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ACCESS TO EDUCATION AND LABOR MARKET IN SUB-SAHARAN AFRICA

Thèse nouveau Régime
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"Pour les pauvres, vivre c'est nager en apnée, en espérant atteindre une rive ensoleillée avant la gorgée fatale."

— Fatou Diome, Le Ventre de l'Atlantique (2003)

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Résumé

Comparée aux autres régions du monde, l'Afrique subsaharienne accuse un retard important sur le plan de la réduction de la pauvreté et du développement humain en général. Le faible accès à l'éducation couplé au faible dynamisme du marché du travail, marqué par la pléthore d'emplois vulnérables, y sont pour beaucoup. En 2016, en Afrique subsaharienne, un enfant sur trois n'est pas scolarisé et plus de sept travailleurs sur dix occupent des emplois vulnérables. Cette thèse propose trois études empiriques pour mieux comprendre d'une part, l'accès à l'éducation en Afrique subsaharienne et d'autre part, l'impact de l'accès à un emploi décent sur la réduction de la pauvreté. Le chapitre 1 s'intéresse au rôle que jouent les interactions sociales dans les décisions de scolarisation des enfants en milieu rural au Sénégal à partir des données d'un suivi démographique. Cette étude utilise le système de castes au Sénégal et la proximité géographique pour construire des groupes sociaux. Les résultats montrent que l'appartenance à un groupe social détermine fortement la scolarisation des enfants. Trois mécanismes pourraient expliquer cet effet des interactions sociales : les normes sociales, la perception des rendements de l'éducation et des effets d'entraînement. Le chapitre 2 cherche à analyser si les orphelins d'une part, et les non-orphelins qui ne vivent pas avec leurs parents biologiques d'autre part, sont désavantagés en termes d'accès à l'éducation et de travail des enfants. Pour cela, j'exploite les données d'une enquête en panel collectée dans des zones rurales en Tanzanie. Les résultats montrent que les orphelins de père et les orphelins de père et de mère reçoivent moins de dépenses d'éducation mais ne sont pas désavantagés en termes de scolarisation ou de travail des enfants. Par contre, les orphelins de père qui résident avec leurs mères, reçoivent en moyenne les mêmes dépenses d'éducation que les autres enfants et ont plus de chances d'être scolarisés. En moyenne, les enfants non-orphelins qui sont confiés ne sont pas différents des enfants vivant avec leurs parents biologiques en termes d'éducation et de charges de travail. Ces résultats suggèrent une absence de discrimination envers les orphelins et les enfants confiés, mais une baisse des ressources allouées aux orphelins de père qui pourrait entraver leur éducation. Enfin, le dernier chapitre s'intéresse à la situation du marché du travail au Sénégal. Il tente d'analyser la meilleure stratégie pour réduire la pauvreté entre l'accès à un emploi décent au Sénégal ou la migration à l'étranger. Les résultats indiquent que l'accès à l'emploi décent et la migration ont tous les deux un impact important sur la réduction de la pauvreté, mais ces deux impacts ne sont pas significativement différents en termes d'ampleur. Toutefois, l'accès à l'emploi décent favorise les dépenses d'éducation des enfants contrairement à la migration qui a peu ou pas d'effets sur les dépenses d'éducation.

Mots clés : Économie du développement ; Éducation, Marché du travail, Travail des

enfants, Interactions sociales, Orphelin, Confiage, Pauvreté, Migration, Afrique subsaharienne.
Codes JEL : D12 ; I20 ; I25 ; I32 ; J13 ; J81 ; O15 ; Z13.

Summary

Compared to other regions, sub-Saharan Africa lags far behind in terms of poverty reduction and human development. This is partly explained by the low access to education combined with the weak dynamism of the labor market, characterized by a large share of vulnerable employment. In 2016, one in three children in sub-Saharan Africa is out of school and more than seven out of ten workers are employed in vulnerable jobs. This thesis proposes three empirical studies to better understand, on the one hand, access to education in sub-Saharan Africa and, on the other hand, the impact of access to a decent job on poverty reduction. Chapter 1 examines the role of social interactions in schooling decisions in rural Senegal using data from a demographic surveillance system. This study uses the caste system in Senegal and geographical proximity to build social groups. Results show that the membership to a social group strongly influences school attendance. Three mechanisms could explain this effect: social norms, the perception of return to education, and ripple effects. Chapter 2 aims to analyze whether orphans on the one hand, and non-orphans not living with their biological parents on the other hand, are disadvantaged in terms of access to education and child labor. I use data from a panel survey collected in rural Tanzania. The results show that paternal orphans and double-orphans receive less education expenditure but are not disadvantaged in terms of schooling or child labor. On the other hand, paternal orphans residing with their mothers receive on average the same amount of education expenditure as other children and are more likely to attend school. On average, non-orphaned fostered children are not different from children living with their biological parents in terms of education and child labor. These findings suggest an absence of discrimination against orphans and fostered children, but a loss of income for paternal orphans which could impede their educational outcomes. Finally, the last chapter looks at the situation of the labor market in Senegal. It attempts to analyze the best strategy to reduce poverty between access to a decent job in Senegal or migration abroad. The results indicate that both decent job and migration have a significant impact on poverty reduction, but the magnitude of these two impacts are not significantly different. However, access to a decent job increases educational expenditure while migration has a little or no effect on educational expenditure.

Keywords: Development economics, Education, Labor market, Child labor, Social interactions, Orphanhood, Child fostering, Poverty, Migration, Sub-Saharan Africa.
JEL codes: D12; I20; I25; I32; J13; J81; O15; Z13

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General Introduction

0.1 Motivation

Africa has a huge challenge in giving better living conditions to its population. Sub-Saharan Africa in particular, is lagging far behind other regions in the world in several aspects ranging from economic and social development, to political stability, industrialization and new technology adoption, institution building etc. The poor level of human development in sub-Saharan Africa is specially striking and will be the focus of my attention throughout this thesis. Even though the poverty rate has declined in sub-Saharan Africa from 55.1% in 1990 to 43.7% in 2012, the number of poor has increased from 280 million in 1990 to 330 million in 2012 (Beegle *et al.*, 2016). This increase in the number of poor is partly due to the rapid population growth. But still, in a global context of a steady improvement of human well-being since decades or even centuries, an increasing number of poor is alarming. Will this trend be reversed? A part of the answer is how young Africans will be doing in creating wealth and fighting inequality. Figures on child education give a first glance on this issue. Indeed, education, as we will see later on, is a powerful mean for social mobility and for access to well-paid jobs as well as for giving opportunity to be fully involved in community development. Yet, 97 millions of primary and secondary school age children in sub-Saharan Africa are out of school (UNESCO (UIS), 2018). This represents nearly one third of primary and secondary school age children in sub-Saharan Africa. This ratio is far higher than the globally 17.8% of out of school children in the world. Worse, the decline in the ratio of out of school children is becoming weaker since the end of the 2000s.

Figures on health, also an important part of human development, are not reassuring either. Under-five mortality has decreased by more than 55% between 1990 and 2015 but this decrease is far from the Millennium Development Goal (MDG) target of a two-third reduction between 1990 and 2015 (United Nations, 2017). The under-five mortality rate stands at 78 deaths per 1,000 live births in sub-Saharan Africa, 30 points higher than that of Southern Asia, the second worst region, whose under-five mortality rate stands at 48.1 deaths per 1,000 live births. Adult mortality is also higher in sub-Saharan Africa compared to any other regions. Despite this, the decrease over time of adult mortality is the slowest in sub-Saharan Africa, raising important concerns on the quality of the health care system in this region.

Moreover, according to UNDP (2017), sub-Saharan Africa is the most unequal region in the World, 10 out of the 19 most unequal countries in the world are in sub-Saharan Africa.

This brief description has clearly evidenced that the current state of human develop-

ment in sub-Saharan Africa is seriously disturbing. African governments, development agencies, NGOs etc. have a big role to play in promoting a better life for African populations. However, in order to define and implement adequate policies, researchers have definitely a key role in helping understand populations' behavior, and in quantifying different facets of human development as well as their relationships with diverse socio-economic and demographic characteristics. The responsibility of researchers in improving standard of livings of African population is huge, but also tricky due to the lack of data, the difficulty to generalize results or to puzzle out mechanisms etc.

This thesis attempts to bring additional knowledge on education and labor market in sub-Saharan Africa. The existing literature on these two fields is certainly wide, but many things remain unknown. The objective of this thesis is twofold:

- First, to contribute on the understanding of the access to education for children and adolescents;
- Second, to measure the impact of a stable employment on poverty and on the investment in children education;

Access to education and labor market are two strategic components of human development. Providing youth a good quality education followed by secured and high earning jobs is probably a strong guarantee for a significant improvement in poverty, inequality reduction, population health, economic dynamism, social development etc. Africa's population is expected to nearly quadruple by 2100 and nearly all the population growth worldwide in 2100 will occur in Africa (United Nations, 2017). Whether this population growth will harm, or on the contrary, benefit Africa's development is unclear. What is clearer, however, is that if young people are better educated and succeed in making a good transition to the labor market, there is a good chance that this high population growth will herald an era of economic, social and human development.

The importance of education in the process of development is pointed out in seminal works. The endogenous growth theory pioneered by Lucas Jr (1988) hypothesizes human capital as one of the main engine of economic development. Human capital and productive labor force are also parts of the story on the miracle growth of Eastern Asia from 1960 to the mid 1990s. Tallman & Wang (1994) stress the important role of education in driving growth in Taïwan. They find that human capital alone measured by educational achievement accounts for 45% of output growth in Taïwan between 1966 and 1989. Nelson & Pack (1999) show theoretically that the productivity of labor and the capacity to assimilate new technologies play an important role in the Asian miracle.

Those theories and findings suggest that a better understanding of how to improve the educational level of young Africans and the functioning of the labor market can lead Africa on the path of development.

In this thesis, I propose three empirical studies each representing one chapter. Chapter 1 addresses the role of social interactions in the schooling decisions. Chapter 2 studies whether orphanhood and child fostering impede children's education and incite child labor. Finally, chapter 3 looks into the comparative impact of a decent work and of migration in reducing poverty and in promoting investment in children's education.

Before I present those three chapters, I describe hereafter the context of education and labor market in sub-Saharan Africa and present a brief description of the existing literature on these issues. I end this general introduction with a presentation of the three chapters of this thesis and their respective contributions to the literature.

0.2 Education and Labor market in sub-Saharan Africa

This section presents some descriptive evidence and stylized facts about the context of education and labor market in sub-Saharan Africa.

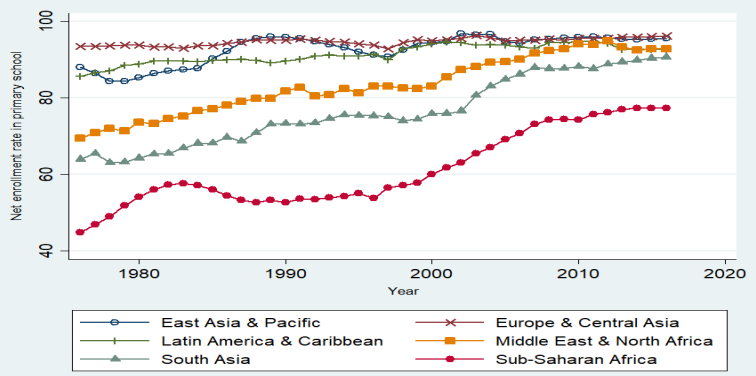
0.2.1 Education

Since 1975, the year from which data are available, the net enrollment rate in sub-Saharan Africa is much lower compared to other regions in the world (see figure 1). In 2016, the net enrollment rate in sub-Saharan Africa stands at 77.3% while the net enrollment rate in all other regions exceed 90%. This represents a huge backlog for sub-Saharan Africa. Despite the highest growth in the net enrollment rate between 1975 and 2016, the initial level of enrollment in sub-Saharan Africa was too low (43.8% in 1975 compared to 76.7% in the world). But most importantly, after continuous progress in the 1970s, the net enrollment rate began to decline from 1984. This drop in enrollment follows the economic and debt crisis of the late 1970s in many sub-Saharan African countries, but reflects also the poor performance, at least on the social side, of the structural adjustment programs. From 1997, the net enrollment rate has resumed a rapid growth. But from 2009 to 2016, this growth has slowed, raising concerns about the efficiency of educational policies and the factors hampering access to education.

Data on secondary school enrollment are scarce. Aggregating countries for which data are available reveals a low net enrollment rate in secondary school (33.6% in sub-Saharan Africa, and 65.6% worldwide).

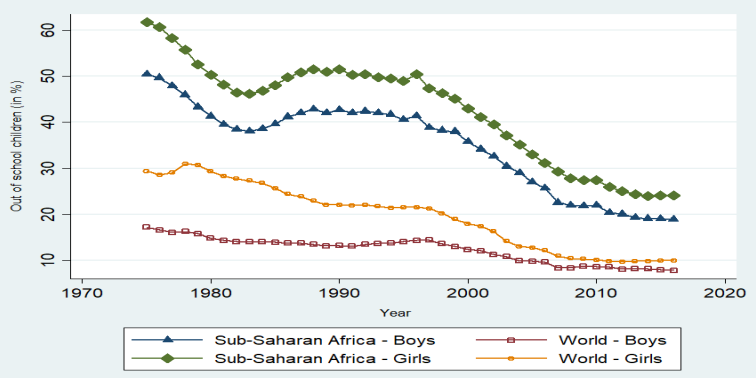
Figure 2 displays the percentage by sex of primary-school-age children not enrolled in primary or secondary school and commonly referred to as "out-of-school children". This figure shows that the percentage of out-of-school children has fallen sharply in sub-Saharan Africa, particularly between the mid-1990s and mid-2000s but remains much higher than the world average. While the gender gap in access to primary schools is significantly reduced worldwide, the gender gap in sub-Saharan Africa remains persis-

Figure 1: Evolution of the net enrollment rate in primary school by region



Source: Author's elaboration from the World Development Indicators (World Bank).

Figure 2: Evolution of the percentage of children out of school by sex

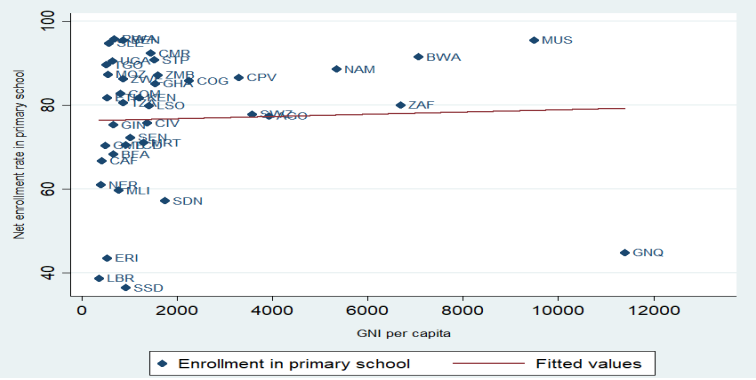


Source: Author's elaboration from the World Development Indicators (World Bank).

tent despite some improvements in the early 2000s. Girls are more often out-of-schools than boys and progress in reducing this gender gap seems to be fading in recent years. But this aggregate picture hides substantial heterogeneities between countries. In Côte d'Ivoire and Niger, the percentage of out-of-school girls is higher than that of boys by 9 percentage points. While in Senegal, girls are more enrolled in primary school than boys by 7 percentage points.

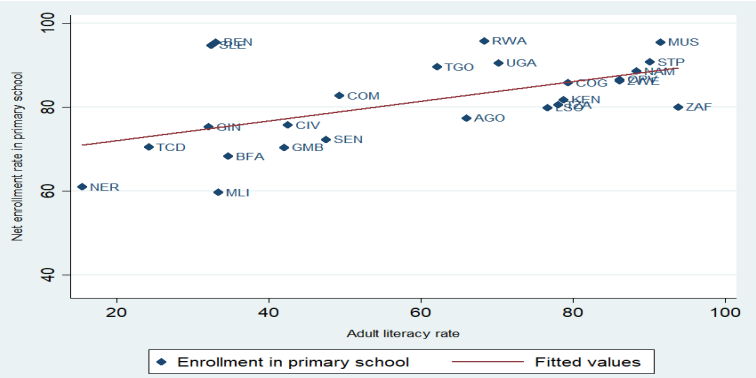
These evidence make one wonder about which factors determine access to education. Unfortunately, no any single factor can fully explain why some children attend school and others do not. The question is more complex. Income may be a natural candidate in explaining differences in children's schooling. Figure 3 illustrates the relationship between the net enrollment rate in primary school and the gross national income for sub-Saharan African countries. The correlation between these two variables is weak. Country's income does not appear to explain the differences in enrollment rate between countries. Many African countries with comparable level of development, have substantial different levels

Figure 3: Relationship between net enrollment rate and gross national income



Source: Author's elaboration from the World Development Indicators (World Bank).

Figure 4: Relationship between net enrollment rate and adult literacy rate



Source: Author's elaboration from the World Development Indicators (World Bank).

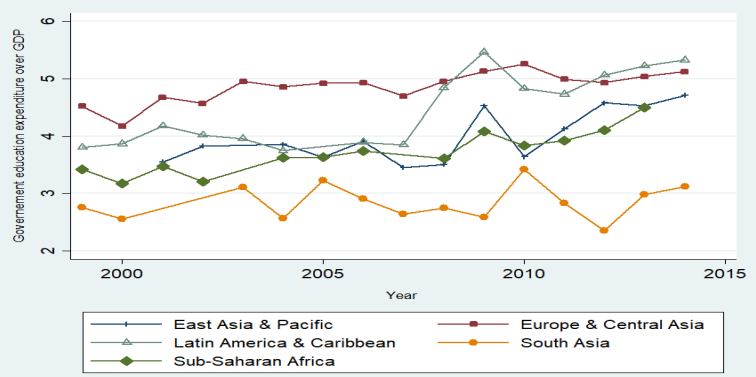
of net enrollment rate.

Adult literacy appears to be a best predictor of differences in net enrollment rate across countries in sub-Saharan Africa.[1] As shown in figure 4, countries where adults are more educated have higher enrollment rates. This suggests a high intergenerational link in educational levels.

Government expenditure on education may reflect the willingness of the government to invest in the education of its population. Figure 5, shows that in all the regions, the ratio of government expenditure on education over GDP has increased in a short period of time (1999-2014) for which data are available. South Asia, however, has the lowest ratio as well as the lowest growth over the period. In Latin America and Caribbean, the government spending on education over GDP is the highest (5.2% in 2013) as a result

[1] Adult literacy is defined as follows in the World Development Indicator from the World Bank website "the percentage of people aged 15 and above who can both read and write with understanding a short simple statement about their everyday life".

Figure 5: Evolution of the government expenditure on education over GDP



Source: Author's elaboration from the World Development Indicators (World Bank).

of a high growth of this ratio (40% over the period). In sub-Saharan Africa, this ratio stands at 4.5% in 2013 a bit lower than the world average (4.7%) with a 32% increase between 1999 and 2013.

Beyond school enrollment, the quality of education represents one of the most important challenges of the education system in Africa. Several empirical studies show that a large proportion of children in school in sub-Saharan Africa, even after several years of primary schooling are far from having acquired the basics of primary education. According to Cloutier *et al.* (2011), more than 80% of students in the third year of primary school in Mali and more than 70% of these students in Uganda cannot read even a single word. These basic skills are essential to be productive in the job market and to be able to aspire to a decent job. Through surveys conducted between 2010 and 2012, the Service Delivery Indicators indicates that the rate of teacher absenteeism in primary school is 15.5% in Kenya, 18% in Senegal and 23% in Tanzania.[2]

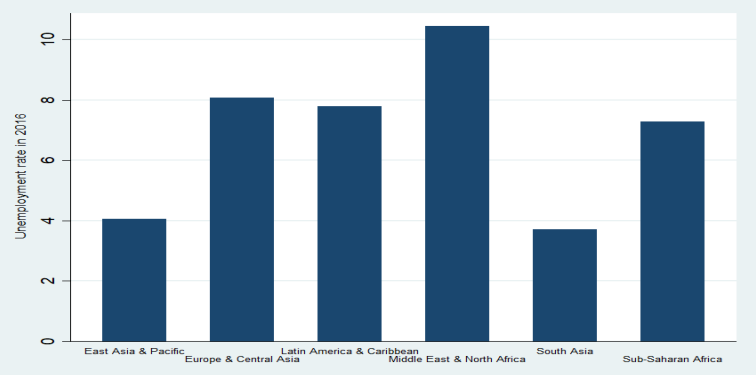
0.2.2 Labor market

Economic growth in sub-Saharan Africa has declined significantly in recent years after a high economic growth in the last decade (World Bank, 2018). Economic growth has reached an annual average of nearly 5% in the last ten years. In 2016 and 2017, the growth rate in sub-Saharan Africa is respectively estimated at 1.3% and 2.4%. This low economic dynamism may have negative consequences in the labor market.

The unemployment rate in sub-Saharan Africa is estimated at 7.2% in 2017. Compared to other regions in the world, sub-Saharan Africa is not doing worse (see figure 6). However, there is substantial heterogeneity between countries. Relatively richer African countries have higher unemployment rates while low income countries have less unem-

[2]https://www.sdindicators.org/

Figure 6: Unemployment rate by region



Source: Author's elaboration from the World Development Indicators (World Bank).

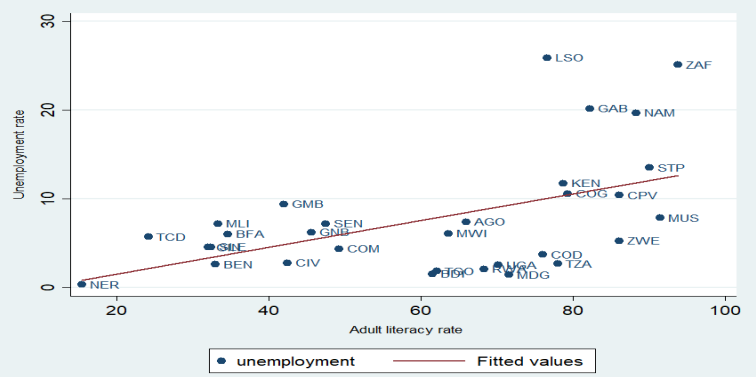
ployment. For instance, unemployment rate nearly reaches 20% in Namibia and Gabon and stands at 25% in South Africa. In some lower income countries, the unemployment rate is less than 5%.

The specificity of many African countries makes the unemployment rate (according to the International Labor Organization (ILO) definition) not appropriate and not straightforward for a good understanding of the functioning of the labor market. In fact, the particularity of many African economies is that a large part of the labor force is employed in precarious, sporadic and low-paid jobs in the agricultural and informal sectors. An individual below the poverty line, in an unstable and poorly paid job, automatically comes out of the definition of "unemployed" according to the International Labor Organization (ILO). Informality, vulnerability and poverty in work remain among the main challenges of employment in sub-Saharan Africa.

According to Filmer & Fox (2014), unemployment in many African countries is higher among university graduates in the top income distribution. This is because, poorer people cannot afford remaining without jobs, no matter how the quality of these jobs. In the absence of social safety nets, they just need to work in order to survive. Figure 7 shows that African countries where adults are more literate end up with higher unemployment rates.

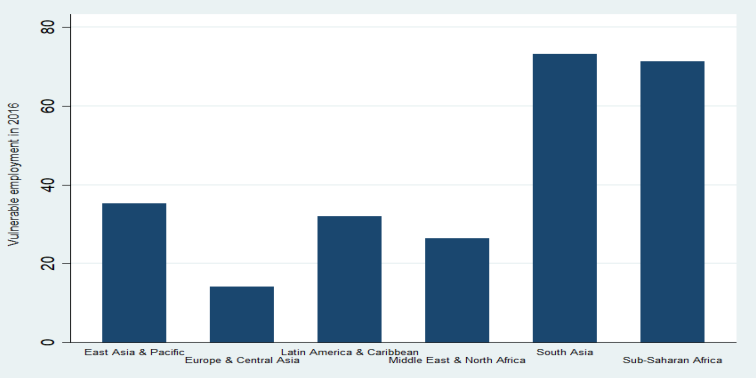
To better characterize the labor market in developing countries, the ILO complements the statistics on unemployment by figures on the vulnerability of unemployment. A vulnerable employment encompasses "contributing family workers and self-employed without hired employees as a percentage of total employment". Unsurprisingly, vulnerable employment is more prevalent in South Asia and sub-Saharan Africa, the two regions with the highest poverty rates (figure 8). In these two regions, more than 7 out of 10 workers are in a vulnerable employment. Figure 9 displays the negative correlation between unemployment and vulnerable employment. Countries with higher level of vulnerable

Figure 7: Relationship between unemployment and adult literacy rate



Source: Author's elaboration from the World Development Indicators (World Bank).

Figure 8: Vulnerable employment by region

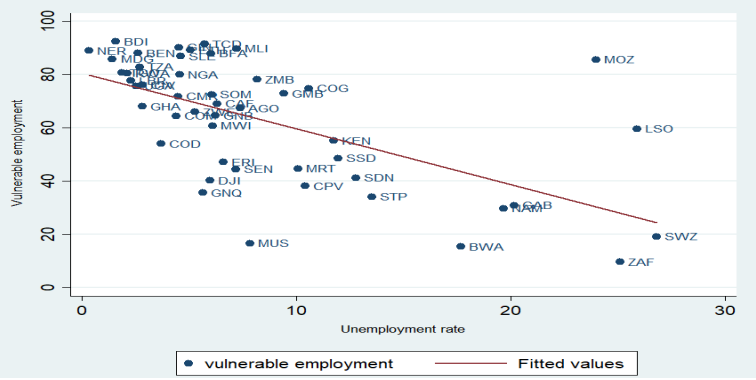


Source: Author's elaboration from the World Development Indicators (World Bank).

employment have also lower level of unemployment. This is because the poorest cannot afford to be unemployed.

