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<https://doi.org/10.15017/3000467>

出版情報：経済論究. 136, pp.61-75, 2010-03. 九州大学大学院経済学会
バージョン：
権利関係：

Effects of Education on Poverty: Evidence from Senegal

Barassou Diawara

Abstract

This paper assesses empirically the role played by households' education levels and training types in determining the poverty status of households in Senegal in 2005. A probit model is estimated separately for urban and rural areas as well as for men and women. The results show that the levels of education and types of trainings have significant but different propensity for poverty reduction. Related to the education levels, the findings show that it is only from the senior high school that education has a significant impact on the probability of poverty reduction in urban and rural areas as well as for men and women. Besides, the findings show that on-the-job training has higher impact in rural than in urban areas. The result suggests the need for a review of the level of compulsory education in Senegal up to senior high school.

Keywords: Education, on-the-job-training, poverty, Senegal

JEL Classifications: O10, I21, I30

1 . Introduction

Poverty alleviation is undeniably what economic growth and/or development is all about (Cuong, 2009). Since 2000, most developing countries under the guidance and support of the International Community (donors and international financial institutions) have refocused their attention on poverty reduction¹⁾ and launched numerous poverty alleviation programs. As an illustration, it is to be noticed that the bulk of developing countries have then been involved in the production of a series of Poverty Reduction Strategy Papers (PRSP) “clearly oriented to achieving the joint objectives of poverty reduction and economic growth” (IMF, 2004; p. vii). Although the benefits and poverty reduction capabilities of the various poverty alleviation programs are not negligible, it is undoubtful that an efficient way to fight poverty is to find out the main factors affecting it. In other words, it is necessary to examine the main determinants of poverty (Albert

1) A formal framework is constituted by the Millennium Development Goals (MDGs).

and Collado, 2004).

This study follows the same line, focuses on the case of Senegal and pays a special attention to education (and training) as one of the main determinants of poverty reduction. The principal objective of this study is to investigate the potential impact of the different levels of education and types of training on the incidence of poverty in Senegal. Investigating not only the impact of education (but also of the other relevant factors) on the poverty incidence in Senegal is potentially important for economists and researchers but also governments and development agencies as the results of the empirical analyses can inform on a range of analytical and policy issues applicable to the country of interest but also the other developing countries of the same characteristics. In particular, the findings of this study can help central government and the international community to understand the sectors or factors to prioritize or on which to act in order to efficiently reduce poverty in Senegal.

The role of education and training in poverty reduction is worth to be examined because of the direct, indirect and intergenerational effects associated with human capital. In fact, the significant role played by education is acknowledged and proven by various theoretical but also empirical studies (Mankiw, Romer and Weil, 1992; McMahon, 1999; Gyimah-Brempong, 2005). Besides, the role of education and training as an efficient and appropriate means for poverty reduction has also been stressed by donors and the International Community through the Millennium Development Goals (MDGs). To the best of our knowledge, no work exists on this aspect for the West African country of Senegal. In fact, Senegal is a useful study case because it is fairly representative of other moderately open, low income economies with few natural resources and relatively high level of human capital in Africa. This paper contributes to the literature by analyzing the impact of the education levels and types of training on the probability of reducing poverty.

Among the studies examining the impact of education on poverty in Sub-Saharan Africa, we can cite those related to Kenya (Alemayehu, de Jong, Kimenyi and Mwabu, 2005), Malawi (Mukherjee and Benson, 2003), Cote d'Ivoire (Grootaert, 1997) and Mauritania (Coulombe and McKay, 1996). Although the main purpose of the above-mentioned studies were to investigate the determinants of poverty in the respective countries, the findings show that higher education levels are negatively and significantly associated with the probability to be poor. Studies related to poverty in Senegal are descriptive and mainly analyze the characteristics of poor households (Cissé, 2003; Badji and Daffé, 2003 and Diagne, Faye and Faye, 2005). Besides, most of them attempt to estimate the poverty lines. This study investigates the impact of different levels of education (primary, senior high, junior high and university) and types of training on poverty.

The remaining of the paper is structured as follows. Section 2 gives an overview of the profile and status of poverty in Senegal while section 3 reviews the related literature. Section 4 presents

the econometric specification and estimation methods and describes the data source. Section 5 presents the empirical results, and the last section concludes the paper.

