.04)	-0.01 (0.04)	0.01 (0.02)	0.01 (0.05)
Family size	0.00 (0.00)	-0.00 (0.01)	-0.00 (0.00)	-0.00 (0.01)
Urban	-0.08 (0.07)	-0.05 (0.08)	-0.07 (0.06)	0.09 (0.10)
Diourbel	0.11 (0.09)	0.33** (0.13)	-0.05*** (0.02)	-0.25* (0.13)
Fatick	0.18*** (0.07)	-0.01 (0.08)	- (0.02)	0.07 (0.09)
Kaolack	0.06 (0.07)	0.06 (0.09)	-0.05** (0.02)	0.05 (0.09)
Kolda	0.05 (0.08)	0.08 (0.11)	-0.05*** (0.02)	-0.02 (0.12)
Louga	0.11 (0.08)	-0.05 (0.08)	-0.03 (0.03)	0.04 (0.11)
Matam	0.01 (0.13)	0.62*** (0.15)	- (0.02)	-0.43** (0.17)
Saint-Louis	0.07 (0.07)	0.12 (0.11)	0.04 (0.05)	-0.22** (0.11)
Tambacounda	0.22** (0.09)	0.32** (0.16)	-0.03 (0.03)	-0.29* (0.15)
Thies	-0.03 (0.07)	0.07 (0.09)	-0.04** (0.02)	0.00 (0.10)
Ziguinchor	0.20*** (0.06)	0.06 (0.08)	-0.05** (0.02)	0.03 (0.08)
Observations	714	407	407	407
R2	0.0481	0.281	0.281	0.281
Log likelihood	-467.64	-283.19	-283.19	-283.19

**Notes:** \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively.

Table B.2

**Disaggregated estimates by gender, the marginal effects (male)**

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	-0.05 (0.03)	-0.08* (0.05)	-0.02 (0.03)	0.10** (0.05)
Junior high school	-0.04 (0.03)	0.23*** (0.05)	0.03 (0.03)	-0.23*** (0.04)
Senior high school	0.03 (0.03)	0.45*** (0.05)	0.05 (0.04)	-0.44*** (0.03)
University	0.08*** (0.03)	0.59*** (0.04)	-0.03 (0.03)	-0.51*** (0.02)
Age	-0.01*** (0.00)	0.00*** (0.00)	-0.00* (0.00)	-0.00* (0.00)
Married	0.21*** (0.03)	0.06** (0.03)	0.01 (0.02)	-0.07* (0.04)
Family size	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Urban	0.05** (0.02)	0.19*** (0.02)	0.04*** (0.01)	-0.28*** (0.03)
Diourbel	0.05* (0.03)	0.27*** (0.05)	-0.08*** (0.01)	-0.04 (0.05)
Fatick	0.09*** (0.02)	0.23*** (0.04)	-0.10*** (0.01)	0.03 (0.04)
Kaolack	0.04 (0.03)	0.22*** (0.04)	-0.10*** (0.01)	0.07 (0.04)
Kolda	-0.04 (0.03)	0.27*** (0.04)	-0.08*** (0.01)	-0.03 (0.05)
Louga	0.04 (0.03)	0.02 (0.04)	-0.06*** (0.01)	0.13*** (0.05)
Matam	-0.03 (0.04)	0.18*** (0.06)	-0.10*** (0.01)	0.14*** (0.05)
Saint-Louis	0.06*** (0.02)	0.11** (0.04)	-0.01 (0.02)	-0.02 (0.04)
Tambacounda	0.01 (0.03)	0.20*** (0.05)	-0.08*** (0.01)	0.00 (0.05)
Thies	0.02 (0.03)	0.13*** (0.04)	-0.03 (0.02)	-0.05 (0.04)
Ziguinchor	0.02 (0.02)	0.12*** (0.04)	-0.09*** (0.01)	0.11*** (0.04)
Observations	3630	2906	2906	2906
R2	0.180	0.207	0.207	0.207
Log likelihood	-1572.57	-2694.41	-2694.41	-2694.41