The supply of labor in Africa is also marked by the migration of skilled workers known as brain drain. In a 2013 joint report by the OECD and the UN, 2.9 million people in the African continent live and work in a developed country. The number of African migrants has increased by 50% in the last 10 years (United Nations & OECD, 2013). Beyond wars and political instability, the lack of job opportunities and the attraction of higher wages in other countries seem to be one of the main reasons of this massive emigration. One in nine Africans with a tertiary level of education and born in Africa live in one of the OECD countries. This rate is much higher than one in thirteen for Latin America and the Caribbean, one in twenty for Europe and one in thirty for Asia (United Nations & OECD, 2013).

Figure 9: Relationship between unemployment and vulnerable employment



Source: Author's elaboration from the World Development Indicators (World Bank).

0.3 A Literature Review

This section presents a brief review of some main economic theories on human capital and labor market and some empirical evidence in developing countries.

0.3.1 The theory of Human capital

The concept of human capital is popularized by Becker and Mincer but the idea of human capital has emerged since Adam Smith and the emergence of economy as an academic discipline. The notion of human capital is commonly understood as a set of individual attributes that contribute to the creation of wealth. These attributes can be related to the individual's knowledge, skills, intelligence, talent, physical strength etc. Adam Smith distinguishes "common labor" to "skilled labor" and relates earnings to education and training (see Chiswick (2003) for a more detailed discussion). Mincer seems to be the first to introduce the concept of human capital into modern economic analysis. In his seminal 1958 paper, Mincer posits that human capital measured by years spent in school and more broadly by experience also, is a major factor explaining income inequality. Mincer (1974) provides an empirical application of his 1958 paper with the famous "human capital earning function". This function aims to estimate returns to education and experience by regressing the logarithm of wage on the years of schooling and a quadratic term of years of experience. Mincer (1974), using a sample of white non-farm men in the US, have found that the estimated return to one additional year of education on wage is about 11%.

For many economists at that time, the term human capital was not appropriate as humans should not be analyzed in terms of capital and be opposed to physical capital. Schultz (1961) has introduced explicitly the term human capital and has argued that people invest in themselves and this investment is large and needs to be accounted in

economic analyses. He explains that several expenditures considered as consumption are in fact investments in human capital. This is the case for direct spending on education, health, internal migration to seize work opportunities, the opportunity costs of still being in school for mature students etc.

In the same vein as Schultz (1961), Becker (1962) points out that "investment in human capital is a pervasive phenomenon and a valuable concept" and provides a "unified and powerful theory" on investment in human capital. Becker (1962) discusses different types on human capital (on the job training, schooling, emotional and physical health) and their implications in earning differences or unemployment. Becker (1962) shows that people may have higher earnings because they invest more in themselves. Furthermore, because people with higher abilities tend to invest more in human capital, inequality in earnings may even increase.

0.3.2 Human capital and economic development

"Why are some countries richer than others?" is a long-standing debate in economics. The seminal model by Solow (1956) points out the importance of capital accumulation and technological progress in explaining differences in output per capita. Following Solow (1956), some notable contributions to the theory of economic growth support the importance of human capital.

For Schultz (1961), taking into account investment in human capital allows to puzzle out the paradox of the US growth. He states that the growth of the national product in the US was far greater than the increase in land and physical capital. For Schultz (1961), the main explanation lies in investment in human capital.

In the 80s, the endogenous growth theory has emerged mainly after the works by Romer (1986) and Lucas Jr (1988). In the Solow model, long-run growth is determined by an exogenous and unexplained technical progress. Endogenous growth theory attempts to model explicitly the determinants of economic growth and particularly the production of new technologies. Romer (1986) gives a central role to knowledge used as input in the production function to explain long-run growth. In Lucas Jr (1988), human capital accumulation is the main driver of productivity of both labor and capital and hence of economic growth. Barro (2001) in a cross-country empirical study, shows that the average years of schooling in the secondary level and higher denotes the capacity to assimilate new technologies and then is a strong determinant of economic growth. However, the relation between growth and school quality, measured by internationally comparable test scores, is quantitatively higher.

Nevertheless, some empirical evidence (Hall & Jones, 1999; Bils & Klenow, 2000) argue that cross-country differences in education weakly explain differences in per capita income. For Hall & Jones (1999), institutions and government policies are the main

determinants of differences in productivity.

Manuelli & Seshadri (2014) argue that most of the cross-country empirical studies which find little impact of human capital on countries' income do not account for the differences in the quality of human capital. Individuals in poorer countries have fewer average years of schooling but also the education they receive is of lower quality. Thus, they accumulate less human capital per year of schooling. Manuelli & Seshadri (2014) show that these differences in the quality of education explain a large share of cross-country income differences.

Human capital in general, and education in particular, is also positively related to other dimensions of economic and human development like health (Berger & Leigh, 1989; Cutler & Lleras-Muney, 2006), agricultural productivity (Davis *et al.*, 2012; Reimers & Klasen, 2013), institutions (Glaeser *et al.*, 2007), social capital (Huang *et al.*, 2009) etc.

0.3.3 Determinants of children's education

In developing countries, a large literature has analyzed determinants of school attendance. One trend of this literature has demonstrated the importance of supply factors. Duflo (2001) shows the importance of building schools. The distance to school has also been shown to be an important determinant (Huisman & Smits, 2009; Lincove, 2009; Kondylis & Manacorda, 2012). Other studies highlight the role of conditions in schools like the pupil-teacher ratios (Case & Deaton, 1999), teaching methods and teachers' motivations (Probe, 1999), the lack of teachers and classrooms (Glick & Sahn, 2006) etc. Another trend shows the importance of the demand side especially household and children's characteristics. The household's income is one of the most documented determinants in the literature (Filmer & Pritchett, 2001; Tansel, 2002; Grimm, 2011; Mani *et al.*, 2013). Parents' or household head's education is also a key factor for children schooling (see Holmlund *et al.*, 2011 for a survey mainly in developed countries, for developing countries see Wolfe & Behrman, 1984, Lloyd & Blanc, 1996, Tansel, 2002, Holmes, 2003, Lincove, 2009, Dumas & Lambert, 2011). Nutrition and health programs are also shown to increase school participation (Del Rosso & Marek, 1996; Miguel & Kremer, 2004) Cultural factors can also have a major impact on children's school attendance. Bommier & Lambert (2000) find that boys and girls in Tanzania follow different patterns of schooling in terms of age of entry and years spent at school. Other studies find substantial ethnic differences in school enrollment (Hannum, 2002; Desai & Kulkarni, 2008; Kırdar, 2009).

0.3.4 Labor market in developing countries

The benefits of education go beyond access to good jobs. Nevertheless, labor market outcomes remain the principal payoff of years spent at school. Furthermore, returns to education are usually evaluated with the earnings in the labor market. Unfortunately,

many well educated individuals in sub-Saharan Africa end up with low-paid jobs or even without jobs (see discussion in section 0.2). This raises legitimate worries on the school-to-work transition in this region. On the other hand, nearly 40% of people aged 15 and above cannot read and write.[3] Those people, most of the time are the less productive and are engaged in vulnerable employment and low-paid jobs. Unlike developed countries, unemployment rate is higher among the better educated people in many sub-Saharan African countries. These points raise the needs to analyze the school-to-work transition and the functioning of the labor market in developing countries and particularly in sub-Saharan Africa.

Labor markets in developing countries are characterized by a strong presence of the agricultural and the informal sector and a small sector gathering the best jobs in terms of earnings, stability and protection. This small sector, qualified as formal, is made of the public sector and the largest and most productive firms. Accounting for this "dual" nature of the economy is key to understand the idiosyncratic character of the labor market in developing countries. The works by Lewis (n.d.) and Harris & Todaro (1970) are the pioneers in the analysis of the labor market in developing economies. The model by Lewis (n.d.) represents an economy where there is a surplus of labor in the low-productive agricultural sector and an industrial sector where employment expands followed technical progress and capital formation. Lewis (n.d.) predicts that output per capita will increase if workers in the agricultural sector migrate to the industrial sector. Harris & Todaro (1970) adds the possibility of unemployment in the industrial sector consistent with the existence of a large informal sector in urban areas of developing countries.

According to the ILO, 50 to 75% of the labor force in the non-agricultural sector in developing countries are employed in the informal sector.[4] This sector is often described as grouping poor and vulnerable workers who work under difficult working conditions ranging from lack of protection, forced overtime or lack of benefits (retirement, sick leave, health insurance, etc.).

The informal sector in developing countries is largely composed of micro enterprises and self-employers. It is also described as widely heterogeneous with low and high return activities (Böhme & Thiele, 2012). Yamada (1996) find competitive earnings for self-employers in the informal sector. Self-employers who are performing worse leave the informal self-employment sector and become wage earners. Maloney (2004) in the case of Latin America, suggests that the informal sector should not always be viewed as inferior to the formal sector. The lack of regulation in the informal sector may attract self-employers who deliberately choose to be informal.

Search models developed in Diamond (1982), Mortensen (1986), Mortensen & Pissarides (1994), Mortensen & Pissarides (1999) are extended in the context of developing

[3] According to data from the World Development Indicators

[4] http://www.ilo.org/global/topics/employment-promotion/informal-economy/lang–fr/index.htm

countries to account for the informal sector. The theoretical framework of Zenou (2008) is based on the fact that the informal sector is frictionless, every worker can enter in this sector. Thus, unemployment comes necessarily from the formal sector. Zenou (2008) show that reducing the firm entry's cost in the formal sector will lower the size of the informal sector but has ambiguous effects on wages.

Alongside a wide literature on the dual labor market in developing countries and on the informal sector, the concept of decent work is today at the heart of the activities of the International Labor Organization. According to the ILO, decent work "sums up the aspirations of people in their working lives". The ILO's Decent Work Agenda is based on four strategic objectives: job creation, rights at work, social protection and social dialogue. It is basically about promoting the creation of productive and well-paid jobs, which guarantee worker safety, good social protection and the freedom to claim one's rights and improve working conditions. The United Nations today has adopted the concept of decent work, which is addressed in Goal 8 of the Sustainable Development Goals (SDGs): "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all".

Few empirical studies seem to have examined the access and the impact of a decent work in developing countries. This lack of study in this topic may be related to the lack of adequate data in the labor market allowing to capture all the dimensions of a decent work. Sehnbruch *et al.* (2015) argue that the concept of decent work has a limited public and policy impact and this is mainly due to the "ILO's failure to conceptualize and measure decent work along these lines". For Bell & Newitt (2010) "the use of the Decent Work Agenda as a planning or programming tool for achieving development outcomes has been limited outside the ILO".

0.4 Outline

This thesis is composed of three chapters. Each of them attempts to bring an empirical contribution to the existing literature using micro-economic data in sub-Saharan Africa. The first chapter studies how social group membership can shift educational decision in rural Senegal. Chapter 2 focuses on the education and the labor outcomes of orphans and fostered children in rural Tanzania and looks at whether they are disadvantaged compared to children who live with their biological parents. Chapter 3 attempts to answer the question about the best strategy between access to a local decent work or migration abroad to reduce poverty and to promote children's education in Senegal.

Understanding which factors determine children's education is fundamental for development policies. As I have discussed in the literature review, researchers have stressed

different factors from income, to parental education and school quality etc. to puzzle out the barriers toward universal education. But the puzzle is far from complete and several potential barriers to children's education need to be identified. Chapter 1 [5] attempts to contribute to this wide literature by studying whether social interactions could represent a strong determinant of children's school attendance. We use data from an eight-year demographic surveillance system in Niakhar (rural Senegal) to see how the membership to a social group could affect schooling decisions. Social groups are constructed using the combination of caste groups and village. This chapter fills a gap in the literature as studies on social interactions on education seem to be concentrated in developed countries. Culture, norms and social capital appear to be central in African societies, therefore such a study is particularly relevant in the African context. Furthermore, many studies on social interactions in education capture those interactions in the classroom or in the school context. The scope of this chapter is broader because it examines the interactions between children at the village level. Finally, few works in economics are concerned with the role of castes in Africa. In several West African countries and in Senegal in particular, castes play an important role in the social, economic and political sphere. Therefore, it appears useful to explore their role in driving norms toward education.

In line with the first chapter, chapter 2 aims to bring additional knowledge on the determinants of children's education using a panel data in rural Tanzania. Following the "Education For All" initiative agreed by 164 governments in Dakar in 2000, sub-Saharan African countries, with the support of the international community, have implemented active educational policies. This resulted in significant progress within a decade. However, progress in school enrollment in sub-Saharan Africa has slowed from 2009 to date. The effectiveness of school construction projects and free access to primary schools appears to be reaching its limits. Shaping educational policies toward a better targeting of vulnerable and disadvantaged groups may be useful to enhance progress in school attendance. Chapter 2 focuses on the education of orphans and fostered children who may be in vulnerable situations as they do not live with their biological parents. Empirical evidence on this issue in sub-Saharan Africa have yield mixed results. This chapter differs with the existing literature by studying both the impact of orphanhood and child fostering. This allows a clear distinction between these two impacts and provides insights on the mechanisms behind the gap between orphans, fostered children and children living with their biological parents. Moreover, data used in this paper make possible to examine how the residence with the remaining parent may attenuate the adverse impact of orphanhood.

Chapter 3 [6] is about the labor market in Senegal. It attempts to identify the best

[5] This first chapter is coauthored with Martine Audibert and Valérie Delaunay
[6] coauthored with Théophile Azomahou

strategy to reduce poverty and to promote children's education between migration abroad and a decent work in the home country. To the best of our knowledge, this question is not addressed in the literature. A large part of Senegalese are living outside the borders of their country. Their involvement in the development of Senegal is real as evidenced by the high ratio of remittances over GDP, one of the highest in sub-Saharan Africa. The migration question is omnipresent among youth Senegalese as many of them dream enjoying a better life beyond the borders of their country. As shown by Mbaye (2014), Senegalese are willing to accept a "substantial risk of death" to migrate illegally. The issue of comparing the impact of migration and decent work is of great importance for policies and may bring useful knowledge to the research in labor economics. The answer to this question is far from obvious. A large literature has demonstrated the positive impact of migration on poverty. On the other hand, a decent work is naturally expected to have a big impact on poverty reduction and children's education. But an impact as large as that of migration would suggest that policies aimed at creating decent jobs should be ranked at the top of the priority ladder.

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Can Social Groups Impact Schooling Decisions? Evidence from Castes in Rural Senegal

This chapter is a joint work with Martine Audibert and Valérie Delaunay[7]

Abstract

Alongside classical determinants of education, there is a growing literature of social interactions in education which seems to be particularly concentrated in developed countries. This seems paradoxical as norms, culture and social capital appear to play a more important role in everyday life in Africa. We use a rich data set collected in Niakhar in rural Senegal, between 2001 and 2008 to study whether the school attendance of a child depends on the school attendance of other children in the same social group. Social groups are defined using geographical proximity and caste groups. While it is particularly difficult to empirically identify the impact of social group behavior, we take advantage of the temporal structure of the data to deal with a number of endogeneity issues. We rely moreover on different empirical strategies and placebo tests to argue that our results are not subject to confounding interpretations. Results show evidence of a strong and positive effect of social interactions on school attendance and the impact is greater for members of the highest caste.

Keywords: children's education, social interactions, caste, Sub-Saharan Africa, Senegal
JEL: I20, O15, Z13

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1.1 Introduction

Children's education is one of the pillars of personal achievement and global economic development. Yet, a significant portion of children in developing countries remain out of school. In 2013, about 30 million primary-school-age children in Sub-Saharan Africa were not enrolled in school. This accounts for half of the world's unenrolled children (UNESCO , UIS). As highlighted by the UNESCO report, "half of these children in the region have never been enrolled and may never enroll without additional incentives" (UNESCO, 2015). This statement raises the issue of a good understanding of which factors can foster or dampen school participation in order to apply effective educational policies. This paper contributes to this literature by analyzing how social interactions can shift the decision to enroll children in school in a rural area in central Senegal. In Senegal particularly, half a million primary-school-age children (between 6 and 11 years old) were out of school in 2013 (UNESCO , UIS), which accounts for a large share (1/4) of the two million primary-school-age children. Beyond the necessary efforts of investing in schools, teachers, textbooks etc. it is crucial to target the most vulnerable children and to identify factors that contribute to this lack of schooling. Social norms and beliefs are probably part of these factors. In this paper, we construct social categories based on caste groups and geographical proximity and show that children's school attendance is affected by the general school attendance of the child's social group.

Some papers have demonstrated the importance of social interactions on school performance or school attendance. Bobonis and Finan (2009) and Lalive and Cattaneo (2009) using the Progresa program, a randomized conditional cash transfer program in Mexico, show that school attendance increased for non-treated children in villages covered by the program suggesting a ripple effect. Likewise, in the assessment of a girls' scholarship program in Kenya, Kremer et al. (2009) point out that school performance of other girls less likely to get a scholarship and even of boys, improved. A growing body of literature in economics studies peer effects in education but seems to be particularly focused on developed countries (Hoxby, 2000; Sacerdote, 2001; Zimmerman, 2003; Cipollone and Rosolia, 2007; Ammermueller and Pischke, 2009). Many of these studies show that peer effects influence educational performance.

Akerlof and Kranton (2002) connect the economic literature on education with the sociological literature and explain how in addition to economic determinants, social interactions can highly influence schooling. They built a model which formalizes ideas of conformity and social norms applied in education. This model adds a social dimension to the standard utility function of education demand. The social utility is expressed as a cost that the individual bears when he is not in line with the expected behavior of his social group. The social utility function takes into account this disutility that arises due to deviation from the social norm. Therefore, a child who belongs to a social group where schooling is not highly valued is less likely to be enrolled and vice versa. This aspect is rarely considered in economic studies. In Africa in particular, the current school system is derived from colonization and is not incorporated in traditional practices particularly in rural zones. This may explain a kind of reticence in some contexts to enroll children in school. Thus, the schooling decision can be strongly driven by social aspects.

To capture how social features impact educational decisions, we rely on caste[8] groups and geographical proximity. We exploit a rich data set from a population monitoring established since 1983, a school monitoring carried out between 2001 and 2008 and a household survey conducted in 2003 in 30 villages in an area in Central Senegal called Niakhar. Castes may convey different norms and traditions that can affect schooling. Some studies demonstrate a relationship between castes and schooling. Dostie and Jayaraman (2006) in India show differentiating effects between castes and find a significant impact of caste fractionalization on children's schooling. Jacoby and Mansuri (2015) show in rural Pakistan that low caste children are deterred from going to school if the most convenient school is in a hamlet dominated by high-caste households. In our study area, castes can be divided into three main groups: farmers, the royal caste and griots and artisans. Thus, children in the same village and of the same caste constitute a social category. The royal caste is considered as the top of the social hierarchy, followed by the farmer caste and lastly by the caste of griots and artisans. Membership to a caste depends only on lineage and not on current profession.

Our paper contributes to the existing literature on the determinants of education in several ways. First, many studies on peer effects in education are conducted in a school or a classroom context and aim to explain school performance, not attendance. Our study aims to examine whether social interactions represent a key determinant of school attendance in Senegal and the scale in which social interactions are studied (the caste and the village) is much broader than the classroom or the school level. Second, there is little evidence on social interactions in education in Africa. Several studies focus on developed countries, which seems somehow a missing opportunity as social norms have an important role in everyday life in Africa. Our study could then be useful to better understand attitudes toward schooling and to improve educational and social policies. Finally, we give particular attention to the role of castes in Senegal. Historically, castes represented a fundamental component of Senegalese society and still today remain omnipresent in different aspects of the functioning of the society particularly in rural areas. Unfortunately, the vast majority of studies on caste groups by economists and some other social scientists have focused on Southern Asia. Little is known about how the categorization of the society through caste membership influences economic life and shifts some economic decisions in Senegal.

A big challenge in this paper is to properly identify the impact of social group behavior on the school attendance decision. Generally, identification in social interaction models is particularly difficult due to multiple endogeneity biases that make the isolation of the true social interaction effect difficult. Manski (1993) shows in the linear-in-means model that the estimated effect can simply denote the fact that individuals with the same unobserved characteristics or exposed to the same environmental factors tend to behave similarly, which makes difficult the separation of the endogenous social interactions effect from the contextual effects. The formation of groups can also be endogenous leading to a self-selection bias. Individuals with similar preferences toward education may, for example, belong to the same group or sort themselves over time leading to a dynamic sorting phenomenon. Moffitt (2001) details the different endogeneity

[8]A caste is a hierarchical social, endogamous and hereditary group.

problems and offers some solutions to them. Blume et al. (2011) have amply discussed the identification of social interactions.

The panel structure of the data allows us to estimate a dynamic model, with the lagged attendance rate as the main explanatory variable, which helps to solve the reflection problem. We also use estimations with individual fixed effects enabling us to predict not levels but changes over time of the school attendance decision by the lagged attendance rate of the social group. Self-selection into social groups in our case is likely to occur only at the village level since caste membership is time-invariant. We use data on internal migration between villages to account for dynamic sorting. Furthermore, we estimate the effect of the difference between the attendance rate of the caste and the attendance rate of the village and rely on some placebo tests as well to argue that geographical confounding factors do not drive our results. We find that the social group behavior strongly influences children attendance decision with a point estimate ranging between 0.25 and 0.30 percentage points.

The remainder of the paper is organized as follows. Section 2 introduces the theoretical framework. Section 3 presents the study area, the caste system in West Africa, the data, and some descriptive evidence. Section 4 explains the methodology and the identification strategies. Section 5 discusses the results. Section 6 concludes.

1.2 Theoretical framework

We rely mainly on the theoretical framework of Akerlof and Kranton (2002), who built a model that formalizes ideas of conformity and social norms applied in education. The particularity of this model is that it adds a social dimension to the standard utility function of education demand. Akerlof and Kranton's framework models student efforts at school and so considers the student as the primary decision maker and the school as the social institution. This is the key difference with our framework. We aim to model school attendance rather than academic efforts of students already in school. Social categories defined by the combination of caste and village membership play a significant role at the society level. In this sense, the relevant social institution, in this case, is the society as a whole. The decision maker is most likely to be the child's parents (or the household head) who have authority over the child and the final say on his/her education.

The utility function of child i in social group g has two components: an individual and a social utility. The probability of school attendance $p_{i,g}$ of child i in social group g depends on the benefits and costs of schooling. The benefits of schooling are represented by $B(p_{i,g})$ which include all the private benefits of education: the acquired knowledge, the expected wage in the labor market etc. Schooling generates costs that can be schooling expenses, efforts made by the child to learn and by the household to bring the child to school, monitoring, opportunity costs of child labor etc. reflected by the function $C(p_{i,g})$. Thus the individual utility is:

$$I_i = I_i(B_i, C_i)$$

Let $B(p_{i,g}) = b * p_{i,g}$ where b is a number between 0 and 1. And let the pecuniary costs of schooling $C(p_{i,g}) = \frac{1}{2} * p_{i,g}^2$. The individual utility is thus written:

$$I_{i,g}(p_{i,g}) = b * p_{i,g} - \frac{1}{2} * p_{i,g}^2$$

At the equilibrium, the marginal gain b is equal to the marginal cost:

$$p_{i,g} = b$$

The singularity of this model is the inclusion of social aspects which in some contexts represent the major factor that determines schooling. The decision of going to school can be driven by norms in place in the social category, by conformity to other similar individuals, or simply by the interactions with closer persons. The social utility is expressed as a cost that the individual bears when he is not in line with the expected behavior of his social group. The social utility function takes into account this disutility that arises due to deviation from the social norm.

In our case, we consider that social categories made up by village and caste membership, have norms and values toward education that affect schooling behavior. Let $E(p_g*)$ denotes the expectation of the empirical probability of schooling in social group g. $E(p_g*)$ proxies the schooling norm in the social group. If $E(p_g*)$ is sufficiently high, schooling seems to be well promoted in the social group and families which deviate to this norm – those which do not enroll their children - bear a social cost, their social utility is negative. And inversely, if $E(p_g*)$ is sufficiently low, enrolling children will create a social cost. $E(p_g*)$ can be computed empirically as the average attendance rate $\frac{n_g}{N_g}$ where n_g is the number of children who attend school and N_g the total number of children in the social group g. The social utility S_i is defined as follows:

$$S_{i,g}(p_{i,g}) = m - (\frac{1}{2}) * (p_{i,g} - \frac{n_g}{N_g})^2$$

As the probability of schooling $p_{i,g}$ approaches the average attendance rate $\frac{n_g}{N_g}$, the social utility increases and reaches its maximum value at point $p_{i,g} = \frac{n_g}{N_g}$

m is a constant that just indicates the maximum social utility level reached when individual i in social group g conforms perfectly to the social norm. At the equilibrium, all members of the social group have the same probability of enrolling their children

$p_{i,g} = \frac{n_g}{N_g}$

Thus the total utility function $U_{i,g}$ is the weighted average of the individual and the social utility:

$$U_{i,g}(p_{i,g}) = aI_{i,g}(p_{i,g}) + (1-a)S_{i,g}(p_{i,g})$$

$$U_{i,g}(p_{i,g}) = a(b * p_{i,g} - \frac{1}{2} * p_{i,g}^2) + (1-a)(m - (\frac{1}{2}) * (p_{i,g} - \frac{n_g}{N_g})^2)$$

With a the share of the individual utility, so $0 < a < 1$

$$\frac{\partial U_{i,g}(p_{i,g})}{\partial p_{i,g}} = 0 \implies a(b - p_{i,g}) + (1 - a)(\frac{n_g}{N_g} - p_{i,g}) = 0$$

$$\frac{\partial U_{i,g}(p_{i,g})}{\partial p_{i,g}} = 0 \implies ap_{i,g} + (1 - a)p_{i,g} = ab + (1 - a)(\frac{n_g}{N_g})$$

$$\frac{\partial U_{i,g}(p_{i,g})}{\partial p_{i,g}} = 0 \implies (p_{i,g}) = ab + (1 - a)(\frac{n_g}{N_g})$$

At the optimum, the probability of schooling depends positively on the marginal private benefit of education and on the average attendance rate in the social group.