2 . Profile of poverty in Senegal

Poverty is a multidimensional phenomenon and, to define it, various approaches have been proposed, namely the well-being, basic needs and capabilities approaches. In the context of Senegal, there are an objective approach based on quantitative data and a subjective approach based on the households' perception of their living conditions. In this paper, we use poverty to refer to the objective measure. In this case, a poverty line is defined as a threshold below which the household is considered as poor; the calculation of the index is based on the foods and nonfoods expenditures (ESPS, 2005).

Over the years, poverty in Senegal has generally declined: poverty incidence at the national level decreases from 61.4% to 42.9% between 1994-95 and 2005. At the disaggregated level (i.e. separating Dakar with the other urban and rural areas), similar conclusions related to the reduction in poverty can be re-conducted. For example, in Dakar the incidence of poverty has reduced from 49.7% in 1994-95 to 26.5% in 2005 while in the other urban areas it has fallen from 62.6% to 44.9% during the same period. The reduction of poverty has been smaller in the rural areas in the sense that it has passed from 65.9% to 57.5% during the period 1994-95 to 2005 (see Table 1).

Taking into consideration the poverty figures in 2001-02, Table 1 shows that poverty incidence at the national level and in Dakar has decreased between 2001-02 and 2005. However, for the same period, the incidence of poverty has slightly increased in the other urban areas while being almost constant in the rural areas. Thus, the position of Dakar as the main political, administrative and economic zone of Senegal has largely impacted the households in the Dakar urban collectivities in comparison with the other areas. It is also to be noticed that there are large disparities in the incidence of poverty among the different urban areas (Figure 1).

Figure 1 presents the regional distribution of poverty during 2001-2005 and show that the disparity of poverty incidence is a reality in Senegal. Although poverty has reduced in most of the regions, the regions of Fatick and Louga experience an increase of the percentage of poor households. The causes of an increase of poverty in Fatick are still mainly social and economic and are related to the inactivity of the households, job loss and retirement. The pluviometric deficit and the presence of parasites have worsened the living conditions of the large rural population (ANSD, 2007a). Related to the region of Louga (with high proportion of emigrants) well-known as a region of low poverty rates, an increase of the poverty incidence is mainly due to rural poverty aggravated by the degradation of the soils' quality, the rarity of the rains. In

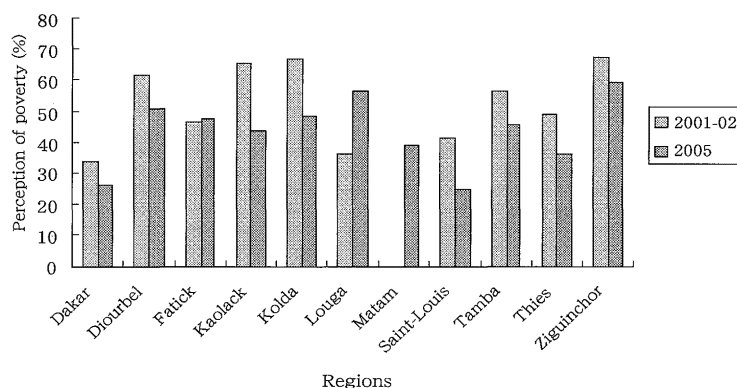
particular, the 2004/2005 agricultural campaign in Louga was marked by an extremely low yield for the main products (groundnuts, millet, watermelon and bean) mainly due to the crickets' invasion (ANSD, 2007b).

Table 1. Households' poverty in Senegal (in percentage), 1994-2005

	Nationwide	Dakar	Other urban areas	Rural area
Incidence of poverty				
1994-95	61.4	49.7	62.6	65.9
2001-02	48.5	33.3	43.3	57.5
2005	42.9	26.5	44.9	57.7

Source: ESPS-2005, ESAM II (2001-02) and ESAM I (1994-95)

Figure 1. Regional evolution of the incidence of poverty in Senegal



Note: Matam was not a region at the time ESAM II was launched.