**Notes:** \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively.



Table C.1

**Disaggregated estimates by location (rural), the marginal effects**

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	0.05 (0.06)	-0.07* (0.04)	0.02 (0.04)	0.00 (0.07)
Junior high school	0.06 (0.06)	0.05 (0.05)	0.10 (0.08)	-0.21** (0.09)
Senior high school	0.08 (0.06)	0.27** (0.11)	0.09 (0.09)	-0.50*** (0.11)
University	0.21*** (0.03)	0.67*** (0.11)	0.06 (0.09)	-0.76*** (0.06)
Male	0.29*** (0.08)	-0.06 (0.06)	-0.06 (0.07)	0.17* (0.10)
Age	-0.01*** (0.00)	0.00*** (0.00)	-0.00*** (0.00)	0.00 (0.00)
Married	-0.15*** (0.04)	-0.01 (0.04)	-	-0.14*** (0.04)
Family size	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Diourbel	0.08 (0.09)	-0.01 (0.04)	0.08 (0.08)	-0.07 (0.10)
Fatick	-0.03 (0.08)	-0.09*** (0.02)	0.00 (0.04)	0.12** (0.05)
Kaolack	-0.18 (0.11)	-0.05** (0.02)	-0.03 (0.04)	0.09 (0.06)
Kolda	-0.19* (0.11)	-0.06*** (0.02)	-0.05* (0.03)	0.13*** (0.05)
Louga	-	-0.05 (0.03)	0.03 (0.11)	0.06 (0.11)
Matam	-0.39*** (0.12)	-0.03 (0.04)	-	0.12* (0.06)
Saint-Louis	-0.03 (0.10)	-0.06*** (0.02)	0.20* (0.11)	-0.01 (0.08)
Tambacounda	-0.21* (0.12)	-0.04* (0.02)	0.07 (0.09)	-0.04 (0.11)
Thies	-0.07 (0.09)	-0.07*** (0.02)	0.08 (0.08)	0.11** (0.05)
Ziguinchor	-0.12 (0.08)	-0.11*** (0.02)	0.01 (0.04)	0.17*** (0.04)
Observations	715	563	563	563
R2	0.0976	0.327	0.327	0.327
Log likelihood	-360.08	-292.53	-292.53	-292.53

**Notes:** \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively.

Table C.2

**Disaggregated estimates by location (urban), the marginal effects**

	(1)	(2)	(3)	(4)
	Employed	Public sector	Private sector	Self-employed
Primary school	-0.15*** (0.05)	-0.10* (0.06)	-0.03 (0.03)	0.15*** (0.05)
Junior high school	-0.13*** (0.05)	0.22*** (0.06)	0.02 (0.03)	-0.19*** (0.05)
Senior high school	-0.03 (0.05)	0.44*** (0.06)	0.05 (0.04)	-0.41*** (0.04)
University	0.03 (0.05)	0.56*** (0.05)	-0.04 (0.03)	-0.46*** (0.03)
Male	0.26*** (0.02)	0.08*** (0.03)	0.07*** (0.01)	-0.20*** (0.03)
Age	-0.01*** (0.00)	0.00*** (0.00)	-0.00 (0.00)	-0.00*** (0.00)
Married	0.07*** (0.02)	0.06* (0.03)	-0.02 (0.02)	-0.03 (0.03)
Family size	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Diourbel	0.04 (0.03)	0.32*** (0.05)	-0.10*** (0.01)	-0.04 (0.05)
Fatick	0.13*** (0.02)	0.28*** (0.04)	-0.11*** (0.01)	-0.00 (0.04)
Kaolack	0.06** (0.03)	0.24*** (0.04)	-0.10*** (0.01)	0.05 (0.04)
Kolda	-0.02 (0.03)	0.31*** (0.04)	-0.08*** (0.01)	-0.07 (0.04)
Louga	0.05* (0.03)	0.04 (0.05)	-0.07*** (0.01)	0.12*** (0.04)
Matam	0.00 (0.04)	0.25*** (0.06)	-0.10*** (0.01)	0.08 (0.06)
Saint-Louis	0.06** (0.03)	0.14*** (0.04)	-0.02 (0.02)	-0.03 (0.04)
Tambacounda	0.04 (0.03)	0.24*** (0.05)	-0.08*** (0.01)	-0.02 (0.04)
Thies	-0.01 (0.03)	0.17*** (0.04)	-0.04** (0.02)	-0.07* (0.04)
Ziguinchor	0.03 (0.02)	0.18*** (0.04)	-0.10*** (0.01)	0.07* (0.04)
Observations	3621	2750	2750	2750
R2	0.170	0.190	0.190	0.190
Log likelihood	1727.19	-2655.61	-2655.61	-2655.61

**Notes:** \*\*\*, \*\* and \* mean significant at 1%, 5% and 10% level respectively.