1.3 Descriptive Analysis

1.3.1 Presentation of the study area

The study area Niakhar is a rural zone in the region of Fatick located 135 km east of Dakar, the capital of Senegal. It contains 30 villages divided into two rural communes (third territorial division in Senegal) Diarrère and Ngayokhème. The population in the study area has increased from 31092 inhabitants in 2001 to 43797 inhabitants in 2008. The study area covers a land area of 203 km^2 resulting in a relatively high density of 216 inhabitants per km^2. The zone is populated at 96% by the Sereer ethnic group, the second most represented ethnic group in Senegal (14% nationwide) behind the Wolof (41%).

Farming is the main economic activity in the area dominated by groundnut and millet cultivation. Livestock is also largely practiced. Other activities are also practiced, but to a lesser extent, such as craftmaking, fishing, hunting and fruit picking. Migration to Dakar represents an important source of income.

The social life in Niakhar is based on strong traditions and solidarity networks which play an important role in that context of poverty. Fertility in marriage is highly valued because it helps increase the agricultural labor force and potential migration opportunities (Delaunay et al., 2006). The elders are well respected and are responsible for the organization of the social life and in particular the distribution of agricultural land.

According to administrative educational data, the study area had 23 public primary schools in 2014.

A thorough description of this area and of the demographic surveillance data was presented in Delaunay et al. (2013).

Figure 2.10: Location of Niakhar

1.3.2 Caste system in West Africa

The caste system is widely present in many countries of West Africa particularly in Mali, Mauritania and Senegal. Tamari (1991) gives a good description of castes in West Africa. The caste system is derived from a historical social division. The caste structure may be slightly different from one country to another or from one ethnic group to another. But a common feature of caste we can found in almost all of the caste systems in West Africa is the dual distribution into two main categories: nobles and non-nobles. They represent the largest part of the society and are associated with agricultural or related activities such as herding or fishing. A small portion of the nobles held the political power and ruled the kingdoms. They are the descendants of royal families and constitute the upper-level of the social hierarchy. The second category in the caste system considered as non-nobles is mainly composed of the griots and artisans. Griots were in charge of the oral tradition and were the guardians of the history of the kingdom. They knew the genealogy of the royal families and the nobles. They mastered the art of speaking, worked as spokespersons for the royal court and sang the praises of the kings and nobles. Artisans were at the same social level as griots and practiced craft activities. They were usually metalsmiths, shoemakers, jewelers, potters, weavers or woodworkers. In some areas, there is another group also considered as non-noble: the captives. Captives were at the bottom of the social hierarchy and were usually the descendants of war prisoners. This group may exhibit some reticence to identify themselves as captives and are therefore usually underrepresented in surveys or studies about caste. Griots, artisans and captives have always constituted a minority of the population. Previous works have estimated the share of griots and artisans to lie between 5% and 20% depending on the ethnic groups and the captives to represent less than 5% of the population Tamari, 1991. Therefore, unlike in India, the caste system in West Africa is not pyramidal. The nobles represent the majority of the population. Castes were characterized by a strict endogamy, marriages were only allowed within the caste group. Caste membership is hereditary and rigid and cannot be changed by any means regardless of economic status, social mobility or evolution of the division of labor. Importantly, it was strictly

forbidden for nobles to engage in craft jobs or to become musicians. The former is reserved only for artisans and the latter for griots. By contrast, griots and artisans were allowed to practice farming activities. In Senegal, the caste system exists in the whole country except in the southwest, in a part of the Casamance region. All of the major ethnic groups in the country (Wolof, Puular, Sereer, Bambara etc.) have a well-rooted caste system. In Senegal, this historical social division still has a strong imprint in the social life. With modernity, job occupation in the labor market has been completely upset, griots and artisans graduate from school and occupy executive positions. However, the historical social division of labor still leaves some traces, particularly in rural areas. People from the royal castes are more likely to occupy village chief positions. Many griots continue the activities of their ancestors and many artisans carry out craft activities. It is rare to see individuals from the noble caste practicing a craft job. Children of griots and artisans sometimes learn skills associated with their caste group. Today, the caste system is deeply present especially in the marriage market. Families still manifest deep reluctance to marry a noble to a griot or an artisan and vice-versa. Even in the political sphere, the caste system has a strong influence. Mbow (2000) shows that people from the griots and artisans caste, struggle to lead political parties or to win elections. They sometimes even have trouble to being heard in political meetings because of their caste. In our study area, the caste system is structured into three groups: the royal caste, the caste of farmers and the caste of griots and artisans. People from the royal caste are the descendants of the dynasty of Kelwar, the only dynasty that could be nominated as king. Griots and artisans constitute the smallest group. Farmers are people with no royal lineage and not carrying crafts. They may have land rights or religious authority (see Becker and Martin, 1982 for reference on caste in this area).

1.3.3 Data

We use different types of original and comprehensive data collected by the French Research Institute for Development (IRD). The first set of data used in this study is a school monitoring system implemented between 2001 and 2008. This system recorded every year whether children attended school or not, and if so their type of education (classic or Arab-Islamic school) and educational level. We use this data to compute the school attendance status of children and the attendance rate in the social group.

The second type of data we exploit in this paper is a demographic surveillance system established since 1983 which provides information on various demographic events such as births, deaths, and migration, as well as many individual characteristics such as gender, caste, ethnic group, religion and information on the household composition. Every child tracked in the school-monitoring data can be identified in this demographic surveillance system. From this latter data set, we have thus merged into the school-monitoring data, the children's information for the study period (2001-2008) and that of their household and social group.

Finally, we use a survey on the standard of living of the households data conducted in 2003 to build an asset index, an agro-pastoral wealth index and some characteristics of the household head (marital status and level of education). The variables taken from this survey do not vary over time and are specific to the year 2003.

1.3.4 Descriptive Statistics

The school-monitoring data set covers 9680 children aged 6 to 16 and tracked between 2001 and 2008. Every year, some children turn 6 years old and enter the sample study and others are over 16 and leave the sample. We exclude children for whom caste group is unknown and the size of the social group (number of children from the same caste and village) is less than 10. In the end, 9207 children are used in this study and the number of observations throughout the 8 years is 50463.
32% of the children in the study sample dropped out during the monitoring period (2001-2008). The majority of these dropouts took place in primary school (86% in total). The dropouts in middle school are minor (3% drop in total) and are partly due to the fact that very few children between 6 and 16 manage to reach middle school level.
Changes over time in the school attendance status are quite common. Among the 2372 children who are observed during all the eight years of the study period, 60.6% experienced at least one change (either drop out or attending school after being out-of-school the previous year) in their attendance status. 38.2% of these 2372 children experienced only one change, 18.6% experienced two changes and 5.8% experienced three changes.

The average attendance rate during the 2001-2008 period for children aged 6 to 16 stands at 75.3%. This rate increased markedly between 2001 and 2004 from 73.4% in 2001 to 83.1% in 2004. From 2005, the attendance rate decreased and had its lowest level in 2006 (67.3%). It recovered slightly in 2007 and 2008 to stand at 69.5% and 71.1% respectively.

The average attendance rate stands at 76.0% for primary school age children (between 6 and 12) and at 73.7% for middle school age children (between 13 and 16). In the first three years, the attendance rate of the older children was higher than that of the youngest. This trend is reversed from 2004 to 2008.

The decline in the attendance rate from 2005 appears to be related to the quality of the data since data from 2005 to 2008 are retrospective data, some enrolled children in this period may be considered as out of school. In our estimations, we do some robustness checks using only data from 2001 to 2004 which is of better quality. Our main conclusions do not change.

In 2001, the attendance rate of the age group 13-16 was much higher than the attendance rate of the age group 6-12. This trend is inverted over time. This fact may be explained first by a disastrous agricultural season in 2002 which incite older children to temporarily migrate to the capital or to other towns or to work more to help their families cope with this shock. In addition, it seems to have a drop in the age of entry over time making younger children be more likely to attend school and older children who were not enrolled at a younger age less likely to enter school. Children are also more likely to drop out of school after completing primary education.

As regards the distribution of caste groups, more than 3/4 of children belong to the farmers caste, 16.5% to the royal caste, 5% are griots or artisans. The attendance rate is the highest for children from the royal caste (79.4%), and stands at 74.5% for the farmers caste and the griots and artisans caste. The mean comparison tests shows that there is no difference between farmers and griots and artisans but the attendance rate of the royal caste is significantly higher

Figure 2.11: Evolution of the school attendance rate by age group

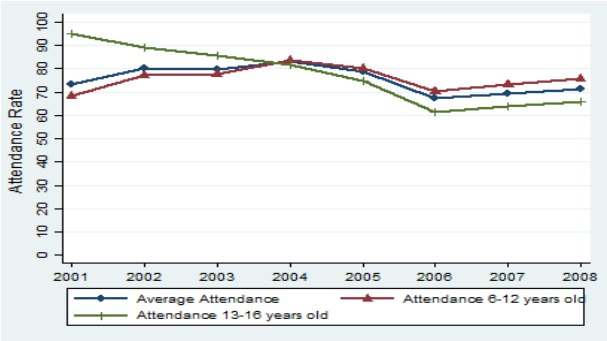


Table 2.1: Mean comparison test of attendance rate between caste groups

	Farmers	**Royal**	**Griots and artisans**
Average attendance rate	0.7454	0.7936	0.7451
Mean comparison test	**Farmers vs royal**	**Farmers vs griots and artisans**	**Royal vs griots and artisans**
Difference	-0.0482	0.0004	0.0485
t-statistics	-9.1891***	0.0422	5.3957***

* p<0.1, ** p<0.05, *** p<0.01

than the attendance rate of the other two castes at the 1% level (see table 4.54).

Simple OLS regressions shown in table A11 find similar results. When a number of child, household and social group characteristics are introduced in addition to village fixed effects, farmers and griots and artisans have a significantly lower probability of attending school than children of the royal caste. But there is no significant difference between the caste of farmers and the caste of griots and artisans.

Simple descriptive statistics for the other variables used in the analysis are presented in table B41 and table B42 in the appendix. In table B41, we can see that households are relatively large with an average of 13 members per household. On average, a household has 3.4 adult women and 2.2 children under the age of five. The average age for children in the study sample is about 10.8. 64 social groups are formed by the combination of the three caste groups and 29 villages (the three castes are not represented in all villages). A social group has more than two thousand inhabitants on average and about 262 children aged between 6 and 16. Table B42 shows that Christians are well represented in our study area with about 21.7% of the population while they account for only 5% of the population nationwide. More than 80% of household heads are married and the half are polygamous. Households are generally headed by men, very few are headed by women (3.6%). Nearly 70% of household heads have never attended schools, 9% have a primary level, 3% have a secondary school level or higher and 3% receive only a Koranic education. There are slightly more boys than girls (51.5% vs 48.5%) and almost 15% of children do not live with one of their biological parents.

Further descriptive statistics are presented in table 2.2 which displays the total population and the average attendance rate for each of the 29 villages in the study area and for each

village-by-caste cell.

We compute the unconditional Intra-Class Correlation (ICC) and the conditional Intra-Class Correlation (ICC) using the analysis of variance estimator. The unconditional ICC is the basic ICC derived from the analysis of variance in which the binary variable "attending school or not" is the outcome and the 64 social groups made up by the combination of caste and village represent the different groups. The conditional ICC is computed through two steps. We first predict the residuals of the regression of the binary outcome on various observable characteristics and then the ICC of the residuals in the 64 social groups is computed. First, the analysis of variance in both cases shows that the likelihood to attend school is significantly different at the 1% level between social groups. The unconditional ICC is estimated at 13.75% and the conditional ICC (the ICC once observable characteristics are removed) is estimated at 8.69%.

Table 2.2: Population and Attendance rate by village

	Population				Attendance Rate			
Village	**Total**	**Farmers (%)**	**Royal Caste (%)**	**Griots and Artisans (%)**	**Total (%)**	**Farmers (%)**	**Royal Caste (%)**	**Griots and Artisans (%)**
			Commune of Ngayokhème					
Diokoul	412	100.00			63.59	63.59		
Kalom	2092	34.13	65.87		82.41	82.91	82.15	
Ngaragne-Kop	1247	100.00			69.69	69.69		
Ngane-Fissel	977	57.01	42.99		68.37	69.66	66.67	
Ngayokhème	3586	74.57	19.83	5.61	78.58	78.87	79.75	70.65
Sass-Ndiafadj	1673	90.68	5.68	3.65	85.65	85.43	90.53	83.61
Sob	1343	89.72	10.28		78.11	76.93	88.41	
Barri-Sine	1216	88.49	11.51		63.24	63.29	62.86	
Datel	916	100.00			50.22	50.22		
Lambanème	1203	53.87	43.39	2.74	82.04	80.40	86.40	45.45
Mbinondare	777	29.47	70.53		69.37	69.87	69.16	
Mboyène	626	100.00			75.24	75.24		
Ndokh	1444	90.10	9.90		77.70	76.40	89.51	
Ngangarlam	2110	96.97		3.03	68.96	68.91		70.31
Ngonine	2465	84.18	11.85	3.98	70.30	70.27	75.34	56.12
Poudaye	1565	92.14	1.41	6.45	76.81	76.91	63.64	78.22
Toucar	6450	82.78	7.27	9.95	84.23	84.19	85.71	83.49
			Commune of Diarrère					
Dame	472	31.99	68.01		89.19	88.08	89.72	
Diohine	6613	76.58	10.03	13.40	85.44	85.92	84.46	83.41
Gadiack	3011	76.92	16.90	6.18	63.33	63.21	64.64	61.29
Godel	1394	91.61	8.39		46.63	45.97	53.85	
Khassous	818	98.66	1.34		44.38	43.87	81.82	
Kotiokh	1687	88.92		11.08	56.97	58.73		42.78
Lème	422	3.08	96.92		77.25	69.23	77.51	
Logdir	1977	68.64	19.58	11.79	84.77	84.97	87.86	78.54
Mème	169	100.00			83.43	83.43		
Mokane-Ngouye	696	83.48	16.52		74.86	75.90	69.57	
Ngardiam	945	28.99	59.47	11.53	71.75	56.20	82.92	53.21
Poultock-Diohine	2157	90.26	7.56	2.18	79.74	80.12	82.82	53.19
Total	50463	78.24	16.12	5.64	75.32	74.54	79.36	74.51

Table 2.3: Intra Class Correlation of social groups

	Unconditional	**Conditional**
Intra-class correlation	0.1375***	0.0869***
	(0.0345)	(0.0234)
Estimated Standard Deviation of social group effect	0.1135	0.0868
Estimated Standard Deviation of within group	0.2843	0.2812

Standard errors in parentheses * p<0.1, ** p<0.05, *** p<0.01

1.4 Empirical Strategy

We argue that social interactions may have a strong effect on schooling decision. Following our theoretical model and the empirical literature on social interactions, we construct social groups and estimate the impact of the average schooling behavior of the social group on the probability of a child attending school. We rely on different identification strategies to control for endogeneity bias. In relation to the theoretical framework, individual behavior should be affected by the overall behavior in the social group since deviating from the group norm has a cost. Our basic assumption is that social interactions go through geographical proximity and social norms. Geographical proximity is measured by the residence in the same village and social norms are captured by the structure of the caste composition. We consider that in general, those castes convey identities, norms and traditions that could have a huge impact on schooling decision. Thus, in our framework, the combination of villages and castes constitute the social group, that is to say, people from the same village and the same caste belong to the same social group.

1.4.1 The empirical model

We estimate the following model to capture the effect of social interactions on schooling.

$$y_{igt} = \beta_1 + \beta_2 X_{it} + \beta_3 G_{gt} + \beta_4 \overline{Y}_{(-i)gt} + u_i + v_t * C_g + \epsilon_{igt} \tag{1.1}$$

Index i refers to a particular child i, g is the social group and t indicates the schooling year between 2001-2002 and 2008-2009.

The dependent variable y_{igt} is a dummy variable taking 1 if child i in social group g at time t attends school and 0 otherwise.

X_{it} is a vector of individual and household characteristics and contains the age of the child (between 6 and 16), the size of the household, the number of adult women, the number of children under five years and the gender of the household's head.

G_{gt} are characteristics of the social group known in the literature as contextual factors. Here we control by the total population in the social group, the number of school-age children (aged between 6 and 16), the average age of peers (other school-age children), the proportion

of Christians and the presence of primary schools in the village.

$\overline{Y}_{(-i)gt}$ is the variable of interest and β_4 is supposed to capture the social interactions effect. $\overline{Y}_{(-i)gt}$ is defined as the mean level of the attendance rate in the social group excluding child i. It represents the attendance rate of the other members of the group calculated as the ratio between the number of children that attend school (without child i) and the total number of children aged between 6 and 16 minus 1. This measure is known as the leave-out mean and is currently used in the literature on peer effects to avoid that the outcome value of an individual i directly influences the main explanatory variable. Not excluding child i will overestimate our parameter of interest.

u_i are individual-specific effects that will be considered as fixed.

v_t are year fixed effects and C_g is a dummy variable for the commune, a territorial division comprising the villages. The rationale behind the interaction $v_t * C_g$ will be discussed in the identification issues subsection.

ϵ_{it} is an idiosyncratic error term of individual i at time t.

The parameters $beta_k$ are estimated with a Linear Probability Model (LPM) in a panel data setting with fixed effects. Indeed, as detailed in Wooldridge (2010), if the main purpose is not to predict the probability itself that $y_{igt} = 1$ but rather to approximate the partial effects of one particular explanatory variable, "LPM often does a very good job". In addition, the LPM allows a more natural use of fixed effects estimation and make easy the interpretation of the coefficients.

A fixed effects estimation is used instead of a random effects for two main reasons. First, fixed effects estimation does not require the independence between individual fixed effects and the covariates that are unlikely to be verified. Second, the demographic surveillance system we are using is not a random draw from a larger population but rather a census of the whole population in the study area. However, a limitation of the fixed effects model is that we cannot interpret the impact of some important time-invariant variables. In appendix A12, we estimate a random effects model with a complete set of control variables. This regression allows us to analyze the impact of some time-invariant variables like the gender of the child, the dominant religion in the household and some characteristics computed in a one round household survey conducted in 2003 such as the level of education and the marital status of the household's head, the standard of living index and the agro-pastoral wealth index computed through multiple component analysis techniques (see variables used in appendix 1.6).

Standard errors are clustered at the social group level to account for heteroscedasticity as well as correlation between individuals in the same social group and serial correlation. The serial correlation problem will be further discussed in the next subsection.

1.4.2 Identification issues

Identification of parameters is a great challenge in the study of peer effects. The coefficient β_4 we try to estimate may capture other phenomena not related to social interactions. Before discussing the different threats to identification, it is worth mentioning that the fixed effects estimation helps rule out a number of endogeneity issues. The individual fixed effects encompass

social group fixed effects and in this way, control for all time-invariant characteristics of the social group as well as all time-invariant unobservables that affect schooling in the social group. Similarly, time-invariant characteristics at a lower level, say at the household or at the child level, are also controlled. Remaining threats to identification are then time-varying factors that affect simultaneously the average schooling in the social group and the schooling decision of a particular child. We note three key endogeneity issues.

- In the linear-in-means model, Manski (1993) points out the reflection problem which means that one's cannot disentangle the endogenous social interaction effects from the contextual ones. In this way, a positive and significant value of the parameter β_4 can simply translate the fact that individuals with the same characteristics X or G behave similarly in their schooling decision. Brock and Durlauf (2007) show however that in a non-linear model with a number of assumptions among which random assignment in different social groups and the absence of non-observable factors that affect y, the reflection problem is ruled out. Unfortunately, our model is not likely to satisfy these assumptions.

- It may have a selection bias in the assignment among different social groups. Unlike the geographical localization, the assignment into different castes can somehow be considered as exogenous because membership into caste groups depends only on family lineage. Contrariwise, membership to a village may be subject to self-selection. People with similar preferences may live nearby and lead to a dynamic sorting phenomenon. For example, families or children may tend to migrate to villages with better schools or better schooling conditions creating an upward bias to our coefficient of interest.

- A third concern is about omitted variable bias. In fact, factors that increase or decline school attendance in some villages may arise over the study period. It is straightforward to imagine some events that take place during the study period and affect the overall attendance in the neighborhood. There may be some infrastructure set up in the village (roads, installations for electrification, water drilling etc.), development projects that foster school enrollment or disasters or other bad events that can reduce enrollment. All such factors artificially increase the correlation between the average school attendance in the social group and the attendance status of a child in this group.

Finding good instruments is a great challenge in social interaction models since this instrument should be a good predictor of the average behavior in the social group and should not affect the enrollment decision of one given child in a channel other than interactions with her social group members. Studies which seem to do better with endogeneity bias use randomized or natural experiments data (Duflo and Saez, 2003; Cipollone and Rosolia, 2007; Bobonis and Finan, 2009; Lalive and Cattaneo, 2009 etc.).

We do not find any reliable instrumental variables. Some solutions to deal with these endogeneity biases are discussed below.

Reflection problem

It is plausible to assume that individuals do not react immediately to the behavior of their social group but respond with a certain lag. Manski (1993) affirms that "it may well be more realistic to assume some lag in the transmission of these effects". He further supports that dynamic model could solve the problem of identifying social interactions.

To understand the reflection problem, just take the expectation of (1.1) in the social group g and assuming that $E(u_i + \epsilon_{igt}|G_{gt}, \overline{Y}_{(-i)gt}) = 0$ we obtain:

$$E(y_{igt}) = \beta_1 + \beta_2 E(X_{it}) + \beta_3 G_{gt} + \beta_4 \overline{Y}_{(-i)gt} + v_t * C_g$$

The mean in the social group of X_{it} can be considered as contextual factors, so $E(X_{it})$ is part of G_{gt} and $E(y_{igt}) \approx \overline{Y}_{(-i)gt}$.

Thus:

$$\overline{Y}_{(-i)gt} = \beta_1 + (\beta_2 + \beta_3) G_{gt} + \beta_4 \overline{Y}_{(-i)gt} + v_t * C_g$$

$$\overline{Y}_{(-i)gt} = \frac{\beta_1 + (\beta_2 + \beta_3) G_{gt} + v_t * C_g}{1 - \beta_4} \tag{1.2}$$

Reflection problem arises because there is a linear dependency between $\overline{Y}_{(-i)gt}$ and G_{gt} in equation (1.2). So there is a co-movement between $\overline{Y}_{(-i)gt}$ and G_{gt} that makes difficult the separation of the contextual effects and the endogenous social interactions.

The dynamic model is simply written as follows:

$$y_{igt} = \beta_1 + \beta_2 X_{it} + \beta_3 G_{gt} + \beta_4 \overline{Y}_{(-i)gt-1} + u_i + v_t * C_g + \epsilon_{igt} \tag{1.3}$$

The probability of child i in social group g is no more affected by the contemporaneous behavior of the group but by its previous behavior. This model helps greatly circumvent the reflection problem.

Indeed by the same calculations as previously (taking the expectation of (1.3)) and let L a lag operator such as $\overline{Y}_{(-i)gt-1} = L\overline{Y}_{(-i)gt}$ we obtain:

$$\overline{Y}_{(-i)gt} = \frac{\beta_1 + (\beta_2 + \beta_3) G_{gt} + v_t * C_g}{1 - L\beta_4} \tag{1.4}$$

We no longer have a linear dependency between $\overline{Y}_{(-i)gt}$ and G_{gt}, so the reflection problem is figured out.

Indeed, following Blume et al. (2011) "dynamic analogs of the linear in means model may not exhibit the reflection problem".

However, in equation (1.3), serial correlation may be an important issue. $\overline{Y}_{(-i)gt}$ and $\overline{Y}_{(-i)gt-1}$ can be correlated due to the correlation between ϵ_{igt} and ϵ_{igt-1}. To deal with this

issue, we cluster standard errors at the social group level[9]. This clustering structure accounts both for the correlation of an individual over time as well as the correlation between individuals in the same social group. Clustering standard errors is robust to cross sectional heteroscedasticity and serial correlation within panel when the time dimension is short enough compared to the number of observations (Bertrand et al., 2004; Angrist and Pischke, 2008; Wooldridge, 2010). In this paper, we have 9207 observations and only 8 years, so this condition seems to be widely respected. We also have 64 social groups suggesting that the number of clusters is sufficiently large for the cluster robust method to be valid.

Self selection

An important issue in estimating peer effects or social interactions is that groups or networks may not be made up randomly. It is the selection problem. In our particular case, the correlation between the average behavior in the social group and the specific behavior of a member of this group is likely driven by some unobservables that explain also the non-random assignment in the groups.

To assess this issue in our empirical analysis, recall first the definition of a social group in our context. Individuals within the same caste and the same village belong to the same social group. As mentioned previously, caste can be considered as exogenous, people belong to a particular caste since birth. And importantly, caste membership is fixed and cannot change over time by no means. Due to the presence of fixed effects in our model, only time-variant characteristics can represent a threat to identification. Therefore, the source of selection bias comes necessarily from non-random assignment over time into different villages known as dynamic sorting. For instance, a given village can have some potentiality for agro-pastoral activities attracting children from other villages to work. These children are then less likely to attend school. On another side, children may move to villages with better schooling environments. All these possible migration patterns are sources of selection bias in the assignment of social groups.

Fortunately, we have data on migration between villages during the study period. Migration to the capital or other towns seems to be a minor concern in this context. Even though this type of migration is widespread in the study area, it is essentially temporary [10], so those migrants are very likely to be recorded in our data.

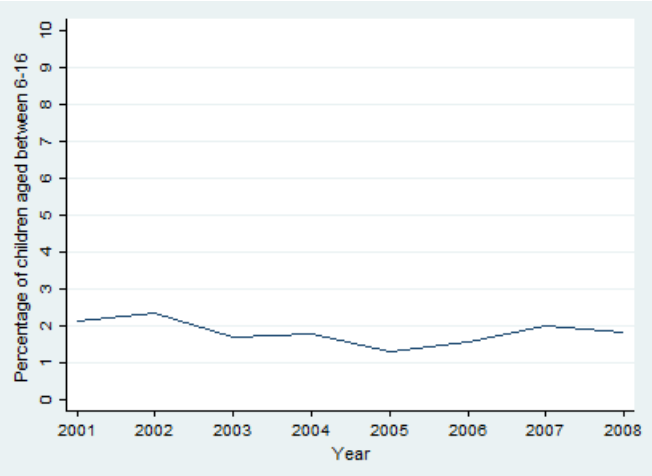
Migration between the different villages in the study area is relatively low as shown in figure 2.12. The internal immigration rate which is the proportion of children aged between 6 and 16 who migrate from one of the 29 villages of the study area to another village of the study area is around 2% and fluctuates very little over time. These figures tend to show that dynamic sorting does not seem to be a major concern.