Source: ESPS-2005 and ESAM II (2001-02)

Table 1 and Figure 1 show that, during the period considered, poverty has generally decreased but large regional disparities do exist. This paper attempts to examine the factors explaining the poverty trends and differences among households in Senegal focusing on the role played by education. Table 2 gives an overview of the characteristics of poor people in Senegal using the latest households' survey conducted in 2005 (ESPS-2005; see the section related to the data for a description of the survey).

For instance, we see from Table 2 that fewer single households' heads (30 percent) are poor in comparison with the married, widowed and divorced heads of household. Among households classified by education levels, those headed by individuals having completed the primary education tend to be poorer than households headed by individuals with secondary or tertiary education levels. Besides, large families are more likely to be poor in comparison with families of smaller

size.

Table 2. Distribution of poverty incidence by marital status, education level and family size

	Poverty incidence
National	42.9
A. Marital status of the households' head	
Monogamy	41.1
Polygamy	48.8
Single	30.0
Widowed	43.0
Divorced	35.0
B. Highest education level of the households' head	
No education	41.4
Primary	37.3
Secondary	25.3
Tertiary	7.8
C. Family size (number of persons)	
1-2	19.0
3-4	23.4
5-6	31.3
7-8	42.4
9-10	49.2
More than 10	59.9

Source: ESPS-2005

3 . Review of the related literature

3.1. On the effect of education on poverty

Education is unanimously regarded as an important instrument for poverty reduction²⁾ (Tilak, 2002; Masood, Nouman and Haroon, 2008). The impact of education poverty can be explained through the direct and indirect impacts.

The direct effect of education on poverty reduction is explained through the increase in wages or income/earnings. In fact, according to the human capital theory, education together with training imparts skills and productive knowledge and transforms the unpolished potential of human beings into more valuable human capital. The skills and productive knowledge imparted in human beings through education in turn increase their productivity and thereby their earnings.

2) The other way around i.e. poverty is a big harm for education attainment is also well-recognized (van der Berg, 2008). However, since it is not the purpose of the present study, we will not consider this alternative in the review of the literature.

Various studies using either the full method (or cost-benefit analysis) or the Mincer equation have confirmed the positive and significant impact of education on earnings (Psacharopoulos and Patrinos, 2004).

The indirect effects of education on poverty are also huge and have attracted the attention of researchers. In fact, education not only increases the income but it also helps households and individuals to fulfill their basic needs such as water and sanitation, shelter and better utilization of health facilities (Tilak, 2002). Besides, education also affects positively the behavior of women with respect to fertility, family welfare and health (Masood, Nouman and Haroon, 2008). The indirect effects of education on poverty are captured through the concept of basic needs approach” (International Labor Office, 1976; Tilak, 2002).

Being aware of the direct and indirect effects associated with education, various studies have been conducted to assess the poverty reduction capability of education and training [for example, Tilak (2007) for India; Masood, Nouman and Haroon (2008) for Pakistan]. Studies related to Senegal are scarce.

3.2. Previous poverty studies in Senegal

Studies on poverty in Senegal are descriptive and mainly examine the measurement issues and characteristics of poor people in Senegal. Analytical works are at our knowledge rare and the existing ones investigate the potential effects of trade liberalization on poverty in Senegal (Maertens and Swinnen, 2009).

The bulk of the studies on poverty in Senegal are descriptive. Cissé, Daffé and Diagne (2003), through a descriptive data analysis, have shown that the differences in the allocation of resources among the different education levels are associated with the differences in education enrollments. Besides, they have shown that households with lower education levels are likely to be poorer (method similar to the one used in panel B of Table 2), meaning that the lack of education reinforces the probability of being poor. On the same line and focusing on the calculation of various poverty lines (rural vs. urban, male vs. female poverty, employed vs. employed and educated vs. uneducated), Cissé (2003) also comes up with the same conclusion related to the relationship between education levels and poverty incidence. Badji and Daffé (2003), using a descriptive analysis, have focused on female poverty (female are vulnerable) and shown that the role and status of the women in the Senegalese society but also their generally low education level are the main explanatory factors. DPS (2004) also confirms the view that households with lower education levels (or no education) represent the majority of the poor in Senegal. In attempting to re-estimate the poverty figures, Diagne, Faye and Faye (2005) have explored the profile of core poverty by combining three indicators, namely the households' expenditures, assets and deprivation. They have also concluded, although using preliminary descriptive analysis, that women and

unskilled individuals are more likely to be poor.