In addition, we control for total inflows (immigration) and total outflows (emigration) in robustness checks to assess the sensibility of results when these population movements are taken

[9]Clustering standard errors at the individual level accounts for the serial correlation problem but does not account for the correlation of individuals in the same social group. Clustering at the individual level yields smaller standard errors and is then less conservative to the cluster at the social group level

[10]Students and particularly girls go to the capital city during the summer holidays after the sowing period but return to their home villages at the start of the school year.

Figure 2.12: Internal immigration rate of children between villages of the study area per year



into account.

Omitted Variables

Time-varying unobservable shocks that affect schooling in a given social group is one of the main threat to identification. Estimating equation 1.1 is misleading if uncontrolled factors affect the average attendance rate in the social group. In this case, these factors will influence the individual attendance probability as well and β_4 will not only capture peer effects. Lacking good instrumental variables, we will rely on different empirical strategies to convince that our results are not driven by unobservable shocks.

First, instead of including only year fixed effects in our regression, we include year multiplied by commune fixed effects. Communes are the smallest territorial division after the districts in urban area. In rural area, the equivalent of communes are called "communautés rurales" in French and the equivalent of districts are villages. The 29 villages in the study area are divided into two rural communes: 17 villages belong to the rural commune of Ngayokhème and 12 villages belong to the rural commune of Diarrère. The interaction between commune and year fixed effects allows controlling for all time-varying factors common to all villages in the same commune. We believe that this set of fixed effects helps reduce omitted variables problem. In fact, villages in the same commune share some geographical shocks and also some consequences of policy actions taken at the commune level, for instance, setting infrastructures, sensitization campaigns, social policies etc. Of course, unobservable shocks within the commune may still be a concern.

Second, in robustness checks, we replace our main variable of interest the average attendance rate in the social group $\overline{Y}_{(-i)gt}$ with the difference between the average attendance rate in the caste $\overline{Y}_{(-i)cvt}$ and the average attendance in the village $\overline{Y}_{(-i)vt}$ [11]. We believe that omitted variable bias can only come from factors that affect the schooling behavior in the whole village. It is difficult to imagine how some unobservables can affect one particular caste in a village

[11] index c refers to the caste and v to the village

without affecting the others. The idea of this difference is to rule out any village component of the average attendance rate in the social group. The difference $\overline{Y}_{(-i)cvt} - \overline{Y}_{(-i)vt}$ corresponds then to the gap between the schooling attendance in the caste and the school attendance in the village. A positive (negative) value of this difference means that the average attendance in the caste is above (below) the village average. Although this specification emphasizes the specific role of caste in social interactions and de-emphasizes the neighborhood effects, we feel comfortable in the fact that it allows removing many confounding factors.

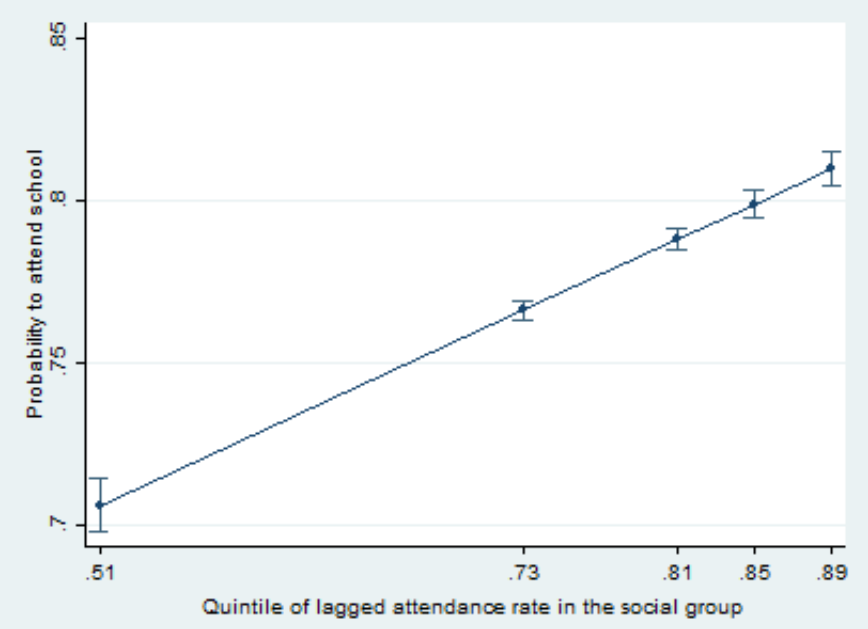
Third, we run some kind of placebo tests to figure out whether our results are driven by omitted variables. In a first placebo test, we estimate the impact of the schooling behavior of other castes in the same village. In the presence of geographical confounding factors, we expect the attendance rate of other castes in the same village to be correlated with individual attendance decision. In a second placebo test, we estimate the impact of the attendance rate of the same caste group in other villages. This test allows us to check whether our definition of social group is accurate.

1.5 Results

Basic Results

Our main results are presented in table 2.4. All specifications are estimated with Linear Probability Model (LPM) with fixed effects. Standard errors are clustered at the social group level to account for serial correlation and for the correlation of outcomes for members in the same social group. Following the discussion in the identification issues section, instead of the contemporaneous attendance rate, the lagged attendance rate in the social group is used as the main variable of interest to deal with the reflection problem. We then study how the attendance rate in the social group for the previous year influences the probability for a child to attend school. Control variables are included step by step. The reported F-statistic tests the null hypothesis that the model we estimated does not fit the sample better than the model with only a constant. A significant F-test means that the explanatory variables are jointly significant. In all specifications, the lagged attendance rate has a positive and significant impact at the 1% level on the probability to attend school. The magnitude of the coefficient decreases when control variables are introduced. In column 1 where no control variables are included, a one percent increase in the lagged attendance rate increases the probability to attend school by 0.41 percentage points. In column 2, individual and household characteristics are included and the coefficient of interest decreases markedly and stands at 0.30. Social group characteristics included in column 3 reduce to a lesser extent the magnitude of the point estimate. Our preferred specification is in column 4 which includes all control variables in addition to the interaction of year and commune fixed effects. These fixed effects account for all time-variant factors that similarly affect villages in the same commune. The impact of the lagged attendance rate in the social group declines slightly but remains positive and statistically significant at the 1% level. A one percent increase in the attendance rate of the social group in the previous year makes

Figure 2.13: Predictive attendance probability with 95% Confidence Intervals



the child 0.27 percentage points more likely to go to school. With a one standard deviation increase in the lagged attendance rate, the increase in the probability to attend school reaches 4.17 percentage points. This evidence shows that social interactions play an important role in the attendance decision.

Figure 2.13 plots the predictive probability to attend school by the lagged attendance rate in the social group. The x-axis indicates the average lagged attendance rate for each quintile category. The curve exhibits the positive relation between the attendance rate at year t-1 and the probability of schooling at t. A child who belongs to a social group in the first quintile in terms of school attendance has a probability of 70.6% to attend school the next year. This probability is 81.0% for a child from a social group in the upper quintile of school attendance, an increase of 10.4 percentage points more compared to a child from the lowest quintile.

Regarding the results on the control variables, the size of the household, the number of adult women and the number of children under 5 years old have no significant impact on the probability to go to school. Attendance decision is negatively correlated with the fact that the household is headed by a woman, suggesting that children who live in households headed by a woman are less likely to attend school. The fact that the household is headed by a woman is potentially related to many other factors as the vulnerability of the household (for instance due to death or absence of the husband), lack of workforce, poverty etc. So it is difficult to go beyond simple correlation in interpreting this result.

The age dummies suggest an inverse U-shaped relationship between age and attendance. The probability of attending school is always positive compared to children who are 6 years old. This probability increases until the age of ten when it reaches its maximum and then decreases. The attendance probability decreases when peers are older and this effect is significant at the 1% level in our preferred specification. The number of school-age children has a negative impact on the likelihood to go to school but the effect disappears with the introduction of year times

commune fixed effects. The total population, the proportion of Christians and the presence of schools have no significant impact.

Heterogeneity

The heterogeneity of the impact of social interactions is studied in table 2.5 regarding the gender and the age of the child and the study period. The point estimate is 0.24 for boys and 0.30 for girls. Girls seem to be more affected by the average behavior of the social group than boys, but the two point estimates are not statistically different.
Primary-school age children (aged between 6 and 12) are strongly influenced by social interactions with a point estimate of 0.22 significant at the 1% level. Contrariwise, middle-school age children are not affected by the average schooling behavior in the social group. This finding suggests that the decision to enroll a young child in primary school is guided to some extent by the average schooling in the social group but school dropout or school enrollment for older children is independent of the group behavior. Somewhat surprisingly, the presence of primary schools in the village is negatively associated with the probability of older children to attend school while it has no impact on younger children (see full table in appendix table A13). The proportion of Christians appears to be positively correlated with older children attendance. The size of the household is negatively correlated with the probability to go to school for older children while it is not significant for younger children.
In the last column of table 2.5, we split the study period and run an estimation only for the period 2001-2004. As mentioned previously, there appears to be a clear difference in data quality between the first half of the study period (2001-2004) and the remainder of the period (2005-2008). Unlike the first half of the period, data from 2005-2008 were collected in a retrospective way, and therefore seem less precise. Thus, some enrolled children appear to have been recorded as out of school explaining the decline in the attendance rate in 2005. The point estimate for the sub-period 2001-2004 declines to 0.16 but remains high and statistically significant at the 5% level.

Robustness Checks

The positive and high impact of social interactions could be driven by some confounding factors correlated with the schooling behavior in the social group. As discussed in the empirical strategy, dynamic sorting and geographical omitted variables can represent important threats to identification. To control for dynamic sorting, we control for annual inflows and outflows between villages in the study area for children aged between 6 and 16. Controlling for these migration patterns will allow accounting for the fact that people can change social groups over time. These results are shown in table 2.6. Column 1 presents the baseline results in table 2.4. In column 2, we introduce annual inflows and outflows between villages. The magnitude of the point estimate is nearly the same and always significant at the 1% level. This suggests that dynamic sorting does not impact our results and consolidates the previous evidence in graph 2.12 that migration flows between villages are low and do not represent a major concern. Further-

Table 2.4: Impact of social group schooling on the probability of school attendance

	(1)	(2)	(3)	(4)
Lagged attendance rate in g	0.409***	0.302***	0.288***	0.266***
	(0.0595)	(0.0470)	(0.0390)	(0.0549)
Size of household		-0.0003	0.0002	-0.0008
		(0.0027)	(0.0027)	(0.0024)
Number of women aged 15 and more		0.0008	-0.0007	-0.0003
		(0.0047)	(0.0048)	(0.0048)
Number of children less than 5		0.0018	0.0022	0.0025
		(0.0048)	(0.0047)	(0.0045)
Household head woman		-0.0911	-0.0823	-0.0826*
		(0.0561)	(0.0550)	(0.0483)
Age=7		0.296***	.	.
		(0.0372)		
Age=8		0.347***	0.0816***	0.0846***
		(0.0330)	(0.0168)	(0.0108)
Age=9		0.338***	0.104***	0.107***
		(0.0269)	(0.0270)	(0.0117)
Age=10		0.313***	0.112***	0.119***
		(0.0227)	(0.0400)	(0.0102)
Age=11		0.274***	0.105*	0.114***
		(0.0191)	(0.0539)	(0.0110)
Age=12		0.240***	0.101	0.114***
		(0.0157)	(0.0685)	(0.0096)
Age=13		0.188***	0.0808	0.0978***
		(0.0111)	(0.0801)	(0.0089)
Age=14		0.131***	0.0537	0.0722***
		(0.0092)	(0.0936)	(0.0075)
Age=15		0.0681***	0.0207	0.0393***
		(0.0077)	(0.108)	(0.0064)
Age=16		.	-0.0184	.
			(0.121)	
Social group characteristics				
Log total population			0.0063	-0.0557
			(0.129)	(0.119)
Average age of peers			-0.0782**	-0.112***
			(0.0360)	(0.0364)
Log number of school age children			-0.194**	-0.0596
			(0.0815)	(0.114)
Proportion of Christians			0.0130	0.0101
			(0.0084)	(0.0068)
Presence of schools in the village			-0.0136	-0.0172
			(0.0361)	(0.0328)
Constant	0.464***	0.307***	2.030*	2.242**
	(0.0452)	(0.0619)	(1.140)	(1.078)
Year×Commune fixed effects	No	No	No	Yes
No. of Observations	40910	40910	40910	40910
R-Squared	0.0263	0.0808	0.0874	0.122
F-statistics	47.07***	42.32***	31.63***	85.22***

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM with individual fixed effects estimates. Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

Table 2.5: Heterogeneity on the impact of social group schooling on the probability of school attendance

	(1) Boys	(2) Girls	(3) Between 6 and 12 years old	(4) Between 13 and 16 years old	(5) Sample limited to 2001-2004
Lagged attendance rate in g	0.236***	0.300***	0.223***	0.0282	0.160**
	(0.0509)	(0.0655)	(0.0582)	(0.0427)	(0.0659)
Controls	All	All	All	All	All
Time×Commune fixed effects	Yes	Yes	Yes	Yes	Yes
No. of Observations	20919	19991	26570	14340	16196
Average attendance rate	0.7403	0.7668	0.7602	0.7374	0.7933
R-Squared	0.147	0.102	0.0841	0.136	0.0596
F-statistics	105.1***	49.47***	37.45***	44.11***	.

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM with individual fixed effects with all the control variables in column 4 table 2.4. Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

more, children inflows and outflows in the village have no significant impact on the probability to attend school.

Confounding factors in the village level are potentially important sources of endogeneity bias. To deal with this issue, the average attendance in the social group is replaced by the average attendance level in the social group minus the average attendance level in the village. This difference as detailed in the identification issues section allows us to remove all the village components of the average attendance rate in the social group. Using this difference as variable of interest, the point estimate declines slightly but does not change much. From 0.27 in the baseline regression, the point estimate falls to 0.26 and is significant at the 5% level. In column 4 of table 2.6, migration flows are included and the coefficient remains roughly the same. It is worth mentioning that this estimation puts a lot of emphasis on social interactions through caste membership. Geographical interactions in this method play a minor role. The large size of the coefficient implies that social group behavior actually influences the individual decision about schooling even when factors driving the average attendance level in the village are ruled out.

The results presented in this section show that even when non-random assignment into social groups and geographical confounding factors are taken into account, the main conclusion of positive and significant impact of social interactions remains.

Other robustness checks are presented in appendix. In table A12, we estimate a random effects model. This model allows us to consider the individual specific effects as random, to include social group fixed effects and to assess the impact of other fixed control variables. The point estimate is high without social group fixed effects but falls to 0.29 when they are included. In table A14, a multilevel model is presented with two levels: the children and the social groups. This regression provides a more general way to model the non-dependency between individuals in the same social group. Thus, social groups and individuals are both considered as random effects. The coefficient of the lagged attendance rate stands at 0.29. In both the random effects and the multilevel model, the impact of social interactions is close to the 0.27 point estimate found in our baseline regression.

Griots and artisans constitute the smallest caste group in terms of size. We then wonder if excluding them from the analysis could change the results. In table A15 in appendix, we restrict the analysis to the farmers and the royal caste. Results are overall very similar to what

we obtain by considering the three caste groups.

Placebo tests

We run two different tests similar to placebos by modifying the definition of social groups. The first test is to capture the impact on attendance probability of the other caste groups in the same village. The second test is about assessing the impact on attendance of the average attendance level of children within the same caste group but living in other villages. [12]

If our results are driven by geographical confounding factors, we expect the schooling behavior of other castes in the same village to significantly impact the probability to go to school. Table 2.7 shows how each caste group is affected by its own average attendance rate in the village as well as the attendance rate of other castes in the same village. A child who belongs to the farmers caste is not affected by the average attendance rate of other farmers in the same village and is not affected either by the other two castes. Griots and artisans are influenced by the average attendance of other griots and artisans in the same village, with a point estimate of 0.20 significant at the 10% level, but are not influenced by the farmers and the royal caste. The set of results for the royal caste is more complex and raises interesting insights. First, social interactions appear to be much more important for members of the royal caste. A one percent increase in the lagged attendance rate of other children from royal caste in the village induces an increase of 0.43 percentage points of the probability to attend school. This magnitude is 1.6 times higher than that of the overall impact of social group schooling behavior and is significant at the 1% level. Furthermore, children from the royal caste are negatively and significantly affected by the schooling behavior of farmers. The impact of griots and artisans on the royal caste is also negative but non significant. This finding suggests that people from the royal caste tend to behave in the opposite way in terms of schooling compared to others. The negative impact of farmers on royal caste does seem to be a simple correlation due to the fact that children from the royal caste are more enrolled than the others. Recall that it is the lagged (and not the contemporaneous) attendance rate of farmers that negatively affects children from the royal caste. In addition, if this relationship was simply a pure correlation, we would probably find a negative impact of the royal caste on the other two castes as well, which is not the case. The royal caste is considered as the upper level in the social hierarchy and this may explain a wish to not conform to the social norm of the other castes. However, a better knowledge of the context and perhaps some qualitative or anthropological studies are probably needed to better understand this issue.

In brief, these findings suggest that confounding factors at the village level do not seem to be driving our basic result of a positive impact of social interactions, but that there is actually a group effect across the caste that influences schooling behavior.

Figure 2.14 shows how the influence of social group behavior is more important inside the royal caste compared to the other two castes. The predictive probability to attend school for each caste group derived from the regressions in table 2.7 is represented in the y-axis. The

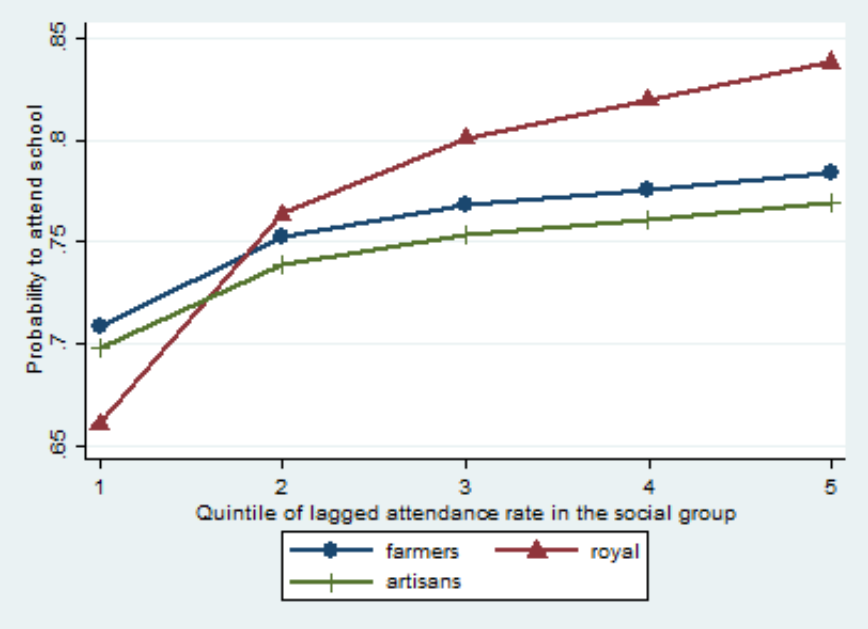
[12] These tests are not true placebo tests since there may be some impact from one caste to another as suggested in (Jacoby and Mansuri, 2015) and as we find below.

Table 2.6: Testing the presence of dynamic sorting and omitted variables bias

	(1) Baseline	(2) Control for migration	(3) Difference with village average	(4) Difference with village average & control for migration
Lagged Attendance rate in g	0.266***	0.268***		
	(0.0549)	(0.0558)		
Lagged (Attendance rate in g - Attendance rate in the village)			0.258**	0.258**
			(0.122)	(0.122)
Size of household	-0.0008	-0.0008	-0.0010	-0.0010
	(0.0024)	(0.0025)	(0.0024)	(0.0025)
Number of women aged 15 and more	-0.0003	-0.0003	-0.0006	-0.0007
	(0.0048)	(0.0048)	(0.0049)	(0.0049)
Number of children less than 5	0.0025	0.0025	0.0030	0.0030
	(0.0045)	(0.0045)	(0.0045)	(0.0045)
Household head woman	-0.0826*	-0.0819*	-0.0820	-0.0809
	(0.0483)	(0.0478)	(0.0529)	(0.0524)
Social group characteristics				
Log total population	-0.0557	-0.0607	-0.0904	-0.0906
	(0.119)	(0.120)	(0.137)	(0.136)
Average age of peers	-0.112***	-0.111***	-0.129***	-0.129***
	(0.0364)	(0.0360)	(0.0445)	(0.0442)
Log number of school age children	-0.0596	-0.0517	-0.0262	-0.0216
	(0.114)	(0.115)	(0.127)	(0.129)
Proportion of Christians	0.0101	0.0100	0.0131*	0.0130*
	(0.0068)	(0.0068)	(0.0078)	(0.0077)
Presence of schools in the village	-0.0172	-0.0177	-0.0371	-0.0362
	(0.0328)	(0.0327)	(0.0440)	(0.0443)
School-age children outflows		0.0017		0.0015
		(0.0021)		(0.0021)
School-age children inflows		-0.0012		-0.0016
		(0.0025)		(0.0022)
Constant	2.242**	2.230**	2.646**	2.629**
	(1.078)	(1.085)	(1.263)	(1.267)
Age dummies included	Yes	Yes	Yes	Yes
Time×Commune fixed effects	Yes	Yes	Yes	Yes
No. of Observations	40910	40910	40910	40910
R-Squared	0.122	0.122	0.115	0.115
F-statistics	85.22***	84.66***	41.91***	39.79***

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM with individual fixed effects. Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

Figure 2.14: Predictive attendance probability for different castes



x-axis displays the five quintile groups of the average lagged attendance rate. A child from the royal caste, whose attendance rate of other royal caste children in his/her village is in the lowest quintile, is 66% likely to attend school compared to 84% for a royal caste child in the highest quintile, a difference of 18 percentage points in the probability to attend school. For farmers and griots and artisans, this probability gap between the bottom and the top quintile of the attendance rate of their peers is 7 percentage points, much smaller than that of the royal caste.

In the second placebo test shown in table 2.8, we study the impact of the average attendance rate of children from the same caste living in other villages. Surprisingly, the lagged attendance rate of farmers in other villages has a negative impact on the attendance probability of farmers. However, for royal caste and griots and artisans, there is no significant impact of the schooling attendance of children from the same caste in the other villages. These results reinforce our view that the definition of social group we use is appropriate. The relevant network where the interactions take place is actually made up of individuals from the same village and the same caste. The negative point estimate we find for farmers is somehow puzzling and perhaps deserves further knowledge of the context to figure out what it really contains. We suggest three possible explanations. First, these results should be taken with caution because the coefficients in these three regressions are very imprecise. Both the standard errors and the coefficients are very high reflecting a miss-specification problem. This miss-specification problem is likely due to the very small variability of the explanatory variables used in these estimations. In fact, the average attendance of children from the same caste in the other villages does not vary much from one village to another. Second, the farmer's caste group is the largest and the most heterogeneous compared to the other two castes. Thus, social norms inside this caste are not so strong and interactions are more likely to occur in the neighborhood. Our last explanation is more technical and relates to what Caeyers and Fafchamps (2016) have called the exclusion bias. This is the mechanical negative relationship between the characteristics of an individual

and those of their peers simply because "individuals cannot be their own peers" as noted by Guryan et al. (2009). For instance, if farmers in a particular village have the highest school attendance rate, this means that the overall attendance rate of farmers in other villages is lower. As a result, the attendance rate in this high-performing village will be negatively correlated to that of other villages. This exclusion bias probably explains the negative but not significant point estimate for the royal caste and griots and artisans.

1.5.1 Mechanisms and Discussion

Although we cannot claim that we estimate a pure causality of peer effects, the different robustness checks and placebo tests implemented allow us to rule out a number of alternative explanations. Nevertheless, social interactions can operate through different channels and identifying these channels can be particularly useful for policymakers as well as for research purpose. As noted by Sacerdote (2011): "Identifying the precise channel through which a given peer effect operates is a Herculean task and in many cases is asking too much of the data" (P. 251).

Lacking data to empirically address the various channels of social interactions, we try to issue a number of hypotheses to understand what our positive social group effect contains. Our first interpretation is that these positive effects reflect social norms. As explained in the theoretical model, there may be a significant social component in the utility function of individuals. Social categories convey norms, and deviating from these norms engenders costs. Our definition of social groups supports this hypothesis. One of the main characteristics of caste groups is to transmit ways of thinking. Despite modernization and the loss of power of these traditional forms of social identity and organization, many of their cultural aspects still have great importance today, particularly in some rural areas. On another side, villages can also have different norms. Geographical proximity and the identity carried by the membership to a certain village can explain why people of the same village behave similarly in accordance with the prevailing norms.

Another transmission channel can simply be a ripple effect phenomenon. People often behave like other members of their social group in response to fads or trends, for example. Simply seeing many children in the social group attending school could motivate a particular parent to send his or her child to school as well. Similar behaviors are observed in other well-known contexts in our everyday lives like choosing a particular restaurant for dinner, adopting new technology or even voting a certain way. People tend to imitate what others do and this behavior is shown by some theoretical papers as being rational. The seminal paper by Banerjee (1992) gives an explanation of why people are influenced by what others do and introduces the concept of "herd behavior" as "everyone doing what everyone else is doing, even when their private information suggests doing something quite different". In this model, people believe that others have some information that leads them to behave in a particular way - for example enrolling their children - and so it is rational to imitate them. The importance of the ripple effect has also been observed in a slightly different context. Kone et al. (2015) show that living in rich neighborhoods, drives poor households to comply with health and social norms.

A third channel could be the perception of the returns to education in the social group. If

Table 2.7: Impact of other castes in the same village

	(1) Farmers	(2) Royal	(3) Griots and artisans
Lagged attendance rate of farmers in the village	**0.185**	-0.238**	-0.208
	(0.114)	(0.0976)	(0.150)
Lagged attendance rate of royal caste in the village	0.0853	**0.431*** **	0.266
	(0.0548)	(0.124)	(0.283)
Lagged attendance rate of griots and artisans in the village	-0.0290	-0.0737	**0.204***
	(0.0514)	(0.0452)	(0.100)
Size of household	0.0001	-0.0041	0.0187
	(0.0026)	(0.0076)	(0.0119)
Number of women aged 15 and more	0.0036	-0.0039	0.0323*
	(0.0045)	(0.0125)	(0.0160)
Number of children less than 5	0.0010	0.0101	-0.0217
	(0.0050)	(0.0079)	(0.0261)
Household head woman	-0.0233	-0.0620	-0.228***
	(0.0590)	(0.167)	(0.0419)
Social group characteristics			
Log total population	-0.0118	0.436	-1.450***
	(0.253)	(0.309)	(0.388)
Average age of peers	-0.155**	-0.0267	-0.0653*
	(0.0598)	(0.0208)	(0.0353)
Log number of school age children	0.0659	0.0471	-0.237
	(0.200)	(0.204)	(0.207)
Proportion of Christians	0.0224*	-0.0016	0.0013
	(0.0126)	(0.0075)	(0.0206)
Presence of schools in the village	0.0118	-0.0418	0.0388
	(0.0393)	(0.0245)	(0.0816)
Constant	1.318	-1.779	9.149***
	(2.414)	(1.771)	(1.758)
Age dummies included	Yes	Yes	Yes
Time×Commune fixed effects	Yes	Yes	Yes
No. of Observations	32476	6337	2539
R-Squared	0.128	0.129	0.205

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM with individual fixed effects. Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

Table 2.8: Impact of the same caste in other villages

	(1) Farmers	(2) Royal	(3) Griots and artisans
Lagged attendance rate of farmers in other villages	**-6.416****	0.373	2.439
	(2.853)	(3.241)	(2.348)
Lagged attendance rate of royal caste in other villages	1.286	**-1.032**	-1.424
	(1.415)	(0.752)	(2.175)
Lagged attendance rate of griots and artisans in other villages	1.151	0.445	**-3.019**
	(1.327)	(0.949)	(1.941)
Size of household	-0.0014	-0.0019	0.0196
	(0.0026)	(0.0057)	(0.0115)
Number of women aged 15 and more	-0.0008	-0.0169	0.0305*
	(0.0050)	(0.0159)	(0.0157)
Number of children less than 5	0.0038	0.0099	-0.0215
	(0.0048)	(0.0075)	(0.0265)
Household head woman	-0.0365	-0.137	-0.280***
	(0.0591)	(0.246)	(0.0369)
Social group characteristics			
Log total population	-0.0340	0.326	-1.480***
	(0.250)	(0.193)	(0.371)
Average age of peers	-0.157**	-0.0484	-0.0719*
	(0.0604)	(0.0304)	(0.0399)
Log number of school age children	-0.0304	-0.0105	-0.180
	(0.210)	(0.140)	(0.197)
Proportion of Christians	0.0186	0.0003	-0.0084
	(0.0112)	(0.0070)	(0.0229)
Presence of schools in the village	-0.0013	-0.0390	0.0757
	(0.0523)	(0.0313)	(0.0791)
Constant	5.051	-0.319	10.98***
	(3.167)	(1.427)	(1.584)
Age dummies included	Yes	Yes	Yes
Time×Commune fixed effects	Yes	Yes	Yes
No. of Observations	35442	7128	2539
R-Squared	0.120	0.109	0.205

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM with individual fixed effects. Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

individuals notice that better educated people in their social category are wealthier, this may encourage them to go to school (or to enroll their children to school). Lincove (2015) in a recent study in Nigeria and Uganda finds that 18% of out-of-school children in Nigeria and 13% in Uganda report not going to school due to a low return to education. Jensen (2010) in a study in the Dominican Republic finds that students' expectations on their returns to education are very low and providing them information on the true returns to education sharply increases the number of completed years of education over the next four years. Attanasio and Kaufmann (2014) show in Mexico that monetary expected returns are a strong determinant to enter in college particularly for boys, but also mother's expectations about unemployment risk as well as earnings risk (measured by the variance of earnings) significantly reduce the probability to attend college for girls. It appears then that the perception of the monetary benefits of schooling, as well as the perception of the probability to find a good job, play an important role in educational decisions.

Policies can strongly depend on which mechanisms drive social interaction effects. If norms prevail, the role of an effective policy is to shift norms in a way favorable to children's education. Social norms can be very difficult to change but some policies have shown some efficiency in breaking unfavorable norms. Charter schools in the USA may be a good example. These schools are located in disadvantaged areas and apply a "No Excuses" philosophy: "long school day and year, selective teacher hiring, strict behavior norms, and encourage a strong student work ethic" (Angrist et al., 2010). As noted by Liu et al. (2014) about charter schools "the main objective is to change the social norms of disadvantaged kids by being very strict on discipline" (p. 53). Angrist et al. (2010) demonstrate a high positive and causal impact on a charter school in Lynn (north of Boston) on test scores. In the context of rural Senegal, an efficient policy should not upset traditional beliefs and customs but rather conveys the idea that it is worthy or beneficial to enroll children in school. It is widely accepted among development practitioners that social norms are difficult or even impossible to change from the outside. Norms change because the insiders want them to change. Any action aimed at breaking a negative norm should fully involve those primarily concerned: men and women in a given social group who will benefit from changing a norm they themselves have conveyed. Government or NGOs can initiate changes by playing the role of catalyst and by providing necessary information and facts that help replace the old views. Awareness campaigns can be useful in changing ways of thinking if the targeted population is properly reached and is responsive to the message.

Changing social norms is closely related to changing the perception of the returns to education and more broadly the returns to investments. Indeed, an important condition which makes the breaking of norms possible is that the population be aware of the benefits of abandoning old norms. Awareness campaigns can also play a key role in getting people be mindful about the returns to education. Convincing evidence is given by Nguyen (2008) who ran a field experiment in schools in Madagascar and found that showing simple statistics on the true returns to education both improved test scores of students who underestimated the returns to education and reduced test scores of those who overestimated the returns. On average however, tests score improved. As mentioned in the previous section, the actual returns to education are usually

well below people's expectations (Jensen, 2010; Lincove, 2015). In this case, providing accurate information on these returns should improve school attendance and educational outcomes. Exhibiting some success stories from members inside the community, known as role models, is highlighted by some works to be effective in raising expectations and in changing investment behavior. Nguyen (2008) finds that a role model from a poor background improves test scores of poor children. This is demonstrated to be effective in other investment behaviors. The paper by Bernard et al. (2014) shows how a simple sensitizing program can modify individual aspirations and saving behaviors. In a field experiment in rural Ethiopia, the authors randomly select some individuals to watch documentaries about people in similar conditions who successfully invest in agriculture or business without the help of government or NGOs. They show that six months later aspirations for those treated individuals change and find treatment effects on savings, credit utilization, education of children etc. Likewise, Macours and Vakis (2014) show in a field experiment in Nicaragua that living close to successful leaders induces higher aspirations and changes investment behavior.

If on the other hand, ripple effects are the major source of social interactions, an exogenous shock which affects the educational choice of some households may spread to others in the social group because people tend to imitate what others do. This suggests positive externalities. The most effective policy will, therefore, be the one which will better apprehend and internalize those externalities. In some sense, this can be a "good new" because school enrollment is currently increasing in sub-Saharan Africa even if there is still much to be done. If ripple effects are the main drivers of social interactions, this suggests that enrollment will increase at a faster pace due to positive spillovers. In this case, all policies that foster immediate school attendance, such as building schools on the supply side or a conditional cash transfer program on the demand side, can be expected to have a major impact on overall school attendance.

1.6 Conclusion

We exploit a rich data set from Niakhar, a rural zone in Senegal to study how social interactions affect educational decision. Peer effects in education are widely studied in the literature but many of these studies analyze learning outcomes in the classroom context and few have looked into what happens in the case of sub-Saharan Africa. Our paper differs in the sense that we study how social group schooling behavior influences the decision to attend school for children in rural Senegal. Social groups are defined with caste membership and geographical proximity. Caste norms represent a key element in the customs and in the social organization in some countries in West Africa and particularly in Senegal. Unfortunately, caste in Senegal appears to be understudied. We, therefore, contribute to the economic literature by studying one aspect of the caste system, namely norms and attitudes toward education. Identification is an important challenge when it comes to disentangling the effects of social group behavior. We take advantage of the panel structure of our data to estimate a dynamic model and to control for fixed characteristics of individuals and social groups. We also implement different tests to convince that non-random assignment into social groups and geographical unobserved factors

are not threats to the validity of our results, even though we cannot fully claim that our effect is entirely causal.

Our finding suggests that the usual economic determinants of schooling are not enough to explain school attendance. The probability to attend school increases between 0.25 and 0.29 percentage points with a 1% increase of the previous average attendance rate in the social group. Thus, schooling behavior in the social group explains a large portion of the attendance decision. Social interactions matter and should be considered when implementing educational policies.

While we use the combination of caste and village membership to construct social categories, one can assume that schooling decisions may be guided by the whole social network. Thus, more precise data on social connections between households would allow analyzing for further, how social interactions can shift children's school attendance.

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Appendix to Chapter 1

Table A9: Descriptive Statistics: Continuous Variables

Variable	Observations	Time-varying	Mean	Std. Dev.	Min	Max
proportion of enrolled in a social group	50463	Yes	75.32	16.53	0	100
wealth in goods and equipment index	9207	No	17.10	20.19	0.30	100
agro-pastoral wealth index	9207	No	65.50	20.60	0	100
size of household	50463	Yes	12.82	8.42	1	60
number of women aged 15 and more	50463	Yes	3.43	2.51	0	19
number of children less than 5	50463	Yes	2.23	2.04	0	17
age	50463	Yes	10.75	2.95	6	16
Social group characteristics						
total population	50463	Yes	2192.32	1547.19	26	5166
average age of peers	50463	Yes	10.75	0.85	7.85	13.83
number of school age children	50463	Yes	261.83	217.98	10	736
proportion of Christians	50463	Yes	21.66	19.15	0	64.31

Table A10: Descriptive Statistics: Categorical Variables

Variable	Observations	Time-varying	Mean	Variable	Observations	Time-varying	Mean
Presence of schools	50463	Yes	.8059	**Household head gender**			
Religion				**Male**	50463	Yes	.7632
Muslim	9207	No	.7661	**Female**	50463	Yes	.0358
Christian	9207	No	.2120	**Missing**	50463	Yes	.2010
Traditional	9207	No	.0107	**Educational level of the HH**			
Missing	9207	No	.0113	**No education**	9207	No	.6959
Marital Status of the HH*				**Primary**	9207	No	.0942
Single	9207	No	.0203	**Secondary or higher**	9207	No	.0315
Monogamous	9207	No	.4131	**Koranic**	9207	No	.0314
Polygamous	9207	No	.4029	**Missing**	9207	No	.1470
Divorced	9207	No	.0049	**Boys**	9207	No	.5147
Widower	9207	No	.0118	**Girls**	9207	No	.4853
Missing	9207	No	.1470	**Live with biological parents**	9207	No	.8572

* Household Head

Table A11: Impact of caste membership on the probability of school attendance

	(1)	(2)	(3)	(4)
Farmers (reference= royal)	-0.0482**	-0.0456**	-0.146***	-0.0790**
	(0.0230)	(0.0196)	(0.0422)	(0.0343)
Griots and Artisans (reference= royal)	-0.0485	-0.0809**	-0.0685**	-0.0715***
	(0.0414)	(0.0358)	(0.0297)	(0.0222)
Size of household		-0.0023	-0.0027**	-0.0022*
		(0.0016)	(0.0013)	(0.0012)
Number of women aged 15 and more		0.0079*	0.0098***	0.0081**
		(0.0040)	(0.0035)	(0.0034)
Number of children less than 5		-0.0041	-0.0017	0.0005
		(0.0035)	(0.0028)	(0.0027)
Household head woman		0.0179	0.0092	0.0095
		(0.0239)	(0.0233)	(0.0221)
goods and equipment index		0.0018***	0.0013***	0.0007***
		(0.0004)	(0.0003)	(0.0002)
agropastoral wealth index		-0.0006*	-0.0004	-0.0002
		(0.0003)	(0.0003)	(0.0002)
Christian (reference=muslim)		0.0313	0.0127	0.0119
		(0.0241)	(0.0101)	(0.0106)
Marital status of the household head (reference=monogamous)				
Single		-0.0089	0.0028	-0.0099
		(0.0298)	(0.0269)	(0.0255)
Polygamous		-0.0063	-0.0050	0.0001
		(0.0096)	(0.0087)	(0.0082)
Divorced		0.0390	0.0223	0.0277
		(0.0403)	(0.0414)	(0.0303)
Widower		-0.0211	-0.0219	-0.0219
		(0.0270)	(0.0243)	(0.0261)
Level of education of the household head (reference=no education)				
Primary		0.0309	0.0226	0.0224
		(0.0189)	(0.0169)	(0.0145)
Secondary or higher		0.0480**	0.0320	0.0483**
		(0.0214)	(0.0191)	(0.0180)
Koranic		-0.0445	-0.0232	0.0112
		(0.0310)	(0.0333)	(0.0319)
Girl		0.0238***	0.0252***	0.0260***
		(0.0075)	(0.0072)	(0.0066)
Live with biological parent		0.0024	0.0146	0.0260***
		(0.0088)	(0.0087)	(0.0073)
Log total population			-0.0367**	-0.0049
			(0.0139)	(0.0066)
Average age of peers			-0.0528***	-0.0599***
			(0.0128)	(0.0170)
Log number of school age children			0.0907***	0.0223
			(0.0199)	(0.0198)
Proportion of Christians			0.0008	0.0021***
			(0.0006)	(0.0006)
Presence of schools in the village			-0.0012	-0.0195
			(0.0268)	(0.0489)
Constant	0.794***	0.752***	1.136***	1.253***
	(0.0183)	(0.0296)	(0.159)	(0.181)
Age dummies included	No	Yes	Yes	Yes
Village fixed effects	No	No	No	Yes
No. of Observations	50463	50463	50463	50463
R-Squared	0.00169	0.0428	0.0632	0.108
F-Test coef farmers= coef griots & artisans	0.00	1.79	2.54	0.04

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM pooled regression
Standard errors in parentheses are clustered at the village level. * p<0.1, ** p<0.05, *** p<0.01

Table A12: Dependent variable: Probability of school attendance - Random effects

	(1)	(2)	(3)	(4)
Lagged attendance rate in g	0.458***	0.390***	0.423***	0.294***
	(0.0487)	(0.0388)	(0.0559)	(0.0540)
Size of household	-0.0022	-0.0017	-0.0015	-0.0012
	(0.0015)	(0.0014)	(0.0014)	(0.0014)
Number of women aged 15 and more	0.0041	0.0056	0.0053	0.0040
	(0.0034)	(0.0035)	(0.0035)	(0.0036)
Number of children less than 5	-0.0017	-0.0016	-0.0014	-0.0003
	(0.0035)	(0.0034)	(0.0033)	(0.0031)
Household head woman	0.0057	0.0068	0.0039	0.0043
	(0.0220)	(0.0207)	(0.0202)	(0.0205)
Non time-varying Variables				
Goods and equipment index	0.0013***	0.0013***	0.0011***	0.0005***
	(0.0003)	(0.0003)	(0.0003)	(0.0002)
Agropastoral wealth index	-0.0005	-0.0006**	-0.0006**	-0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Religion (reference=muslim)	0.0157	0.0052	0.0061	0.0083
	(0.0177)	(0.0126)	(0.0127)	(0.0132)
Single	-0.0105	-0.0030	-0.0115	-0.0120
	(0.0277)	(0.0269)	(0.0256)	(0.0260)
Polygamous	0.0008	-0.0020	-0.0057	-0.0001
	(0.0091)	(0.0090)	(0.0095)	(0.0089)
Divorced	0.0376	0.0318	0.0326	0.0269
	(0.0379)	(0.0376)	(0.0385)	(0.0330)
Widower	-0.0560**	-0.0487*	-0.0417*	-0.0432*
	(0.0259)	(0.0269)	(0.0253)	(0.0243)
Level of education of the household head reference=no education				
Primary	0.0254**	0.0278**	0.0308**	0.0220*
	(0.0129)	(0.0129)	(0.0124)	(0.0116)
Secondary or higher	0.0399**	0.0379*	0.0340*	0.0389*
	(0.0190)	(0.0194)	(0.0202)	(0.0202)
Koranic	-0.0312	-0.0217	-0.0236	0.00756
	(0.0349)	(0.0342)	(0.0332)	(0.0334)
Girl	0.0214***	0.0266***	0.0281***	0.0294***
	(0.0082)	(0.0075)	(0.0075)	(0.0074)
Live with biological parent	0.0021	0.0110	0.0175**	0.0247***
	(0.0091)	(0.0090)	(0.0084)	(0.0085)
Social group characteristics				
Log total population		-0.0098	-0.0237***	-0.0003
		(0.0075)	(0.0076)	(0.0067)
Average age of peers		-0.0605***	-0.0688***	-0.100***
		(0.0122)	(0.0213)	(0.0335)
Log number of school age children		0.0107	0.0250***	-0.0136
		(0.0099)	(0.0081)	(0.0139)
Proportion of Christians		0.0005	0.0014**	0.0026***
		(0.0005)	(0.0006)	(0.0006)
Presence of schools in the village		-0.0011	0.0044	-0.0155
		(0.0139)	(0.0120)	(0.0297)
Constant	0.283***	1.041***	1.095***	1.639***
	(0.0495)	(0.163)	(0.242)	(0.420)
Age dummies included	Yes	Yes	Yes	Yes
Year×Commune fixed effects	No	No	Yes	Yes
Village fixed effects	No	No	No	Yes
No. of Observations	40910	40910	40910	40910
R-Squared	0.0725	0.0803	0.1170	0.1206

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM panel data random effects estimates.
Non time-varying control variables are measured in year 2003.
Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

Heterogeneity- Full table

Table A13: Heterogeneity on the impact of social group schooling on the probability of school attendance

	(1) Boys	(2) Girls	(3) Between 6 and 12 years old	(4) Between 13 and 16 years old	(5) Sample limited to 2001-2004
Lagged Attendance rate in g	0.236***	0.300***	0.223***	0.0282	0.160**
	(0.0509)	(0.0655)	(0.0582)	(0.0427)	(0.0659)
Size of household	-0.0019	0.0023	0.0006	-0.0080**	0.0015
	(0.0030)	(0.0037)	(0.0026)	(0.0040)	(0.0032)
Number of women aged 15 and more	-0.0080	0.0014	-0.0029	0.0083	0.0015
	(0.0074)	(0.0054)	(0.0052)	(0.0069)	(0.0053)
Number of children less than 5	0.0077	-0.0044	0.0006	0.0088	0.0006
	(0.0050)	(0.0061)	(0.0047)	(0.0057)	(0.0039)
Household head woman	-0.0957	-0.0589	-0.143**	0.0380	0.0868
	(0.0700)	(0.0679)	(0.0682)	(0.112)	(0.115)
Social group characteristics					
Log total population	0.0356	-0.160	-0.0973	-0.0352	-0.152
	(0.131)	(0.155)	(0.167)	(0.143)	(0.190)
Average age of peers	-0.122***	-0.0992**	-0.105**	-0.0818**	0.0435*
	(0.0337)	(0.0442)	(0.0423)	(0.0387)	(0.0258)
Log number of school age children	-0.0715	-0.0466	-0.0941	-0.0596	0.137
	(0.108)	(0.138)	(0.144)	(0.114)	(0.0915)
Proportion of Christians	0.0158**	0.0055	0.0133	0.0114*	0.0116
	(0.0069)	(0.0075)	(0.0086)	(0.0062)	(0.0073)
Presence of schools in the village	0.0190	-0.0509	-0.0246	-0.0746**	0.0251
	(0.0373)	(0.0320)	(0.0474)	(0.0328)	(0.0662)
Constant	1.607	2.740**	2.493*	2.023	0.141
	(1.024)	(1.285)	(1.440)	(1.227)	(1.265)
Age dummies included	Yes	Yes	Yes	Yes	Yes
Time×Commune fixed effects	Yes	Yes	Yes	Yes	Yes
No. of Observations	20919	19991	26570	14340	16196
R-Squared	0.147	0.102	0.0841	0.136	0.0596
F-statistics	105.1***	49.47***	37.45***	44.11***	.

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM with individual fixed effects Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

Table A14: Impact of social group schooling on the probability of school attendance - Multilevel Regression

	(1)
Lagged Attendance rate in g	0.289***
	(0.0157)
Size of household	-0.0014
	(0.0009)
Number of women aged 15 and more	0.0053**
	(0.0023)
Number of children less than 5	-0.0006
	(0.0020)
Household head woman	0.0111
	(0.0167)
Social group characteristics	
Total population	-0.0000
	(0.0000)
Average age of peers	-0.113***
	(0.0065)
Number of school age children	-0.0001
	(0.0001)
Proportion of Christians	0.0021***
	(0.0005)
Presence of schools in the village	-0.0123
	(0.0093)
Constant	1.692***
	(0.0872)
Variance of group random effects	0.1028
	(0.0109)
Variance of individual random effects	0.2517
	(0.0027)
Variance of overall errors	0.3047
	(0.0012)
Age dummies included	Yes
Year×Commune fixed effects	Yes
No. of Observations	40907
Wald chi2(25)	4480.95***
LR test vs. linear regression: chi2(2)	8973.41***

Social group and children are both considered as random effects. The test at the bottom at the table strongly rejects the model with one-level ordinary linear regression in favor of a multi-level regression.
Standard errors in parentheses * p<0.1, ** p<0.05, *** p<0.01

Table A15: Restricting the analysis on farmers and royal caste

Panel 1			
	(1) Baseline	(2) Control for migration	(3) Difference with village average
Lagged Attendance rate in g	0.272***	0.273***	
	(0.0582)	(0.0588)	
Lagged (Attendance rate in g – Attendance rate in the village)			0.340**
			(0.167)
No. of Observations	38575	38575	38575
R-Squared	0.120	0.120	0.113
F-statistics	86.58***	95.24***	39.13***

Panel 2					
	(1) Boys	(2) Girls	(3) Between 6 and 12 years old	(4) Between 13 and 16 years old	(5) Sample limited to 2001-2004
Lagged attendance rate in g	0.248***	0.299***	0.224***	0.0301	0.178**
	(0.0530)	(0.0703)	(0.0616)	(0.0456)	(0.0666)
No. of Observations	19652	18923	25074	13501	15228
R-Squared	0.144	0.100	0.0830	0.133	0.0604
F-statistics	139.0***	60.97***	41.41***	52.52***	.

Notes: The dependent variable is a dummy indicating whether the child attends school or not. All columns show LPM with individual fixed effects with all control variables and Year×Commune fixed effects. The sample is restricted to the farmers and the royal caste. Standard errors in parentheses are clustered at the social group level. * p<0.1, ** p<0.05, *** p<0.01

Computation of standard of living index

We use Multiple Component Analysis (MCA hereafter) to compute standard of living indicators using the 2003 household survey in Niakhar. In a first MCA, we introduce a set of variables about housing characteristics and possession of goods. The spectrum of correlations show that variables about goods and equipment and those about agro-pastoral activities seem to be negatively correlated: households with good housing characteristics and good facilities have less livestock and farming equipment and vice versa. So we run afterward two MCA separating these two

aspects and eliminating variables with lesser contributions on the axes. These two MCA allow us to compute an indicator of good and equipment and an indicator of agro-pastoral wealth. The variables used in the construction of the indicator of goods and equipment are:

Variables used in the building of the goods and equipment index
Number of rooms owned by the household
Percentage of rooms whose floor is in: 1. Banco[13] 2. Cement
Percentage of rooms whose wall is in: 1. Banco 2. Cement
Percentage of rooms whose roof is in: 1. Straw 2. Metal sheet
Owning : 1. Gas cooker 2. TV
Owning at least one of the following good: phone, car, refrigerator, solar panel
Access to a latrine
Source of water supply

Variables used in the building of the agro-pastoral wealth index:
Owning: 1. Seeder 2. Cart 3. Horse 4. Shelling machine 5. Hoe
Owning: 1. Poultry 2. Small-stock 3. Large cattle
Practice of livestock fattening

Education For All: Are Orphans and Fostered Children Left Behind?

Abstract[14]

The high mortality in Africa and the dramatic consequences of the HIV/AIDS epidemic have left many children without parents. Also, child fostering is a widespread practice in Africa even for non-orphans. These two phenomena have caused many children to live without their biological parents which could hamper their human capital accumulation. Empirical evidence on the effect of orphanhood and child fostering focus either only on orphanhood or only on fostering and have given mixed results and little information about the underlying mechanisms. Using data from rural Tanzania, I analyze both the impact of parental death and the impact of fostering on education, child labor and domestic chores. Examining simultaneously both issues allow me to distinguish how orphans and other non-orphans who are fostered are affected and provide useful insights on the underlying mechanisms. To overcome endogeneity issues, I use a difference in difference strategy combined with a propensity score matching method. I find that father's death induces a significant decrease in the educational expenditure received by the orphan. But, when the orphan lives with his/her mother, this adverse effect disappears. I find no evidence of discrimination against fostered children. These results suggest that the income loss following a father's death is the prevailing mechanism on the negative impact of orphanhood.

Keywords: orphanhood, child fostering, children education, child labor

JEL: I25, J13, O15

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2.1 Introduction

164 governments and several development actors met in Dakar in 2000 and committed to promote quality basic education for all children, youth and adults by 2015. In 2015, only one-third of countries have achieved the measurable objectives of the Education for All initiative, and inequalities in education have even increased (Unesco, 2015). It is therefore crucial to implement educational policies that will target the most vulnerable and marginalized children.