All the above-mentioned studies are purely descriptive (i.e. they classify the poor according to the education levels, the residence, the age, the professional categories or the gender) and consequently did not show the impact of a given variable or characteristics while controlling for the effect of the other relevant indicators. Studies in this line include Maertens and Swinnen (2009) who have examined the effects of trade liberalization (not education) on income and poverty in Senegal. The present study proposes to look at the role played by the different education levels and type of training on poverty using the “*Enquête de Suivi de la Pauvreté au Sénégal*” Survey conducted in 2005.

4 . Empirical strategy

4.1. Data issues

The present study relies on the Senegal Poverty Monitoring Report conducted in 2005 (SPMR-2005) well-known as ESPS-2005 (*Enquête de Suivi de la Pauvreté au Sénégal* in French). 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 (ESPS, 2005) is the first survey conducted in the framework of the global program for the monitoring-assessment of the poverty reduction strategies. It aims at analyzing relevant and easy-to-collect indicators for a regular follow-up of poverty progression in Senegal. The information collected are related to education, health, employment, households' assets and comfort, access to basic community services, viewpoint of the populations vis-à-vis their life conditions and expectations from the government. The data are also related to the priorities and solutions for poverty reduction but also populations' perception of the institutions. Consequently, the survey provides a large series of variables allowing estimating various valuable indicators at different geographical levels and for many social categories (ESPS, 2005).

To analyse the role played by education in the reduction of poverty (or the probability of being poor), the ESPS-2005 database provides a comprehensive list of appropriate variables. See Table 3 for the description and summary statistics of the different variables used in this study. The households' size related variables show that there are large differences in family size among the households, with 30 percent of families having more than 10 persons (Table 3). The age of the households' head in the sample is also heterogeneous as shown by the large standard deviation (14.64). Table 3 also show that 43% of the heads of household are poor. The table show that the majority of households' heads have reached the primary education (42 percent) and have a followed an on-the-job training type. Few have a technical or professional training (2 percent). Besides, most of the heads of household surveyed are male (79 percent) and live in urban areas

(63 percent). Besides, each household has on average 3 heads of cattle and other livestock (a variable showing the households' holdings).

Table 3. Summary statistics description of the variables

Variable	Description	Mean	Std. Dev.
Poverty	1 if the household head is poor and 0 otherwise	0.43	0.49
Primary education	1 if the household heads' highest education level is primary and 0 otherwise	0.42	0.49
Senior high school	1 if the household heads' highest education level is senior high and 0 otherwise	0.25	0.43
Junior high school	1 if the household heads' highest education level is junior high and 0 otherwise	0.15	0.36
University	1 if the household heads' highest education level is university and 0 otherwise	0.12	0.32
On-the-job training	1 if the household head has on-the-job type of training and 0 otherwise	0.13	0.34
Technical secondary education	1 if the household head has a secondary education technical training and 0 otherwise	0.03	0.16
Technical tertiary education	1 if the household head has a tertiary education technical training and 0 otherwise	0.02	0.13
Professional secondary education	1 if the household head has received a secondary education professional training and 0 otherwise	0.02	0.14
Professional tertiary education	1 if the household head has received a tertiary education professional training and 0 otherwise	0.02	0.15
Households' size (3-4 persons)	1 if the household has 3 to 4 people and 0 otherwise	0.11	0.32
Households' size (5-6 persons)	1 if the household has 5 to 6 people and 0 otherwise	0.18	0.39
Households' size (7-8 persons)	1 if the household has 7 to 8 people and 0 otherwise	0.19	0.39
Households' size (9-10 persons)	1 if the household has 9 to 10 people and 0 otherwise	0.14	0.35
Households' size above (10 persons)	1 if the household has more than 10 people and 0 otherwise	0.30	0.46
Male dummy	1 if the households' head is male and 0 otherwise	0.79	0.41
Urban dummy	1 if the household is located in urban area and 0 otherwise	0.63	0.48
Age	Age of the head of the household	50.67	14.64
Polygamy	1 if the household head marital status is polygamy and 0 otherwise	0.27	0.44
Single	1 if the household head marital status is single and 0 otherwise	0.03	0.18
Widowed	1 if the household head marital status is widowed and 0 otherwise	0.11	0.32
Divorced	1 if the household head marital status is divorced and 0 otherwise	0.02	0.14
Plough dummy	1 if the household has a plough and 0 otherwise	0.13	0.34
Pirogue dummy	1 if the household has a pirogue and 0 otherwise	0.02	0.15
Vehicle/truck dummy	1 if the household has a vehicle or truck and 0 otherwise	0.04	0.20
Land (in hectares)	Land possessed by the household in hectares	2.06	5.06
Number of cattle and other livestock	Number of livestock owned by the household	3.03	12.76