The purpose of this paper is to focus on the education of specific cases of children in vulnerable situations: orphans and fostered children in rural Tanzania.

The high mortality levels in Africa make relevant to study the human capital accumulation of orphans. The life expectancy at birth in Africa stands at 60 years, well below the World average of 71 years. Life expectancy at birth exceeds 80 years in many developed countries. Yet, Africa has made substantial progress in reducing child mortality but the decline in adult mortality over the decade is very modest (United Nations, 2017). This high mortality is explained also by the disastrous consequences of the HIV/AIDS epidemics particularly in Eastern and Southern Africa. According to UNAIDS (2016), adult HIV prevalence reaches 4.7% in 2015 in Tanzania and 36000 people died from AIDS-related causes, one of the highest number in the World. This situation raises important questions on how the resulted high number of orphans will be supported by the society and whether they will be able to benefit from the same human capital investments as non-orphans.

On the other hand, child fostering is a current practice in Africa even for non-orphans. Child fostering is commonly understood as the fact that biological parents decide to let their children be raised by other people, usually in the extended family. Therefore, biological parents transfer parental rights to the host household. Evidence from West Africa shows that child fostering is widespread and responds to a mechanism of strengthening social connections and kinship ties (Akresh, 2009). In Southern Africa, fostering practices seem to originate from family division due to labor migration during the colonial era (Grant & Yeatman, 2012). Many other reasons can also explain the institution of child fostering: resolving demographic imbalances between households or need of child work (Akresh, 2009), enhancing human capital investments (Zimmerman, 2003), coping with negative income shock in the sending household (Akresh, 2009) etc.

Orphans and fostered children can be vulnerable in many dimensions because they do not live with their biological parents. They may suffer from stress or trauma following the experience of parents' death or fostering. Although, we may think that orphans are more affected by parents' death, fostered children can also be emotionally affected by the separation with their biological parents. The burden of those feelings can have negative psychological consequences and can be detrimental in the educational performance of the children. Orphans and fostered children may also benefit from less care in their host household according to the theory of the evolutionary psychologists (see Daly & Wilson, 2008). This theory suggests that investing in non-biological children is more costly, so there may be a discrimination from the guardian in favor of his/her own children. This is commonly referred as the Cinderella effect. On the other hand, solidarity, altruism and strong social ties may play an important role in helping orphans

(fostered children) recover from their parents' deaths (separation) and benefit from adequate human capital investments. Therefore, with the presence of these two antagonistic effects, the nature of the relationship between orphanhood/fostering and education is far from obvious. And yet, it is crucial for policies and for a better targeting of vulnerable children, to know how the separation with biological parents affects human capital investments. Several NGOs and UN agencies launch programs where orphans are targeted in order to improve their access to education. Child fostering is also viewed by many researchers and development practitioners as detrimental for the child and is sometimes associated with a disguised form of child labor (Deshusses, 2005; Pilon, 2003). Some countries have even established or have debated laws in order to reduce the practice of fostering (Akresh, 2009). These actions are assuming, maybe implicitly, that the extended family or the social network fails at providing orphans and fostered children the adequate care necessary for their present and future welfare. If on the contrary, the society as a whole performs well in supporting orphans and fostered children without any discrimination compared to children who live with their biological parents, policies that aim to target the formers may simply be ineffective. In this case, targeting in other aspects of vulnerability like poverty, remoteness etc. might be a better strategy.

Understanding this issue is clearly fundamental for the implementation of educational policies. Unfortunately, it is difficult to retain uniform conclusions from the existing empirical evidence. Rigorous empirical studies are scarce and study either only the impact of orphanhood or only that of child fostering. Importantly, results from these studies are mixed and sometimes difficult to conciliate.

Gertler *et al.* (2004) find that parent's death strongly reduces child enrollment in Indonesia and both paternal and maternal death are driving this effect. In contrast, Chen *et al.* (2009) in analyzing the impact of an unexpected death on college enrollment in Taiwan, find a large negative impact of maternal death but no effect of paternal death. Evans & Miguel (2007) show in Kenya a substantial decrease in school participation for orphans with a higher negative impact of maternal death. Senne (2014) study the impact of any adult death in the household on the school attendance of children living in the household in rural Madagascar. He finds a high negative impact of adult death on schooling with a greater impact for girls, younger children and children from poorer households.

Other studies show heterogeneous results regarding the child or the household characteristics. Case *et al.* (2004) using data from 10 sub-Saharan African countries, find different effects depending on the relatedness of the orphans to their household heads. Orphans living with non-related household heads have the worst levels of schooling. Similarly, De Vreyer & Nilsson (2017) find in Senegal a diminished school presence only if the child was under the direct responsibility of a deceased member. Yamano & Jayne (2005) in rural Kenya find that the death of a working-age adult in the household negatively affects school attendance of boys and children from poorer households but find no impact for girls and for children in households in the top half of the asset distribution.

Lloyd & Blanc (1996) find no evidence of adverse effects of becoming orphans in seven sub-Saharan African countries. Ainsworth *et al.* (2005) in Tanzania find also minor evidence of

adverse effects of orphanhood. They find that the number of hours spent at school is reduced prior to adult death but recover at the normal level after the death. They also do not find any impact of orphan status or adult death for older children.

Studies on the impact of child fostering appear to be notably scarce particularly among economists. This is surprising as regard to how the institution of child fostering is rooted in many African cultures. Huisman & Smits (2009) in an analysis including 30 developing countries find that children who do not live with their biological parents are less likely to be enrolled at school and perform more domestic chores. Fafchamps & Wahba (2006) show in Nepal that children closely related to the household head are more likely to attend school and less likely to do market or house work. Akresh (2004) in Burkina Faso and Beck *et al.* (2014) in Senegal show that fostered children are neither worse nor better relative to their host siblings in terms of school enrollment. Beck *et al.* (2014) present the same finding on child work. Zimmerman (2003) have shown similar results in a study on Black South African but only for children fostered to closer relatives. The impact of fostering can then be highly heterogeneous depending on the reason of fostering, the relation with the fostered child and the receiving family, whether the receiving household live in rural area or in a city etc. This fact is truly summarized by Beck *et al.* (2014) who mentions: "fostering situations are vastly heterogeneous and no single model can account for the variety of cases".

My study aims to add more clear evidence on the education and child work outcomes of orphans and fostered children. I contribute to the literature by analyzing simultaneously the impact of orphanhood and that of child fostering. Previous studies focus only on one of them: either orphanhood or child fostering. I argue that it is essential to analyze both of these aspects in order to have a more clear view and identify more precisely the channels of their impact on education and child work. First, orphans and fostered children share some features as mentioned above. They are both separated from their parents. Following the Hamilton rule, they can be victim of discrimination in their host family who may favor their biological children. In this sense, it is particularly useful to know whether orphans and fostered children face the same difficulties in their human capital accumulation. In this case, policies which target orphans should also target fostered children. If, as one might expect, we find that orphans face more difficulties, then this provides crucial information about the channels through which orphans are affected by their parent's death. Second, when analyzing the impact of orphanhood, it is useful to know whether the orphan live with the remaining parent or not. The well-being of the orphan may be substantially different regarding to the presence of the other parent. Previous studies fail to deepen this aspect probably because of data limitations. I have precise information on the residence with biological parents which allow me to address this issue. Third, many studies on child fostering capture broadly whether the child live or not with his/her biological parents and consider children who do not live with their biological parents as fostered children regardless whether they are orphans or not. In this study, I consider a child as fostered if he/she does not live with his/her biological parents while they are alive. This definition allows a clear distinction between a fostered child and an orphan.

Identification issues are a real concern in the estimation of the impact of orphanhood and

child fostering. Omitted factors like the previous behavior of the child or his/her ability may affect both the fostering decision and the educational outcomes. Similarly, many factors that affect parents death are also strong determinants of schooling outcomes and child labor: poverty, poor health and education outcomes of adult members, remoteness of the household etc. Also, a key issue is to control for the child and household characteristics before the parent's death occurs. Indeed, these characteristics are likely affected by the death of an adult member. Using pre-death characteristics is necessary to find a good counterfactual for orphans (also valid for fostered children).

I use three rounds of a panel survey collected in rural Tanzania between 2009 and 2012 and a difference in difference strategy which helps rule out a number of threats to identification mentioned above. I also pay a special attention to the selection bias using a propensity score matching. Results show that paternal orphans and double orphans receive less human capital investments after the parents' death. But paternal orphans who live with their mother do not bear a decrease in their educational spending. Moreover, boys and older children who are fostered are better off in terms of human capital investments compared to other children who live with their biological parents. These results raise important insights regarding the underlying mechanisms driving the impact of orphanhood an fostering on human capital accumulation.

The remaining of this paper is structured as follows: section 2.2 presents the data and descriptive statistics, section 2.3 describes the empirical strategy. Section 2.4 presents the results and section 3.6 concludes.

2.2 Data and Descriptive Statistics

2.2.1 The Survey

Data used in this paper comes from a survey conducted between 2009 and 2012 in rural areas of Tanzania by the World Bank and IFPRI.[15] Three districts are included in the survey: Bagamoyo (70 km from the capital Dar es Salaam), Chamwino (500 km from the capital), and Kibaha (35 km from the capital). The data are collected as part of an Impact Evaluation program of a Community-Based Conditional Cash-Transfer. Poorest households in 80 villages in the three districts were surveyed in three rounds: firstly in 2009 and then tracked in 2011 and in 2012. 1764 households are surveyed in the baseline survey in 2009. Due to attrition and households which split, the number of households has changed in round 2 and in round 3. Thereby, 1826 households were surveyed in round 2 and 1784 were surveyed in round 3. The attrition rate is estimated at 9% in round 2 and 13% in round 3. This survey contains various information on the households and individual characteristics and detailed information on orphanhood and whether children live or not with their biological parents.

[15]The data are available on the World Development Indicators website of the World Bank

Table 3.16: Number of individuals observed for each round

	Frequency	**Percentage**
round 1-2-3	632	36.2
round 1-2	539	30.9
round 1-3	76	4.4
round 2-3	498	28.5
Total	1745	100.0

Sample used in the paper

The education system in Tanzania is structured as follows: 2 years of pre-primary education for ages 5 and 6, 7 years of primary education for ages 7-13, 4 years of secondary ordinary level education for ages 14-17 and 2 years for secondary advanced level education for ages 18-19. Education is free, universal and compulsory for every child who reaches the age of 7 (United Republic of Tanzania, 2014). Therefore, I would restrict the study to children aged between 7 and 19 which corresponds to primary and secondary school age. Unfortunately children aged 19 cannot be included because data on orphanhood and residence with biological parents are only recorded for children aged 18 and less. Then, the sample used in this paper include children aged between 7 and 18. Also, the empirical strategy is based on a difference in difference setting. Basically, I restrict the study to children who were non-orphan (or non-fostered) at the baseline survey and analyze how education and child labor outcomes change with orphanhood (fostering). Therefore, children appearing only in one round are dropped in the sample. Two or three appearances are necessary to be considered in the analysis.

Finally, the study sample contains 1745 children aged between 7 and 18 years old for an overall of 4122 observations along the three rounds. 632 children (36.2%) are observed in all the three rounds while the remaining 1113 children (63.8%) are observed in two rounds.

2.2.2 Descriptive Statistics

Education and Child labor

The sample has slightly more boys (52.0%) than girls (48.0%). On average, during the three rounds, the attendance rate stands at 77.2%. Girls attend school more than boys with an attendance rate of 78.6% versus 76.0% for boys. The evolution of the attendance rate by age follows an inverted U-shaped curve. School attendance is very low at age 7 (62.9%) and increases gradually until the age of 12 when it reaches 90.5% before falling sharply until age 18 when the attendance rate is only 31.5%. Between 9 and 12 years old, 9 out of 10 children attend school. Only half of children aged 17 go to school, and this ratio falls to 3 out of 10 children who attend school at 18 years old.

I compute a simple measure of school progression to further characterize the education status

Figure 3.15: Evolution of the school attendance rate by age

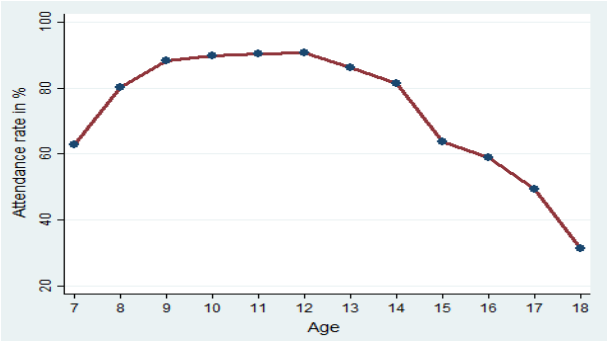


Table 3.17: School progression

School progress	No. of observations	Percentage
-10	1	0.0
-9	6	0.2
-8	9	0.2
-7	17	0.5
-6	39	1.1
-5	72	2.0
-4	274	7.4
-3	440	11.9
-2	741	20.1
-1	1080	29.2
0	824	22.3
1	173	4.7
2	18	0.5
Total	3694	100.0

of children. School progression is measured as the current grade of the child minus the grade corresponding to his/her age which is the grade the child should have if he/she experienced no dropout, no repetition and no delay in school initiation. For children who are not currently attending school, the highest grade is considered instead of the current grade. A value of zero of the school progression index indicates that the child has the right grade for his/her age, a negative value indicates school delay and a positive value indicates school advance. In table 3.17 we can see that only 22.3% observations in our sample have the right grade for their age. The big majority (72.5%) face school delay and only 5.2% have a higher grade compared to the grade corresponding to their age.

Education expenditure is also used as an outcome in the analysis. The education expenditure variable captures all the expenses related to the education of every child in the last 12 months. It includes school fees, books, materials, uniforms, transport, extra tuition and school contributions[16]. On average, households spent 29000 Tanzanian Shilling (TSH)[17] for each child in the last 12 months preceding the survey (see table 3.18). Households spent more on the education of boys than that of girls. On average, 31000 TSH are spent annually for the education

[16]This variable is defined only for children who attend school
[17]Tanzanian Shilling (TSH) is the currency in Tanzania

Table 3.18: Descriptive Statistics for outcome variables

Outcome	No of observations	Mean	Std. Dev.	Minimum	Maximum
Education					
Attendance status	4122	0.772	0.419	0	1
Progression index	3694	-1.521	1.586	-10	2
Education expenditure	3168	29004.560	48030.520	0	1200000
Child Labor					
Fetching water	4122	0.709	0.454	0	1
Cooking	4122	0.374	0.484	0	1
Taking care of children	4122	0.139	0.346	0	1
Child labor outside	4122	0.026	0.158	0	1

of every boy while this amount is 26900 TSH for girls. Also, the education of the children of secondary-school age (14-18 years old) is much more expensive, almost 3 times more than that of the children of primary-school age (7-13 years old). Education spending is equal to zero for just under 4% of children attending school.

Regarding child labor, I distinguish two types of child labor: domestic chores and child labor outside the household. 2.6% of children in the sample work outside the household. Boys are more likely to work outside the household with an incidence of 3.3% compared to 1.8% for girls (see appendix B37 and B38). Few children work outside the household while attending school. Among children attending school, only 1.4% work whereas 6.6% of children who do not attend school are working. As might be expected, the incidence of child labor increases with the age of the children. Below 9 years old, no child works outside his/her household. At 9, 1.0% of children are working outside their household and this rate increases with age and reach the maximum value of 8.9% at age 18 (figure 3.16).

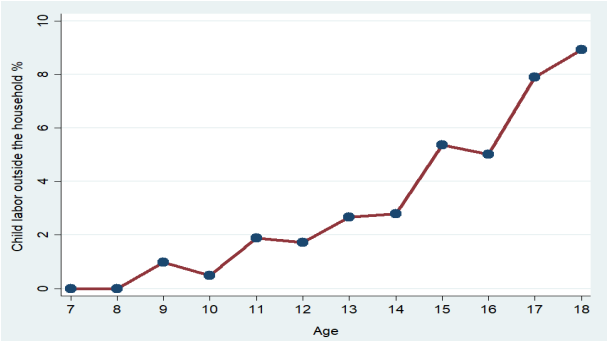
Three different domestic chores are studied in this paper: fetching water, cooking and taking care of children. A large majority of children have fetched water during the past seven days preceding the survey (70.9%). 37.4% have cooked and 13.9% of children have taken care of children in the past seven days before the survey. Girls perform more domestic chores than boys and older children perform more domestic chores than younger children (see appendix B37, B38, B39 and B40).

Orphanhood and Child fostering

Most of the children in our sample are not orphans. Almost 8 out of 10 children have both parents alive. 12.5% of children are fatherless orphans, while only 4.5% are motherless orphans. 3.3% lost both parents.

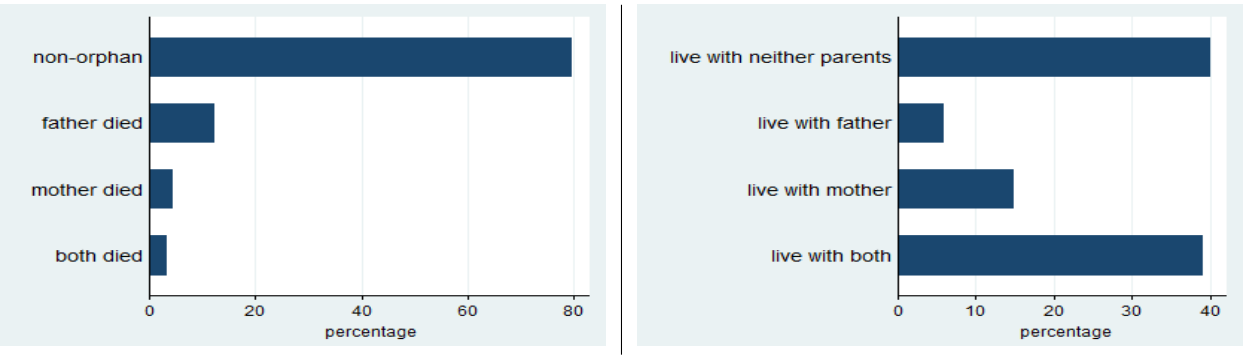
Child fostering is defined in this study as not living with any of biological parents while they

Figure 3.16: Evolution of the incidence of child labor by age



are alive. Therefore, child fostering is only defined for non-orphans. In this sample, only 39.9% of non-orphans live with both parents. 40% of children do not live with any of their parents, 6.0% live only with their father and 14.9% live only with their mother.
Among fatherless orphans, more than the half (exactly 53.3%) do not live with their mother. And among motherless orphans, 69.0% do not live with their father.

Figure 3.17: Percentage of orphanhood and residence with biological parents



My empirical strategy is based in a difference in difference estimation where the treatment variables will be "becoming orphan in a next round while being non-orphans in the baseline survey" [18] and "becoming fostered in a next round while living with one or both parents in the baseline survey". For orphanhood, three treatment variables will be used: fatherless orphans, motherless orphans and full orphans (lost both parents). Among the non-orphans at baseline, 4.1% become fatherless later (in round 2 or in round 3), 1.5% become motherless and only 0.6% become full orphans. Table 3.19 displays mean difference tests of outcome variables between treated (orphans) and controls (non-orphans). We note very few differences between orphans and non-orphans. Fatherless orphans have a lower progression index and are less likely to take care of children than non-orphans. There is no difference between motherless orphans and non-orphans and full orphans are less likely to attend school than non-orphans.

[18] By baseline survey here, I mean the first time the child is observed in the data. It may be in round 1 or in round 2. Recall that children observed only in one round are not included in the sample.

Table 3.19: Difference between orphans and non-orphans in education and labor

	Non-orphan	**Fatherless**		**Motherless**		**Lost both parents**	
Variable	Control	Treated	Treated - Control	Treated	Treated - Control	Treated	Treated - Control
Attendance status	0.775	0.815	0.04	0.818	0.043	0.438	-0.337***
Progression index	-1.519	-1.865	-0.346**	-1.325	0.194	-2.077	-0.558
Log education expenditure	9.458	9.407	-0.051	9.617	0.159	9.837	0.379
Fetching water	0.697	0.765	0.067	0.795	0.098	0.688	-0.009
Cooking	0.358	0.42	0.062	0.409	0.051	0.313	-0.045
Taking care of children	0.145	0.084	-0.061*	0.091	-0.054	0.063	-0.082
Child labor	0.024	0.042	0.018	0.000	-0.024	0.000	-0.024

* p<0.1, ** p<0.05, *** p<0.01

Table 3.20: Difference between fostered and non-fostered children in education and labor

Variable	**Treated**	**Control**	**Difference**
Attendance status	0.829	0.756	0.073*
Progression index	-1.181	-1.639	0.458***
education expenditure	8.45	9.76	-1.310***
fetching water	0.607	0.69	-0.083*
Cooking	0.316	0.344	-0.028
Taking care of children	0.077	0.182	-0.105***
Child labor	0.017	0.032	-0.015

* p<0.1, ** p<0.05, *** p<0.01

On the other side, among children who lived with at least with one of their biological parents at the baseline, 6.7% no longer live with any biological parent in round 2 or round 3. Contrary to what we have seen above concerning the difference between orphans and non-orphans, there are several differences between fostered and non fostered children. Fostered children appear to attend school more and have better school progression index than children who live with a biological parent but receive less educational expenditure. For all child labor variables, fostered children have higher averages. Mean differences are significant for fetching water and child care suggesting that fostered children tend to perform more household chores.

Balance sheets

Descriptive statistics for the other variables used in the paper are reported in appendix B41 and B42. The average age for children in the sample is 11.9 and the average age of household head is 64.7. 51.7% of children in the sample are boys and 66.8% of the households are held by male. A wealth index of the household is constructed using Multiple Correspondence Analysis (MCA) method. The following households characteristics are used to construct the wealth indicator: the material of the floor, the material of the roof, the material of the walls, the number of rooms in the house, the main source of drinking water, the distance of this water source, the type of toilet and the main source of energy. The first axis derived from the MCA explains 63.2% of

Table 3.21: Balance sheets for orphanhood

	Non-orphans	Fatherless		Motherless		Lost both parents	
Variables	**Control**	**Treated**	**Treated-Control**	**Treated**	**Treated-Control**	**Treated**	**Treated-Control**
Age	10.494	10.286	-0.208	10.864	0.370	11.563	1.069
Girls	0.487	0.521	0.034	0.591	0.104	0.375	-0.112
Age of the household head	63.438	63.874	0.436	61.636	-1.802	63.563	0.125
Household head female	0.264	0.454	0.190***	0.318	0.054	0.125	-0.139
Household head monogamous	0.604	0.496	-0.108**	0.659	0.055	0.875	0.271**
Wealth index	0.375	0.36	-0.015	0.391	0.016	0.356	-0.019
Land area	4.985	4.496	-0.489	4.727	-0.258	3.922	-1.063
Number of adults in the household	2.741	2.403	-0.338***	2.909	0.168	2.875	0.134
Number of children in the household	3.88	3.84	-0.04	3.796	-0.084	4.500	0.62
Proportion of primary educated or more	0.268	0.174	-0.094***	0.24	-0.028	0.213	-0.055
Proportion of sick and injured	0.332	0.393	0.061*	0.298	-0.034	0.384	0.052

* p<0.1, ** p<0.05, *** p<0.01

the variability of these characteristics. The indicator is then normalized between 0 and 1 with an average of 0.29 where 0 indicates the poorest households and 1 the richest households. The land area is the total area of land owned by the household members measured in acre. On average, a household holds 4.7 acre of land. The average household size is 7 members with 3.1 adults (aged 19 and higher) and 3.9 children (aged 18 and less). On average, 21.0% of adult members in a household have a primary school level or more and 32.4% of adults in the household became ill or were injured during the last 4 weeks preceding the survey. 64.3% of household heads are married and 16.1% of them are polygamous. 11.4% of household heads are separated or divorced and 23.7% are widow or widower.

Balance tests for the three orphanhood treatment variables (paternal orphans, maternal orphans, and full orphans) are shown in table 3.21. These balance tests compare the initial values of the variables described above between orphans and non-orphans before the treatment occurs. Several significant differences can be noted between paternal orphans and non-orphans. Children who become fatherless live in households mostly headed by women and are more likely to live in households where the head is not married monogamous which would suggest a certain vulnerability. They also live in households where there are fewer adults and where the proportion of adults with primary education is lower. They are also more likely to be in households where the proportion of sick adults is higher. No significant differences is noted between the characteristics of non-orphans and those of maternal orphans at the baseline. This result may suggest that mother's death is somehow exogenous regarding the observable characteristics. Finally, children who lost both parents are more likely to live in households where the household head is married monogamous.

Table 3.22 presents the balance tests for fostering. Children who will be fostered are on average younger. They live in households where the head is older, more likely a woman and less likely married monogamous. Fostered children come from richer households with more adult members and children.

Table 3.22: Balance sheets for fostering

Variable	Treated	Control	Difference
Age	9.624	10.742	-1.118***
Girls	0.504	1.47	-0.966
Age of the household head	63.205	59.129	4.076***
Household head female	1.342	1.165	0.177***
Household head monogamous	0.538	0.668	-0.130***
Wealth index	0.423	0.372	0.051***
Land area	5.1	5.224	-0.124
Number of adults in the household	3.513	2.931	0.582***
Number of children in the household	4.513	4.153	0.360*
Proportion of primary educated or more	0.292	0.339	-0.047
Proportion of sick and injured	0.293	0.296	-0.003

* p<0.1, ** p<0.05, *** p<0.01

2.3 Empirical Strategy

In this section, I detail the empirical strategy used to estimate the impact of orphanhood and child fostering in different outcomes related to education, domestic chores and child labor. Regarding orphanhood, I study distinctly the effects of the three types of orphans: paternal orphans, maternal orphans and double orphans.

Orphanhood and child fostering are not pure random events. Thus, it is necessary to think about how endogeneity, mainly omitted variable bias, can confound the impacts we would like to measure.

As regard to orphanhood, parental death could sometimes be considered as exogenous depending on the causes of the death. Causes of parental death cannot be identified in the data. But parental death can be related to some factors like poverty, health status, remoteness or poor economic conditions of the locality etc. Most of these causes are observable and can be controlled for, although we cannot be sure that it would remain some omitted variables which affect both orphanhood and children education.

Unlike orphanhood, it is difficult to imagine how the decision to foster a child to another family can be random. The literature usually mentions different motivations of fostering children: strengthening social ties, better access to schools or to economic resources for the fostered child, need of child labor for the receiving household, reducing demographic imbalances between households etc. The child chosen to be fostered may also have specific characteristics which affect schooling achievement. A selection bias in the fostering decision is then potentially an issue.

I rely on a difference in difference strategy combined with a propensity score matching to identify the effect of orphanhood and fostering on children education and labor.

2.3.1 Difference in Difference

Let C_{it} the treatment variable referring to orphanhood or fostering of child i at time t. It captures the existence of a Cinderella effect. At the baseline $t = 0$, $C_{it} = 0$ for all the children

meaning that all the children were non-orphans or lived with one of their biological parent. At $t = 1$, $C_{it} = 1$ for some children meaning that some children become orphans or fostered, they represent the treatment group.[19] Other children remain non-orphans and non-fostered $C_{it} = 0$ they represent the control group.

Say Y_{it} the outcome which is child education or child labor. $E(Y_{it}|C_{i1} = 1)$ is the expected outcome of the treatment group and $E(Y_{it}|C_{i1} = 0)$ the expected outcome of the control group. Let ${Y_{it}}^f$ a fictive value of Y_{it} so that $E({Y_{it}}^f|C_{i1} = 1)$ represents the outcome of children in the treatment group if they were not treated. The Cinderella effect β_1 can be captured as:

$$\beta_1 = E(Y_{i1}|C_{i1} = 1) - E({Y_{i1}}^f|C_{i1} = 1) \tag{2.5}$$

$E({Y_{it}}^f|C_{i1} = 1)$ is not observed and should then be estimated. Under the parallel trend assumption a good estimate of $E({Y_{it}}^f|C_{i1} = 1)$ can be found. The parallel trend assumption is simply translated as follows:

$$E(Y_{i1}^f|C_{i1} = 1) - E(Y_{i1}|C_{i1} = 0) = E(Y_{i0}|C_{i1} = 1) - E(Y_{i0}|C_{i1} = 0)$$

This assumption implies that the gap between the treatment and the control group would remain the same at $t = 0$ and $t = 1$ in the absence of the treatment. Under this assumption, the counterfactual term $E({Y_{it}}^f|C_{i1} = 1)$ can be estimated as follow:

$$E({Y_{it}}^f|C_{i1} = 1) \approx E(Y_{i0}|C_{i1} = 1) + [E(Y_{i1}|C_{i1} = 0) - E(Y_{i0}|C_{i1} = 0)]$$

Replacing this term in equation 2.5, the estimator $\hat{\beta}_1$ of β_1 can be written as:

$$\hat{\beta}_1 = E(Y_{i1}|C_{i1} = 1) - E(Y_{i0}|C_{i1} = 1) - [E(Y_{i1}|C_{i1} = 0) - E(Y_{i0}|C_{i1} = 0)] \tag{2.6}$$

$\hat{\beta}_1$ is the difference in difference estimator of C_{it} on Y_{it}. This difference in difference strategy controls for all non-time varying factors which may affect the outcome and the treatment. However, it is necessary to control for time varying factors that could threaten the hypothesis of parallel trend. Thus, the difference in difference estimator is derived from the following parametric linear model which allows to control for other children and household characteristics:

$$Y_{it} = \beta_0 + \beta_1 C_{it} + \beta_2 X_{it} + u_i + v_t + \epsilon_{it} \tag{2.7}$$

Index i refers to children aged between 7 and 18 years old. t refers to the round 1, round 2 or round 3 corresponding to years 2009, 2011 or 2012.

Y_{it} is the outcome variable. Three outcome variables are related to education: school attendance which is a dummy variable indicating whether child i attends school or not, an index of school progression and education expenditure for child i. As regard child labor outcomes, four dummy variables are used: fetching water, cooking and taking care of children which measure domestic chores; the fourth variable indicates whether the child works outside or not.

[19] $t = 1$ may correspond to round 2 or round 3

C_{it} is the variable of interest and captures the existence of a Cinderella effect. It refers to orphanhood or child fostering. Orphanhood is studied in the first part of the analysis. C_{it} is then a dummy variable taking one if the child becomes orphan during the study period and zero otherwise. A special attention is given to the heterogeneity of the orphanhood status: paternal orphan, maternal orphan or both orphan. In the second part of the analysis, child fostering is studied. C_{it} will then indicate whether the child is fostered. C_{it} is equal to one if the child does not live any more with one of his/her biological parent during the study period and zero otherwise.

X_{it} is a set of explanatory variables. X_{it} includes children characteristics (age and sex) and household characteristics: sex and marital status of the household head, a wealth index, the land area owned by the household, household size, education level and the health status of adult members in the household.

u_i and v_t are respectively children and year fixed effects.

ϵ_{it} is an idiosyncratic error term of child i at time t.

The coefficient β_1 is the Difference in Difference (DID) estimate of the impact of orphanhood or child fostering. The variable C_{it} measures how the changes in orphanhood and fostering affect education or child labor outcomes. All the equations are estimated with Ordinary Least Square in a panel data fixed effects model. For dummies outcome, we prefer using a Linear Probability Model (LPM) over a conditional logit model because the first offers a straightforward interpretation of the marginal effects.

Despite the presence of control variables in the model, the parallel trend assumption is still violated if $cov(C_{it}, \epsilon_{it}) \neq 0$. This is particularly the case if children who become orphans or fostered have different characteristics. A propensity score matching can help reduce this selection bias.

2.3.2 Propensity score matching

A special focus will be made on the selection process of becoming orphans or fostered children. Indeed, if the pool of children affected by the treatment is different from the pool of children not affected, we may expect that the trajectory of education and child labor between these two groups will also be different. This difference of trajectory (or non-parallel trend) causes a bias on the difference in difference estimator. In this case for example, children with a higher academic performance may be fostered to enable them to benefit from a better schooling environment. Those children, even if they were not fostered, would likely widen the gap with other children in terms of academic performance. A widely used solution in the literature is to combine the difference in difference with a matching method. The goal is to restrict the comparison between treatment and control to children with similar characteristics in the two groups. This strategy will help satisfy the parallel trend assumption.

Following Rosenbaum & Rubin (1983), matching on the probability to be treated, called propensity score, is equivalent to matching on covariates and is then enough to obtain consistent estimates of the treatment effect. Propensity score is estimated using factors which potentially affect both orphanhood (or fostering) and the different outcomes, but measured at the baseline

$t = 0$ to avoid ex-post matching. The vector used to estimate the propensity score include interaction and quadratic terms and is then richer than the vector of explanatory variables used in equation 2.7. The basic assumption of using propensity score is:

$$E({Y_{it}}^f | p(X_i), C_{i1} = 1) = E({Y_{it}}^f | p(X_i), C_{i1} = 0)$$

This means that the participation to the treatment at the baseline and the fictive outcome in the absence of the treatment are independent once the propensity score is controlled for. More explicitly, this assumption means that for two individuals with close propensity scores, the difference of outcome at $t = 1$ is only due to the treatment status. This assumption is not satisfied if some non-observable factors are strong determinants of the likelihood to be treated.

Several matching methods with the propensity are used in the literature. In this paper, I use the propensity score covariate adjustment method which consists of including the propensity score as additional control in equation 2.7.

2.4 Results

This section presents the results on the impact of orphanhood and child fostering on different outcomes related to education and child labor. These results are derived from a difference in difference estimation controlling for the probability of being treated as described in the empirical strategy section. Results on the estimation of the propensity scores are shown in the appendix table B43 and B44. The probit estimation of the likelihood to become orphan suggests that orphanhood is quasi-random. Indeed, very few variables significantly explain the probability to become orphan. Contrariwise, child fostering is well explained by some baseline factors. Younger children and children from household headed by a woman are more likely to be fostered. The fact that the household head is separated or is a widow(er) is negatively associated with the likelihood to be fostered. The household size is positively associated with fostering while the number of adults with a primary education level negatively affects the likelihood to be fostered.

2.4.1 Orphanhood

I analyze separately the three possible types of orphanhood: paternal orphanhood, maternal orphanhood and double orphanhood.

Father mortality

Results on the impact of paternal orphanhood on education are mixed (see table 3.23). Surprisingly, losing his/her father leads to a higher probability of attending school. However, educational expenditure decreases substantially following a father's loss. The latter result is easily understandable in the sense that men in Sub-Saharan Africa, particularly in a rural context, are the main providers in the household. Therefore, the father's decease could represent a high income loss and consequently reduces the educational expenditure of the children. The

positive effect on school attendance is more difficult to explain. Results presented below indicate that this effect is driven by paternal orphans who live with their mother.

Results on control variables show that older children are less likely to attend school and have a lower progression index. But education spending is higher for older children reflecting the higher costs of education in the upper levels. Girls have a better progression index than boys and children in households headed by a woman have lower educational expenditure. The marital status of the household head is significantly related to educational outcomes. The fact that the household head is respectively single and widow/widower is positively related to school progression and educational expenditure. Children living with a divorced household head have significantly a lower progression index. The wealth index, the land area owned by the household and the household size are not significantly related to any educational outcomes.

The results on child labor (table 3.24) show that losing his/her father has no impact on the likelihood to work outside the household or to do domestic chores (fetching water, cooking or taking care of children) suggesting that orphans are not discriminated against non-orphans regarding child labor. This result is rather in line with the hypothesis of the existence of a solidarity system in the society which allows protecting and caring for orphans without any cost or compensation for the orphan.

Regarding the control variables, age significantly affects the likelihood to work outside, to fetch water and to cook. Girls have a higher probability to fetch water and to cook than boys. The land area owned by the household members is positively related to the likelihood of cooking and taking care of children. The number of children in the household is negatively related to the likelihood of fetching water and positively related to the likelihood of taking care of children. The proportion of primary educated adults in the household positively impacts the probability to take care of children and the proportion of sick adult members increases the likelihood of fetching water.

Heterogeneity on whether the paternal orphans live with her mother yields interesting results. As noted above, paternal orphans who live with their mother have greater chance to attend school compared to non-orphans. This effect is possibly related to the care of the mother who may also encourage her child to go to school. However, the progression index is lower for paternal orphans who live with their mother.

Mother mortality

I find no evidence that maternal orphans have lower educational outcomes than non-orphans. Also, the probability to work outside the household and to do house work is not significantly different between maternal orphans and non-orphans. This result is not new in the literature. Alam (2015) have found in Tanzania that father's illness has negative effects in children's education while mother's illness has no impact. This result may also be driven by the small share of maternal orphans in the sample. As shown in the descriptive statistics section, only 4.5% of children have lost their mother. Furthermore, my identification strategy exploits the switch in the orphanhood status. Only 1.5% of non-orphans at baseline become maternal orphans at round 2 or round 3. This small incidence of maternal orphanhood may yield imprecise estimates

Table 3.23: Impact of paternal orphanhood on education outcomes

	(1) Attendance	(2) Progression	(3) Education expenditure
Paternal orphan	0.286***	-0.335	-1.299**
	(0.0899)	(0.268)	(0.559)
Age	-0.0315***	-0.353***	0.104***
	(0.0075)	(0.0242)	(0.0325)
Girl	0.0017	0.209*	0.0403
	(0.0406)	(0.123)	(0.225)
Age of the household head	-0.0018	-0.0081	-0.0090
	(0.0014)	(0.0049)	(0.0147)
Household head female	-0.0879	-0.0977	-1.396**
	(0.0719)	(0.176)	(0.566)
Marital status of head of HH: ref=monogamous			
Polygamous married	-0.0865	0.141	0.364
	(0.119)	(0.235)	(0.309)
Separated/Divorced	0.0343	-0.376**	0.403
	(0.0617)	(0.166)	(0.407)
Widow/Widower	-0.0094	-0.0836	1.240**
	(0.0630)	(0.200)	(0.575)
Never married	0.114	1.040*	1.034
	(0.116)	(0.562)	(0.718)
Wealth index	0.119	-0.106	0.296
	(0.150)	(0.437)	(1.381)
Land area	-0.0023	-0.0004	-0.0076
	(0.0030)	(0.0065)	(0.0125)
Number of adults in the household	0.0096	-0.0262	-0.0523
	(0.0120)	(0.0364)	(0.114)
Number of children in the household	-0.0053	-0.0614	0.0622
	(0.0126)	(0.0412)	(0.0708)
Proportion of primary educated or more	0.0191	-0.0858	0.396
	(0.0668)	(0.142)	(0.348)
Proportion of sick and injured	-0.0082	0.130	0.408
	(0.0425)	(0.0961)	(0.255)
Propensity score	-2.147**	2.205	15.99**
	(0.902)	(2.738)	(6.440)
round=2	0.0083	0.102	0.105
	(0.0335)	(0.104)	(0.294)
round=3	0.0109	0.196	0.332
	(0.0427)	(0.146)	(0.269)
Constant	1.331***	3.528***	9.870***
	(0.185)	(0.532)	(1.487)
No. of Observations	1875	1661	1442
R-Squared	0.0493	0.357	0.0521
F-statistics	2.615***	33.24***	2.520***

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.24: Impact of paternal orphanhood on child labor and domestic chores

	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Paternal orphan	0.0191	0.0391	-0.0410	-0.0408
	(0.0276)	(0.109)	(0.108)	(0.0809)
Age	0.0104**	0.0233***	0.0430***	0.0095
	(0.0046)	(0.0077)	(0.0066)	(0.0066)
Girl	0.0080	0.181***	0.445***	0.0594
	(0.0171)	(0.0589)	(0.0430)	(0.0468)
Age of the household head	-0.0018	-0.0000	0.0014	-0.0014
	(0.0012)	(0.0036)	(0.0030)	(0.0026)
Household head female	-0.0422	0.0993	-0.0706	0.0132
	(0.0476)	(0.0940)	(0.0859)	(0.0972)
Marital status of head of HH: ref=monogamous				
Polygamous married	0.0071	-0.0812	-0.0005	0.0413
	(0.0129)	(0.129)	(0.0963)	(0.150)
Separated/Divorced	0.0431	-0.0382	0.0788	-0.0253
	(0.0562)	(0.0963)	(0.0642)	(0.0748)
Widow/Widower	0.0717*	-0.0558	0.0939	-0.0055
	(0.0373)	(0.0991)	(0.0573)	(0.0663)
Never married	0.0454	0.134	-0.0737	-0.141
	(0.0436)	(0.144)	(0.213)	(0.101)
Wealth index	0.104	-0.321	-0.144	0.0712
	(0.0797)	(0.196)	(0.232)	(0.143)
Land area	-0.0005	0.0033	0.0057**	0.0056**
	(0.0010)	(0.0044)	(0.0022)	(0.0027)
Number of adults in the household	0.0042	-0.0180	0.0007	-0.0073
	(0.0043)	(0.0188)	(0.0130)	(0.0105)
Number of children in the household	0.0067	-0.0510**	0.0003	0.0304**
	(0.0055)	(0.0201)	(0.0171)	(0.0133)
Proportion of primary educated or more	0.0025	0.0552	0.0669	0.146**
	(0.0266)	(0.0837)	(0.0642)	(0.0592)
Proportion of sick and injured	0.0157	0.0786*	-0.0082	-0.0395
	(0.0176)	(0.0411)	(0.0448)	(0.0390)
Propensity score	-0.0453	0.183	0.547	-0.249
	(0.341)	(0.860)	(0.964)	(0.717)
round=2	-0.0168	0.0816*	0.165***	-0.0483
	(0.0210)	(0.0474)	(0.0461)	(0.0345)
round=3	-0.0331*	0.0122	0.0409	-0.0796*
	(0.0195)	(0.0597)	(0.0477)	(0.0453)
Constant	-0.0027	0.489*	-0.441*	-0.0350
	(0.106)	(0.246)	(0.225)	(0.230)
No. of Observations	1875	1875	1875	1875
R-Squared	0.0315	0.0754	0.188	0.0654
F-statistics	1.106	9.252***	17.57***	3.443***

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.25: Impact of paternal orphanhood on education outcomes by the residence with the mother

	Reside with his/her mother		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Paternal orphan	0.434*	-0.974*	-1.098
	(0.254)	(0.542)	(0.793)
No. of Observations	989	865	718
R-Squared	0.0819	0.422	0.106
	Not reside with his/her mother		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Paternal orphan	0.0922	-0.226	-2.118**
	(0.102)	(0.336)	(1.035)
No. of Observations	886	796	724
R-Squared	0.0652	0.329	0.0630

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.26: Impact of paternal orphanhood on child labor and domestic chores by the residence with the mother

	Reside with his/her mother			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Paternal orphan	-0.0247	0.0738	-0.441***	-0.203
	(0.0476)	(0.182)	(0.144)	(0.196)
No. of Observations	989	989	989	989
R-Squared	0.0365	0.0994	0.205	0.0613
	Reside with his/her mother			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Paternal orphan	-0.0460	0.117	0.120	-0.0325
	(0.0433)	(0.173)	(0.166)	(0.133)
No. of Observations	886	886	886	886
R-Squared	0.0561	0.0821	0.209	0.0874

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

and explain the non-significance of this effect.

However, as shown in table 3.30, maternal orphans who do not live with their father have a higher probability to spend time taking care of children. This result is significant at the 1% significance level and suggests that a maternal orphan who do not live with his/her father may be more exposed to doing household chores.

Full orphan

Double orphans naturally may face a greater trauma because they lose both parents between the baseline survey and the third round. Although very few children in the sample are in this situation (0.6%), it is possible to detect a significant negative and high effect at the 5% level on educational expenditure. Educational expenditure halve following the two parents' death. This result is totally consistent with the results presented above for paternal orphans and seems to be driven by the father's death. Indeed, fathers usually have a higher earning power. However, the residence with the mother plays an important role. We have seen that father's death no longer affects educational expenditure if the child reside with his/her mother but has a strongest negative impact if the paternal orphan do not live with his/her mother. Therefore, double orphans suffer from the double penalty of losing both parents. I find no significant impact regarding attendance and school progression but this may be due to the low sample of double orphans.

I find negative impact of double orphanhood for all the outcomes of child labor and domestic chores but only the fact of taking care of children is statistically significant. This may suggest that children perform less household and market work following their parents' death but this needs to be confirmed by studies with a larger sample of double orphans.

2.4.2 Fostering

I analyze in this section the impact of fostering on education and child labor outcomes. Fostered children are defined as children who do not live with any of these biological parents while both parents are alive.

Main Results

The main results on the impact of child fostering are presented in table 3.33 and table 3.34. The fostering dummy is non-significant for any outcome related to education or child labor. These results show that we do not have a Cinderella effect in our sample study. On average, in a household, fostered children and children who live with their biological parents do not have different probabilities to attend school or to be involved in child work or domestic chores. They are not different also in terms of educational expenditure and school progression. These results confirm the recent evidence on child fostering Beck *et al.* (2014) and are also in line with Zimmerman (2003) and Akresh (2004).

Table 3.27: Impact of maternal orphanhood on education outcomes

	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Maternal orphan	0.0397	0.221	0.509
	(0.121)	(0.243)	(1.051)
Age	-0.0255*	-0.378***	0.0742
	(0.0127)	(0.0385)	(0.0503)
Girl	-0.0815	0.187	0.449
	(0.0552)	(0.174)	(0.408)
Age of the household head	-0.0020	-0.0089	-0.0064
	(0.0022)	(0.0067)	(0.0197)
Household head female	-0.0173	0.426	-0.300
	(0.0736)	(0.285)	(0.871)
Marital status of head of HH: ref=monogamous			
Polygamous married	0.453*	0.469	-0.349
	(0.229)	(0.287)	(0.840)
Separated/Divorced	-0.0268	-0.261	-0.165
	(0.0847)	(0.267)	(0.862)
Widow/Widower	-0.0875	-0.237	1.277
	(0.0609)	(0.247)	(0.998)
Never married	0.0751	0.213	0.834
	(0.0697)	(0.258)	(0.764)
Wealth index	0.138	-0.313	-0.754
	(0.124)	(0.409)	(2.233)
Land area	-0.0000	0.0026	-0.0310
	(0.0038)	(0.0200)	(0.0277)
Number of adults in the household	-0.0067	-0.0306	-0.0402
	(0.0157)	(0.0564)	(0.264)
Number of children in the household	0.0127	-0.121*	0.346*
	(0.0206)	(0.0683)	(0.180)
Proportion of primary educated or more	0.119	-0.147	0.766
	(0.0839)	(0.179)	(0.468)
Proportion of sick and injured	-0.0231	0.252**	0.0307
	(0.0522)	(0.120)	(0.643)
Propensity score	0.554	3.260	-16.61
	(1.029)	(3.014)	(14.02)
round=2	-0.0269	0.0737	0.0356
	(0.0400)	(0.126)	(0.500)
round=3	0.0115	0.262*	0.345
	(0.0442)	(0.144)	(0.389)
Constant	1.220***	3.581***	7.784***
	(0.226)	(0.770)	(2.268)
No. of Observations	954	866	766
R-Squared	0.0738	0.456	0.0740
F-statistics	2.448**	60.08***	4.259***

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.28: Impact of maternal orphanhood on child labor and domestic chores

	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Maternal orphan	0.0026	-0.191	0.0017	0.194
	(0.0237)	(0.184)	(0.204)	(0.159)
Age	0.0051	0.0184*	0.0520***	0.0173
	(0.0057)	(0.0108)	(0.00990)	(0.0105)
Girl	0.0390	0.0515	0.367***	0.0847
	(0.0301)	(0.0689)	(0.0611)	(0.0534)
Age of the household head	0.0013	-0.0081***	-0.0080*	-0.0039
	(0.0021)	(0.0029)	(0.0039)	(0.0025)
Household head female	-0.0383	0.134	0.288***	0.0540
	(0.0343)	(0.0987)	(0.1000)	(0.116)
Marital status of head of HH: ref=monogamous				
Polygamous married	-0.0121	-0.0618	0.217*	0.125
	(0.0290)	(0.354)	(0.117)	(0.219)
Separated/Divorced	0.0326	-0.0334	-0.0668	0.0192
	(0.0687)	(0.118)	(0.0586)	(0.0411)
Widow/Widower	0.0416	-0.0494	-0.0540	-0.104*
	(0.0364)	(0.118)	(0.0962)	(0.0587)
Never married	0.0177	-0.117	0.115	0.178***
	(0.0576)	(0.244)	(0.643)	(0.0583)
Wealth Index	0.119	-0.462*	-0.194	-0.149
	(0.111)	(0.237)	(0.294)	(0.222)
Land area	0.0029	-0.0019	0.0069*	0.0107***
	(0.0023)	(0.0032)	(0.0037)	(0.0037)
Number of adults in the household	0.0051	0.0137	-0.0187	-0.0006
	(0.0072)	(0.0205)	(0.0161)	(0.0170)
Number of children in the household	0.0082	-0.0477**	-0.0080	0.0120
	(0.0106)	(0.0228)	(0.0229)	(0.0212)
Proportion of primary educated or more	0.00318	0.0766	0.167	0.184**
	(0.0312)	(0.117)	(0.123)	(0.0837)
Proportion of sick and injured	0.00329	0.0384	-0.107	-0.0616
	(0.0307)	(0.0699)	(0.0706)	(0.0567)
Propensity score	-0.386	5.377**	0.0737	-2.281
	(0.580)	(2.109)	(2.010)	(1.760)
round=2	-0.0220	0.0616	0.0992	-0.120**
	(0.0236)	(0.0465)	(0.0584)	(0.0563)
round=3	-0.0342	-0.0778	0.0676	-0.151***
	(0.0285)	(0.0714)	(0.0614)	(0.0541)
Constant	-0.178	1.066***	-0.221	0.105
	(0.135)	(0.264)	(0.261)	(0.208)
No. of Observations	954	954	954	954
R-Squared	0.0402	0.0963	0.210	0.108
F-statistics	1.837*	7.408***	16.97***	10.60***

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.29: Impact of maternal orphanhood on education outcomes by the residence with the father

	Reside with his/her father		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Maternal orphan	-0.369	0.502	1.144
	(0.333)	(0.372)	(0.749)
No. of Observations	436	386	330
R-Squared	0.189	0.567	0.146
	Not reside with his/her father		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Maternal orphan	-0.0891	-0.568	0.0825
	(0.147)	(0.343)	(1.126)
No. of Observations	518	480	436
R-Squared	0.0830	0.408	0.144

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.30: Impact of maternal orphanhood on child labor and domestic chores by the residence with the father

	Reside with his/her father			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Maternal orphan	-0.0143	-0.214	-0.299	-0.434
	(0.0516)	(0.250)	(0.536)	(0.257)
No. of Observations	436	436	436	436
R-Squared	0.0847	0.106	0.220	0.197
	Not reside with his/her father			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Maternal orphan	0.00178	0.00309	0.319	0.566***
	(0.0738)	(0.227)	(0.198)	(0.188)
No. of Observations	518	518	518	518
R-Squared	0.130	0.136	0.243	0.199

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.31: Impact of double orphanhood on education outcomes