4.2. Econometric specification and estimation method

The specification adopted here attempts to explain why some households are poor. We use the following general relationship:

$$Y_i^* = \beta_0 + \beta_1 EDUC + \sum_{j=2}^k \beta_j X_{ij} + \varepsilon_i, \quad (1)$$

where Y_i^* is our dependent variable (dummy variable) showing whether household i is poor or not, β_0 is a constant, β_1 and β_j are the coefficients of explanatory variables $EDUC$ (education levels and training types) and X_{ij} (the other controls) respectively, and ε_i is the error term.

Y_i^* is a dummy variable representing the dependent variable which takes the value of 1 if the household is poor and 0 otherwise; this indicator is based on calculation of the poverty lines using the households' expenditures. It is a threshold below which the household is considered as poor; the calculation of the index is based on the foods and nonfoods expenditures (ESPS, 2005).

EDUC refers to the set of education levels and training types indicators considered in this study. All the education and training related variables are presented in Table 3. The education levels data are binary and concern the following levels: primary school, senior high school and junior high school and university (no education is set as base). The training types-variables are the on-the-job training, technical secondary education, technical tertiary education, professional secondary education and professional tertiary education (no training being the baseline).

In addition, X_{ij} is a vector of variables controlling for the other characteristics of the households (see Table 3 related to the summary statistics for the other variables in the empirical analysis). The other controls are related to the households' size, location (rural or urban area), the head of households' gender and marital status. Variables related to the households' holdings are also included in the sense that they are supposed to explain the households' living conditions (Mukherjee and Benson, 2003). The proxies included in this paper are plough (for rural households), pirogue and vehicle/truck dummies but also the land owned (in hectares) and the number of cattle and other livestock.

The employment related variables are also of great explanatory capability and could be taken into account (Coulombe and McKay, 1996). However, their non-included did not affected in any way our results related to the impact of education and training.

We adopt a probit estimation approach to assess the role played by education levels and training types on the probability of being poor. The choice of this method is influenced by the nature of our dependent variables which are binary taking values one or zero. Besides, a probit model is a statistical procedure developed to estimate the relationship between a dichotomous dependent variable and continuous explanatory variables (Jones, 2007). Specifically, Y_i^* in equation (1) is a discrete random variable that assumes one of two possible values: 1 if households' head is poor and 0 if he/she is not. The independent variables may be either continuous or discrete, but they are assumed to be non-stochastic.

An issue in the estimation of the impact of education on poverty is that, as shown and considered in various studies (for example, van der Berg, 2008), education can also be influenced by poverty, suggesting the probable endogeneity of our main independent variable of interest (education). However, in the specific case of Senegal, formal schooling (from primary school to university) is totally free, compulsory for the primary education and can be undertaken by any Senegalese who wish to do so. The lack of appropriate data cannot help to tackle this problem.

5 . Empirical results

5.1. Impact of education related indicators

Table 4 summarizes the parameter estimates from the probit models for urban and rural areas and for men and women. Besides, Table 5 presents the marginal effects of the different education levels and training types on the probability of being poor. Our analyses and comments related to the impact of education and training on poverty will consequently be based on Table 5.

The estimated impacts of education presented in Table 5 show that, for both men and women and in the rural and urban areas, more education reduces the probability of being poor (regressions 1, 2, 5 and 6). However, in all the cases, the impact of primary education is statistically not significant; meaning that it is from senior high school that the education can clearly have poverty reduction capabilities. Previous studies related to African countries (Coulombe and McKay, 1996; Alemayehu, de Jong, Kimenyi and Mwabu, 2005) have also witnessed the important role played by education in explaining the probability of being poor, the main difference being that primary education is not significant in the case of Senegal. A closer look at the coefficients (Table 5) shows that the higher the education level, the higher is the poverty reduction effect of education. In addition, for all education levels, the effect is higher for women and rural areas.

The types of trainings also exert a significant impact on the likelihood of being poor (regressions 3, 4, 7 and 8, Table 5). In fact, on-the-job training is negatively and significantly associated with the probability of being poor in urban and rural areas but also for men. While all types of training are significant in urban areas, technical and professional secondary education type of training are not significant in rural areas. This result might probably due to the low number of technicians and professionals with secondary education training in rural areas included in the sample. Here also the higher the level of training, the higher is the poverty reduction effect. Related to the men-women classification, all trainings types are significant for both genders except on-the-job training which is not significant for women. This result can be explained by the low likelihood of women to follow on-the-job training but also the few sectors where women can easily be on-the-job trained.

5.2. Impact of the other variables

The other independent variables considered are the households' size, the gender of the households' head, the age, the matrimonial status (with monogamy as a comparison base) and holdings. Besides, the regional dummies (putting the capital Dakar as a base) have also been taken into account. See Table 4 for the probit estimates of the impact of the other independent variables.

Table 4. Probit estimates of households' poverty (rural vs. urban and male vs. female)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Urban	Rural	Urban	Rural	Male	Female	Male	Female
Schooling								
Primary education	-0.18 (0.13)	-0.21 (0.19)	-	-	-0.10 (0.10)	-0.53 (0.32)	-	-
Senior high school	-0.38*** (0.13)	-0.47** (0.21)	-	-	-0.34*** (0.11)	-0.67** (0.33)	-	-
Junior high school	-0.66*** (0.14)	-0.66** (0.26)	-	-	-0.57*** (0.12)	-1.02*** (0.38)	-	-
University	-1.18*** (0.16)	-1.06*** (0.34)	-	-	-1.05*** (0.14)	-	-	-
Training								
On-the-job training	-	-	-0.15*** (0.04)	-0.29*** (0.08)	-	-	-0.21*** (0.04)	-0.11 (0.12)
Technical secondary education	-	-	-0.84*** (0.10)	-0.33 (0.22)	-	-	-0.77*** (0.09)	-0.81*** (0.30)
Technical tertiary education	-	-	-1.09*** (0.15)	-0.92** (0.40)	-	-	-1.09*** (0.14)	-0.99* (0.51)
Professional secondary education	-	-	-0.87*** (0.11)	-0.42 (0.27)	-	-	-0.82*** (0.10)	-1.05*** (0.33)
Professional tertiary education	-	-	-1.20*** (0.14)	-1.01** (0.44)	-	-	-1.21*** (0.13)	-0.76* (0.42)
Households' characteristics								
Households' size (3-4 persons)	0.20 (0.14)	0.57* (0.30)	0.17** (0.08)	0.30** (0.13)	0.17 (0.13)	0.41 (0.33)	0.21** (0.08)	0.09 (0.12)
Households' size (5-6 persons)	0.26** (0.13)	0.87*** (0.29)	0.36*** (0.08)	0.56*** (0.13)	0.35*** (0.13)	0.29 (0.33)	0.47*** (0.08)	0.16 (0.12)
Households' size (7-8 persons)	0.78*** (0.13)	1.11*** (0.29)	0.69*** (0.08)	0.88*** (0.13)	0.78*** (0.13)	0.73** (0.33)	0.78*** (0.08)	0.53*** (0.12)
Households' size (9-10 persons)	0.98*** (0.13)	1.36*** (0.31)	0.83*** (0.08)	1.21*** (0.13)	0.98*** (0.13)	0.91*** (0.34)	1.01*** (0.08)	0.55*** (0.13)
Households' size above (10 persons)	1.33*** (0.13)	2.01*** (0.31)	1.23*** (0.07)	1.43*** (0.13)	1.30*** (0.12)	1.57*** (0.33)	1.29*** (0.08)	1.00*** (0.12)
Male	0.29*** (0.08)	0.14 (0.22)	0.28*** (0.05)	0.34*** (0.08)	-	-	-	-
Urban dummy	-	-	-	-	-0.41*** (0.07)	-0.32 (0.21)	-0.41*** (0.03)	-0.36*** (0.07)
Age	-0.00 (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00** (0.00)	-0.00 (0.00)	0.00 (0.01)	0.00*** (0.00)	-0.00 (0.00)
Polygamy	0.04 (0.07)	-0.23 (0.15)	0.01 (0.04)	-0.17*** (0.05)	-0.01 (0.07)	-0.08 (0.18)	-0.11*** (0.03)	-0.09 (0.08)
Single	0.45*** (0.12)	0.20 (0.28)	0.37*** (0.09)	0.00 (0.16)	0.38*** (0.12)	0.69** (0.28)	0.36*** (0.08)	0.13 (0.20)
Widowed	0.17 (0.13)	-0.12 (0.34)	0.19*** (0.06)	0.24** (0.11)	-	0.39** (0.17)	-	0.32*** (0.08)
Divorced	0.02 (0.16)	0.26 (0.50)	0.27*** (0.10)	0.22 (0.21)	-0.15 (0.24)	0.20 (0.20)	0.31** (0.15)	0.24** (0.12)
Households' holdings								
Plough dummy	-	-0.03 (0.14)	-	-0.06 (0.04)	0.17* (0.10)	0.22 (0.49)	0.00 (0.04)	-0.01 (0.13)
Pirogue dummy	0.32 (0.21)	0.03 (0.23)	0.17 (0.12)	-0.22** (0.11)	0.27* (0.16)	0.24 (0.46)	-0.02 (0.08)	0.11 (0.24)
Vehicle/truck dummy	-1.12*** (0.15)	-1.15*** (0.42)	-1.24*** (0.10)	-1.28*** (0.17)	-1.15*** (0.15)	-0.77* (0.43)	-1.31*** (0.09)	-0.83*** (0.23)
Land (in hectares)	0.01 (0.01)	-0.00 (0.02)	0.00 (0.00)	0.00 (0.00)	0.00 (0.01)	0.07 (0.04)	0.00 (0.00)	0.02** (0.01)
Number of livestock	-0.02** (0.01)	0.00 (0.01)	-0.01*** (0.00)	-0.00 (0.00)	-0.01 (0.00)	0.01 (0.02)	-0.00 (0.00)	-0.01 (0.01)
Constant	-1.20*** (0.23)	-2.47*** (0.50)	-1.45*** (0.11)	-2.27*** (0.20)	-0.71*** (0.20)	-1.07* (0.58)	-0.95*** (0.10)	-0.85*** (0.18)
Observations	3606	717	8520	4966	3614	681	10622	2864
R ²	0.209	0.229	0.170	0.164	0.223	0.199	0.184	0.129

Notes: Regional dummies are included in the regressions but dropped from this table because of space problems. Standard errors are in parentheses. ***, ** and * mean significant at 1%, 5% and 10% level respectively.

Table 5. Impact of education and training on the probability of being poor (the marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Urban	Rural	Urban	Rural	Male	Female	Male	Female
Schooling								
Primary education	-0.05 (0.03)	-0.08 (0.07)	-	-	-0.03 (0.03)	-0.14 (0.09)	-	-
Senior high school	-0.09*** (0.03)	-0.18** (0.08)	-	-	-0.10*** (0.03)	-0.16** (0.07)	-	-
Junior high school	-0.14*** (0.02)	-0.25*** (0.09)	-	-	-0.15*** (0.03)	-0.18*** (0.04)	-	-
University	-0.21*** (0.02)	-0.36*** (0.08)	-	-	-0.24*** (0.02)	-	-	-
Training								
On-the-job training	-	-	-0.05*** (0.01)	-0.11*** (0.03)	-	-	-0.08*** (0.01)	-0.04 (0.04)
Technical secondary education	-	-	-0.22*** (0.02)	-0.13 (0.09)	-	-	-0.26*** (0.02)	-0.22*** (0.05)
Technical tertiary education	-	-	-0.25*** (0.02)	-0.35*** (0.12)	-	-	-0.33*** (0.03)	-0.25*** (0.07)
Professional secondary education	-	-	-0.22*** (0.02)	-0.17 (0.11)	-	-	-0.27*** (0.03)	-0.26*** (0.04)
Professional tertiary education	-	-	-0.27*** (0.01)	-0.37*** (0.13)	-	-	-0.35*** (0.02)	-0.21*** (0.08)

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

Households' size is represented in the regressions by dummy variables for different size categories. The findings show that the households' size has a positive and significant impact on the probability of being poor in the urban and rural areas but also for men and women, especially for families with more than 7 persons. Thus, the larger the households' size, the higher is the likelihood to be poor; the coefficients however vary according to the sizes. Besides, in urban areas, the male headed households have higher probability to be poor. This result highlights the change in the situation of women who were always considered as vulnerable by early studies such as Badji and Daffé (2003) and Diagne, Faye and Faye (2005), meaning that recently poverty tends to be masculine. The head of households' age, however, seems to be not a primordial determinant of the incidence of poverty.

Another important result is that single households' head have higher probability to be poor in urban areas. Notwithstanding, this result can also mean that because people are poor then have decided to stay single. Concerning the households' holdings, households' heads with vehicle/truck are less likely to be poor. This result is consistent for men and women but also households living in rural and urban areas. However, the effect is higher for male and head of households living in rural areas.

In addition, besides the urban areas of the regions of Matam and Saint-Louis, poverty is more likely to be higher in the other regions of Senegal. However, it is only in Saint-Louis that women have lower probability to be poor. Saint-Louis is a touristic zone with many development projects helping local populations to have decent revenues. Besides, the productive activities around the Senegal River help also the residents of the Matam and Saint-Louis regions to earn

consistent revenues.

6 . Concluding remarks

In this article, we have analyzed the role played by education and training, especially the different education levels and training types, in poverty reduction. More importantly, we have looked at the impact of the different levels (primary school, senior high school, junior high school and university) on the probability of being poor, a way not explored by previous studies on Senegal which are mainly descriptive. Besides, the role of the different training types on poverty reduction is also examined. The empirical setting is Senegal using the 2005 Household Survey, the “*Enquête de Suivi de la Pauvreté au Sénégal*”.

The results drawn from the probit estimations show that, except primary schooling, all education levels have a negative and significant impact on the probability of being poor in urban and rural areas and for men and women. The results suggest that it is from senior high school that the impact of education can have some poverty reduction effect in urban and rural areas but also for men and women. The findings also show that, except for women, on-the-job training has significant impact on the reduction of poverty in both rural and urban areas. Besides, except in rural areas and for the technical and professional secondary education trainings, all types of trainings are negatively and significantly associated with the probability of being poor.

Results related to the beneficial effects of education in poverty reduction are similar to the findings obtained by previous studies related to other African countries such as Kenya (Alemayehu, de Jong, Kimenyi and Mwabu, 2005), Mauritania (Coulombe and McKay, 1996), Cote d'Ivoire (Grootaert, 1997) and Malawi (Mukherjee and Benson, 2003). The main contribution and difference relatively to the previous studies lie in the disaggregation of secondary education into junior high school and senior high school. Besides, while most of the previous studies on other African countries show that primary education has significant poverty capabilities, our results indicate that the impact of education on poverty is significant starting from the senior high school.

Our results indicate that policies oriented toward the settlement of compulsory education to senior high school can help reduce poverty to a great extent. In fact, our results show that, although primary education which is now the official level of compulsory education is negatively associated with the probability of being poor, it is from the senior high school that the effect is statistically significant. A review of the compulsory education up to senior high school needs however to be accompanied by a sound judicial and legal system and the availability of various opportunities for the urban as well as rural households.

Further research is, however, required to investigate in greater detail the relationship between education levels and poverty in the sense that an analysis based on the individual regions can give

more precise evidence. Besides, an investigation of the channels through which education levels affect poverty can give a clear picture on the way education help to reduce poverty in Senegal.

Acknowledgements

We are indebted to the Agence Nationale de la Statistique et de la Démographie (ANSD) of the Republic of Senegal for providing the ESPS-2005 dataset and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan for supporting this research. We thank Hitoshi Osaka for his valuable comments.

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