	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Double orphan	-0.144	0.517	-1.089**
	(0.324)	(1.276)	(0.371)
Age	-0.0429**	-0.396***	0.114
	(0.0151)	(0.0655)	(0.0752)
Girl	-0.141	0.330	-0.375
	(0.103)	(0.328)	(0.257)
Age of the household head	-0.112	-0.500*	-0.0031
	(0.0763)	(0.251)	(0.333)
Household head female	-	-	-
	-	-	-
Marital status of head of HH: ref=monogamous			
Polygamous married	-0.256**	1.513***	-3.114***
	(0.0988)	(0.407)	(0.555)
Separated/Divorced	-0.574***	-0.651**	-
	(0.0868)	(0.228)	-
Widow/Widower	-0.792	-1.602	-
	(0.546)	(2.138)	-
Wealth index	0.828	0.343	2.197
	(0.553)	(1.538)	(2.293)
Land area	-0.0058	-0.0415	0.0578***
	(0.0073)	(0.0236)	(0.0189)
Number of adults in the household	-0.0421**	0.0479	-0.208
	(0.0191)	(0.0806)	(0.121)
Number of children in the household	-0.0313	-0.0479	-0.232*
	(0.0207)	(0.117)	(0.117)
Proportion of primary educated or more	0.156	-0.0149	0.412
	(0.177)	(0.331)	(0.562)
Proportion of sick and injured	0.105	0.354	0.823*
	(0.136)	(0.294)	(0.414)
Propensity score	-0.773	-2.262	4.096
	(1.970)	(6.780)	(3.270)
round=2	0.390*	1.089	0.223
	(0.198)	(0.635)	(1.013)
round=3	0.650**	1.615*	1.203
	(0.260)	(0.877)	(1.326)
Constant	8.351	34.62*	8.752
	(4.860)	(16.05)	(21.33)
No. of Observations	231	201	164
R-Squared	0.152	0.496	0.235

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.32: Impact of double orphanhood on child labor and domestic chores

	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Double orphanhood	-0.126	-0.0594	-0.147	-0.302*
	(0.108)	(0.276)	(0.263)	(0.147)
Age	0.0057	-0.0079	0.0162	0.0126
	(0.0070)	(0.0191)	(0.0166)	(0.0125)
Girl	0.0963*	0.0138	0.233**	-0.144
	(0.0541)	(0.116)	(0.105)	(0.0884)
Age of the household head	0.0201	-0.0743	-0.190**	0.0767
	(0.0155)	(0.159)	(0.0658)	(0.0589)
Marital status of head of HH: ref=monogamous				
Polygamous married	-0.0310	-1.004***	-0.0500	-0.123
	(0.0450)	(0.207)	(0.156)	(0.110)
Separated/Divorced	-0.493***	-0.117	0.244*	-0.535***
	(0.0090)	(0.0968)	(0.133)	(0.0303)
Widow/Widower	-0.485***	-0.780**	0.477	-0.150
	(0.0605)	(0.313)	(0.307)	(0.212)
Wealth index	0.0860	0.787	0.855	-0.0820
	(0.329)	(0.640)	(0.571)	(0.524)
Land area	0.0008	-0.0014	-0.0062	0.0202**
	(0.0027)	(0.0084)	(0.0089)	(0.0071)
Number of adults in the household	0.0234*	-0.0684*	-0.0729***	-0.0187
	(0.0116)	(0.0328)	(0.0242)	(0.0164)
Number of children in the household	0.0050	-0.0655	-0.0140	-0.0066
	(0.0103)	(0.0442)	(0.0290)	(0.0340)
Proportion of primary educated or more	0.0236	0.180	0.434	0.262
	(0.0167)	(0.298)	(0.256)	(0.197)
Proportion of sick and injured	0.0300	-0.0020	0.111	-0.0212
	(0.0419)	(0.120)	(0.101)	(0.124)
Propensity score	0.295	-1.152	1.802	0.557
	(0.507)	(1.454)	(1.333)	(1.568)
round=2	-0.0245	0.349	0.659***	-0.257
	(0.0508)	(0.409)	(0.143)	(0.157)
round=3	-0.0705	0.534	0.999***	-0.314
	(0.0706)	(0.549)	(0.252)	(0.208)
Constant	-1.418	5.723	11.76**	-4.749
	(1.086)	(10.07)	(4.207)	(3.788)
No. of Observations	231	231	231	231
R-Squared	0.175	0.118	0.193	0.241

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.33: Impact of child fostering on education outcomes

	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	-0.0395	0.208	-0.122
	(0.0938)	(0.236)	(0.791)
Age	-0.0434***	-0.384***	0.0678
	(0.0077)	(0.0281)	(0.0434)
Girl	-0.0925*	0.279*	0.166
	(0.0470)	(0.163)	(0.306)
Age of the household head	-0.0013	-0.0066	-0.0051
	(0.0026)	(0.0065)	(0.0284)
Household head female	-0.132*	-0.0456	0.294
	(0.0765)	(0.241)	(0.857)
Marital status of head of HH: ref=monogamous			
Polygamous married	-0.212*	0.368	-0.130
	(0.110)	(0.362)	(0.891)
Separated/Divorced	0.0506	-0.362	-1.953
	(0.0602)	(0.340)	(1.164)
Widow/Widower	-0.145*	-0.114	-0.693
	(0.0741)	(0.255)	(0.797)
Never married	0.409**	0.831	1.303
	(0.193)	(0.845)	(1.036)
Wealth index	0.282	0.346	2.271
	(0.170)	(0.552)	(1.468)
Land area	0.0021	0.0058	-0.0107
	(0.0030)	(0.0059)	(0.0126)
Number of adults in the household	-0.0124	-0.0144	-0.0712
	(0.0137)	(0.0438)	(0.110)
Number of children in the household	-0.0166	-0.0131	0.180*
	(0.0183)	(0.0454)	(0.104)
Proportion of primary educated or more	0.0282	-0.0271	0.470
	(0.0762)	(0.205)	(0.503)
Proportion of sick and injured	0.0169	0.0753	0.398
	(0.0496)	(0.187)	(0.337)
Propensity score	0.0706	-0.526	-6.436
	(0.393)	(1.385)	(4.241)
Round=2	0.0519	0.155	0.526*
	(0.0388)	(0.108)	(0.287)
Round=3	0.0905	0.293**	0.877**
	(0.0614)	(0.144)	(0.421)
Constant	1.563***	3.291***	7.306***
	(0.241)	(0.961)	(2.080)
No. of Observations	1091	980	827
R-Squared	0.0984	0.452	0.140
F-statistics	8.351***	19.32***	.

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.34: Impact of child fostering on child labor and domestic chores

	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	0.0416	-0.0090	-0.105	-0.0352
	(0.0376)	(0.144)	(0.116)	(0.104)
Age	0.0092**	0.0106	0.0374***	0.0032
	(0.0041)	(0.0119)	(0.0080)	(0.0079)
Girl	0.0437	0.163**	0.444***	0.0231
	(0.0263)	(0.0732)	(0.0534)	(0.0622)
Age of the household head	-0.0008	-0.0005	-0.0029	0.0017
	(0.0006)	(0.0041)	(0.0028)	(0.0050)
Household head female	-0.0786	0.110	-0.0273	-0.237*
	(0.0608)	(0.151)	(0.0865)	(0.129)
Marital status of head of HH: ref=monogamous				
Polygamous married	0.0080	-0.0911	0.0072	-0.0395
	(0.0204)	(0.126)	(0.134)	(0.133)
Separated/Divorced	0.140	-0.0999	0.0469	0.0899
	(0.0856)	(0.168)	(0.102)	(0.113)
Widow/Widower	0.0465	-0.140	0.208**	0.0864
	(0.0353)	(0.147)	(0.0963)	(0.0968)
Never married	0.137	0.375	0.133	-0.140
	(0.0871)	(0.344)	(0.116)	(0.196)
Wealth index	0.133	-0.502**	-0.275	-0.0738
	(0.0977)	(0.235)	(0.209)	(0.234)
Land area	-0.0008	0.0008	0.0034	0.0059***
	(0.0012)	(0.0034)	(0.0030)	(0.0022)
Number of adults in the household	0.0067	-0.0081	-0.0149	0.0017
	(0.0069)	(0.0246)	(0.0161)	(0.0191)
Number of children in the household	0.0045	-0.0605***	-0.0121	0.0086
	(0.0080)	(0.0195)	(0.0149)	(0.0186)
Proportion of primary educated or more	-0.0223	-0.0207	-0.0582	0.0865
	(0.0391)	(0.122)	(0.0868)	(0.0838)
Proportion of sick and injured	-0.0044	0.0762	-0.0726	-0.0037
	(0.0266)	(0.0592)	(0.0651)	(0.0575)
Propensity score	-0.199	-0.499	0.129	0.0188
	(0.323)	(0.660)	(0.462)	(0.476)
Round=2	-0.0056	0.0906	0.158***	-0.102*
	(0.0200)	(0.0691)	(0.0481)	(0.0563)
Round=3	-0.0290	-0.0155	0.0281	-0.146**
	(0.0264)	(0.0786)	(0.0501)	(0.0698)
Constant	-0.0380	0.785***	0.00522	0.304
	(0.0857)	(0.286)	(0.230)	(0.374)
No. of Observations	1091	1091	1091	1091
R-Squared	0.0466	0.0807	0.209	0.0750
F-statistics	1.075	6.184***	12.44***	3.614***

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Heterogeneity

Heterogeneity analysis show that fostering can improve educational outcomes for some subgroups. Typically, for boys and older children, educational expenditure increases after being fostered relatively to other children living with their biological parents. This effect is strong and significant at the 1% level (tables 3.35 and 3.36). This positive effect of fostering for boys and secondary school-aged children leads to put a question mark over the point of view of some NGOs and development practitioners that living away from the biological parents is detrimental for the children. Serra (2009) argues that in some specific conditions to Africa society, fostering can be beneficial for children. Many factors related to the fostering arrangements may explain that fostering children receive more educational expenditure than other children. In particular, if education is the main reason of fostering, one can expect the fostered child to be in proper conditions to succeed at school. Because secondary schools can be scarce particularly in rural areas, the positive effect for older children can express the fact that children need sometimes to live away from their biological parents to be closer to a secondary school. Results on child labor and domestic chores show that fostered girls are less likely to fetch water than other girls in the household (table B48). This finding supports the evidence of an absence of discrimination against fostered children.

Further heterogeneity effects are explored with the type of relationship with the household head. Zimmerman (2003) and Delaunay *et al.* (2013) have found differential effects of fostering depending on the family relationship with the caregiver. I classify as close relationship if the fostered child is a grandchild or a brother or sister of the household head. A distant relationship includes the other types of relationship with the household head (niece/nephew, cousin, non-relative etc.). Following this definition, 79% of fostered children are close relatives of the household head. Results presented in tables B46 and B47 show no differentiate effects regarding the relationship of the fostered child with the household head. This may be due to the fact we do not have precise data on the relationship of the fostered child with the caregiver who might be different from the household head.

Finally, I analyze specifically fostering cases which involve a change of household by the fostered child. Basically, the structure of the data makes difficult the identification of some fostered children who change households. Indeed, a change of household is usually associated with a change in the identification number. This makes impossible the follow-up for those children. I use information on the time the child spent in the household to identify fostered children whose initial identification number has changed. Fostering in another household is then defined as a child who: i) is not fostered at the baseline; ii) does not currently live with any of his biological parents while they are alive and; iii) have spent less than two years in the hosted household. Two years corresponds to the gap between the baseline survey and the 2nd round (respectively in 2009 and 2011). Results in table B50 show that fostering in another household reduces the likelihood to attend school but reduces also the likelihood to do domestic chores namely fetching water and cooking. These findings suggest that those fostered children who have changed households do not seem to be discriminated because they are less involved in house chores than other children who live with their biological parents. The negative impact

Table 3.35: Impact of child fostering on education outcomes by sex

	Boys		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	0.115	0.143	2.483***
	(0.139)	(0.385)	(0.790)
No. of Observations	600	531	452
R-Squared	0.126	0.480	0.266
	Girls		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	-0.225	0.565	0.379
	(0.160)	(0.385)	(1.510)
No. of Observations	491	449	375
R-Squared	0.155	0.420	0.241

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table 3.36: Impact of child fostering on education outcomes by age

	7-13 years old		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	0.106	-0.124	0.725
	(0.0729)	(0.218)	(0.837)
No. of Observations	736	639	624
R-Squared	0.125	0.336	0.253
F-statistics	.	12.24	4.727
	14-18 years old		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	-0.137	0.678	2.745***
	(0.287)	(0.637)	(0.912)
No. of Observations	355	341	203
R-Squared	0.281	0.425	0.426

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

on school attendance could be explained by the fact that the child leaves his/her old school. Enrolling in a new school close to the destination household may be more costly explaining the drop in the probability to attend school.

2.5 Conclusion

This paper attempts to shed light on how not living with biological parents can affect educational outcomes of children and their likelihood to do child work or household chores. I emphasize on the distinction between orphans and fostered children and whether or not single orphans live with the remaining parent. Results show differential effects for orphans and fostered children.

For a given child, losing his/her father substantially reduces the education spending he/she receives. However, when the child lives with his/her mother, this adverse effect of paternal orphanhood disappears. Paternal orphans have a higher probability to attend school, but this effect is completely driven by paternal orphans who reside with their mother. These results

allow to fill the gap in the previous literature by pointing out the importance of taking into account the residence with the remaining parent. I find no evidence of an adverse effect of maternal orphanhood. Althought, this result could be justified and is sometimes found in the literature, it should be taken with cautious in this paper regarding the small sample of maternal orphans in the data.

On average, fostered children are not different than children who live with their biological parents in terms of education and child labor outcomes. For boys and older children, not living with biological parents even has a positive impact on educational expenditure. Fostered girls are also less likely to fetch water than their non-fostered counterparts. Fostered children who change households are however less likely to attend school but they are also less likely to perform domestic chores. These results bring evidence on the absence of a Cinderella effect in our study area. While I cannot rule out the existence of some cases of discrimination, these results allow to conclude that on average, fostered children are not discriminated in terms of education, child labor and household chores. Also, I cannot rule out the existence of discrimination in other outcomes not studied in this paper.

The different impacts of orphanhood and child fostering bring a more clear understanding on the underlying mechanism behind the impact of parents' loss on human capital accumulation. Paternal orphans face a decrease in their human capital investments compared to other children in the same household while fostered children are even better off in certain cases compared to children who live with their biological parents. Some features specific to orphans certainly explain this differential effect. The trauma felt after parents' death does not seem to be the full story. I find no evidence of parents' death on school attendance or school progression which are normally mostly affected by trauma. The lack of impact of orphanhood on child labor and domestic chores also supports the idea of no favored treatment towards biological children and an absence of discrimination against orphans. A more likely mechanism would be the income loss associated to father's death. The decrease in educational expenditure following the death of the father or of both parents supports the hypothesis of a negative income shock as the main channel through which orphanhood impedes investment in education. It appears that the caregiver of the orphan does not adjust (enough) his/her education spending so that the orphan can receive the same education investment as the non-orphans in the household. This represents a weakness in the solidarity system to take care of the orphans.

Evidence shown in this paper also brings a better understanding on how the institution of child fostering in Africa works. My findings highlight some differences between orphans and fostered children. The fact that the biological parents are alive, even if they do not live with their children, makes a substantial difference. First, caregivers in the hosted household may be more willing to respect the moral contract to adequately invest in the human capital of the fostered child. This can be particularly true if education is among the reason of the fostering decision. Second, biological parents can maintain a more or less close relationship with their fostered children, allowing them to monitor their education. Third, biological parents can directly send money to the hosted household in order to participate in the education spending of their children.

The results on this paper are specific to a poor area in rural Tanzania. The paper also suffers from a limited sample of orphans (particularly of maternal orphans) that prevents having more precise estimates and further heterogeneity analysis. Future research employing larger sample in different regions in Africa are needed to bring more clear evidence in this mixed literature and help understand the mechanisms through which orphans and fostered children may be affected. While I will be cautious on policy recommendations, orphans appear to be disadvantaged in human capital investments. Thus, targeting orphans and giving them financial support will probably help to avoid the double penalty of being orphan and not accumulating the necessary skills to build a bright future.

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Appendix to Chapter 2

Table B37: Descriptive Statistics for outcome variables - Boys

Outcome	No of observations	Mean	Std. Dev.	Minimum	Maximum
Education					
Attendance status	2130	0.760	0.427	0	1
Progression index	1903	-1.698	1.679	-10	2
Education expenditure	1608	31009.470	55328.570	0	1200000
Child Labor					
Fetching water	2130	0.641	0.480	0	1
Cooking	2130	0.173	0.378	0	1
Taking care of children	2130	0.095	0.294	0	1
Child labor outside	2130	0.033	0.178	0	1

Table B38: Descriptive Statistics for outcome variables - Girls

Outcome	No of observations	Mean	Std. Dev.	Minimum	Maximum
Education					
Attendance status	1992	0.786	0.410	0	1
Progression index	1791	-1.333	1.458	-8	2
Education expenditure	1560	26937.970	39018.540	0	492500
Child Labor					
Fetching water	1992	0.781	0.414	0	1
Cooking	1992	0.589	0.492	0	1
Taking care of children	1992	0.185	0.389	0	1
Child labor outside	1992	0.018	0.133	0	1

Table B39: Descriptive Statistics for outcome variables - 7-13 years old

Outcome	No of observations	Mean	Std. Dev.	Minimum	Maximum
Education					
Attendance status	2767	0.850	0.357	0	1
Progression index	2414	-0.999	1.234	-6	2
Education expenditure	2342	19721.740	19637.870	0	492500
Child Labor					
Fetching water	2767	0.681	0.466	0	1
Cooking	2767	0.308	0.462	0	1
Taking care of children	2767	0.130	0.336	0	1
Child labor outside	2767	0.012	0.107	0	1

Table B40: Descriptive Statistics for outcome variables - 14-18 years old

Outcome	No of observations	Mean	Std. Dev.	Minimum	Maximum
Education					
Attendance status	1355	0.613	0.487	0	1
Progression index	1280	-2.505	1.705	-10	2
Education expenditure	826	55324.640	82603.340	0	1200000
Child Labor					
Fetching water	1355	0.765	0.424	0	1
Cooking	1355	0.509	0.500	0	1
Taking care of children	1355	0.157	0.364	0	1
Child labor outside	1355	0.055	0.227	0	1

Table B41: Descriptive Statistics: Continuous Variables

Variable	Observations	Mean	Std. Dev.	Min	Max
Age	4122	11.941	3.113	7	18
Age of the household head	4122	64.680	14.509	15	100
Wealth index	4122	.294	.166	0	1
Land area	4122	4.746	6.001	0	80
Number of adults in the household	4122	3.115	1.832	0	15
Number of children in the household	4122	3.874	2.056	1	13
Proportion of primary educated or more	4122	.210	.288	0	1
Proportion of sick and injured	4122	.324	.343	0	1

Table B42: Descriptive Statistics: Categorical Variables

Gender of the child

	Observations	Percentage
Male	213	51.67
Female	1992	48.33
Total	4122	100.00

Gender of the household head

	Observations	Percentage
Male	2754	66.81
Female	1368	33.19
Total	4122	100.00

Marital Status of the household head

	Observations	Percentage
Monogamous married	2222	53.91
Polygamous married	427	10.36
Separated/Divorced	468	11.35
Widow/Widower	976	23.68
Never married	29	0.70
Total	4122	100.00

Table B43: Determinants of orphanhood

	(1) Paternal orphanhood	(2) Maternal orphanhood	(3) Double orphanhood
Age	-0.0054	0.0129	0.0460
	(0.0140)	(0.0218)	(0.0425)
Age of the household head	-0.0010	-0.0492	0.0713
	(0.0276)	(0.0345)	(0.0888)
Age of the household head^2	0.0000	0.0003	-0.0003
	(0.0002)	(0.0003)	(0.0007)
Household head female	0.190	0.294	0.796
	(0.272)	(0.357)	(2.297)
Marital status of head of HH: ref=monogamous			
Polygamous	-0.515*	-	-
	(0.266)	-	-
Separated/Divorced	-0.159	-0.142	-1.999
	(0.289)	(0.356)	(2.349)
Widow/Widower	0.135	-0.408	-1.695
	(0.276)	(0.413)	(2.379)
Never married	0.856*	-	-
	(0.508)	-	-
Wealth index	0.413	1.240	1.104
	(0.470)	(0.778)	(1.545)
Land area	0.00107	-0.0005	-0.0290
	(0.0101)	(0.0149)	(0.0472)
Number of adults in the household	-0.195	-0.0787	1.310
	(0.166)	(0.230)	(1.221)
Number of adults in the household^2	0.0093	0.0145	-0.0889
	(0.0209)	(0.0257)	(0.188)
Number of children in the household	0.0694**	-0.0572	0.111
	(0.0316)	(0.0484)	(0.0943)
Proportion of primary educated or more	-0.518	-0.457	7.159***
	(0.505)	(0.643)	(2.661)
Proportion of sick and injured	-0.149	-0.141	3.013*
	(0.300)	(0.521)	(1.621)
Number of adults × Primary educated or more	0.0838	0.0863	-1.779**
	(0.177)	(0.246)	(0.731)
Number of adults × sick and injured	0.128	-0.135	-0.839
	(0.132)	(0.195)	(0.606)
Constant	-1.776*	-4.109	-13.84
	(0.993)	(194.0)	(187.5)
No. of Observations	2162	1014	523
Pseudo R-Squared	0.08	0.07	0.22

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table B44: Determinants of child fostering

	(1) Fostering
Girls	0.0501 (0.129)
Age	-0.0532*** (0.0164)
Age of the household head	0.0110 (0.0376)
Age of the household head^2	-0.0000 (0.0003)
Household head female	2.291*** (0.613)
Marital status of head of HH: ref=monogamous	
Polygamous	0.349 (0.256)
Separated/Divorced	-1.209** (0.599)
Widow/Widower	-1.808*** (0.627)
Wealth index	1.215 (2.156)
Wealth index^2	-0.415 (2.289)
Land area	0.0622 (0.0420)
Land area^2	-0.0029 (0.0022)
Number of adults in the household	0.526** (0.216)
Number of adults in the household^2	-0.0102 (0.0254)
Number of children in the household	0.0137 (0.0341)
Proportion of primary educated or more	0.487 (0.652)
Proportion of sick and injured	0.615 (0.569)
Number of adults × Primary educated or more	-0.374* (0.200)
Number of adults × sick and injured	-0.141 (0.182)
Constant	-3.719*** (1.363)
No. of Observations	1178
Pseudo R-Squared	20.59

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table B45: Impact of paternal orphanhood on education outcomes by sex

	Boys		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Paternal orphan	0.164	-0.788**	-0.584
	(0.114)	(0.346)	(1.090)
No. of Observations	996	878	746
R-Squared	0.0567	0.358	0.0501
F-statistics	3.812***	20.15***	2.150**
	Girls		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Paternal orphan	0.140	-0.169	-2.389***
	(0.127)	(0.396)	(0.766)
No. of Observations	879	783	696
R-Squared	0.0974	0.316	0.140
F-statistics	4.354***	16.80***	6.356***

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table B46: Impact of child fostering on education outcomes by the type of relation with the household head

	Close relationship with the household head		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	-0.119	-0.0371	-0.383
	(0.109)	(0.223)	(0.791)
No. of Observations	854	774	662
R-Squared	0.0976	0.474	0.132
	Distant relationship with the household head		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	0.177	0.103	-0.331
	(0.140)	(0.554)	(1.171)
No. of Observations	256	234	180
R-Squared	0.271	0.546	0.427

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table B47: Impact of child fostering on child labor and domestic chores by the type of relation with the household head

	Close relationship with the household head			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	-0.0067	0.0820	-0.0465	-0.0100
	(0.0452)	(0.125)	(0.109)	(0.109)
No. of Observations	854	854	854	854
R-Squared	0.0470	0.0761	0.223	0.0786
	Distant relationship with the household head			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	0.0002	-0.103	-0.227	-0.0630
	(0.102)	(0.256)	(0.220)	(0.118)
No. of Observations	256	256	256	256
R-Squared	0.180	0.157	0.325	0.175

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table B48: Impact of child fostering on child labor and domestic chores by sex

	Boys			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	0.0751	0.189	0.0412	-0.0275
	(0.0810)	(0.177)	(0.200)	(0.122)
No. of Observations	600	600	600	600
R-Squared	0.0714	0.136	0.196	0.138
F-statistics	1.433	5.136	5.580	8.513
	Not reside with his/her father			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	0.0461	-0.393*	-0.276	0.0937
	(0.0506)	(0.222)	(0.188)	(0.190)
No. of Observations	491	491	491	491
R-Squared	0.0883	0.127	0.256	0.0650

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table B49: Impact of child fostering on child labor and domestic chores by age

	7 - 13 years old			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	0.0379	-0.0378	0.105	-0.0360
	(0.0357)	(0.216)	(0.123)	(0.117)
No. of Observations	736	736	736	736
R-Squared	0.0673	0.110	0.217	0.149

	14 - 18 years old			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	-0.0339	-0.0794	-0.177	0.181
	(0.110)	(0.231)	(0.224)	(0.298)
No. of Observations	355	355	355	355
R-Squared	0.126	0.171	0.332	0.0629

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Table B50: Impact of fostering in another household

	Impact on education outcomes		
	(1)	(2)	(3)
	Attendance	Progression	Education expenditure
Fostering	-0.875***	0.0402	-1.682
	(0.131)	(0.411)	(0.998)
No. of Observations	609	547	439
R-Squared	0.188	0.532	0.122

	Impact on child labor and domestic chores			
	(1)	(2)	(3)	(4)
	Labor outside	Fetching water	Cooking	Taking care of children
Fostering	0.0021	-1.276***	-1.063***	-0.136
	(0.0773)	(0.281)	(0.269)	(0.0963)
No. of Observations	609	609	609	609
R-Squared	0.0431	0.114	0.261	0.0779

Standard errors in parentheses are clustered at the village level
* p<0.1, ** p<0.05, *** p<0.01

Decent work or migration?

This chapter is a joint work with Théophile Azomahou [20]

Abstract

In this paper, we try to answer a simple normative question: between migration and access to a local decent job, which is the more effective way to reduce poverty? In Senegal as in other places, people tend to overstate the economic returns of migration. Does a decent job represent a good substitute for migration? To the best of our knowledge, no studies have attempted to compare explicitly the effects of a good local job and migration on poverty. We use data from the 2011 Senegalese Survey of Monitoring Poverty (ESPS 2011) and rely on a propensity score weighting approach as well as an instrumental variable strategy to correct for endogeneity bias due to self-selection in migration and access to a decent job. Proxies of migration and labor market networks captured from ethnicity and geographical location are used as instruments. The results confirm the economic literature on the positive impact of migration on poverty, but show that access to decent work has a similar impact on poverty even if we just consider migration to developed countries. Indeed a decent work, even if it is not highly remunerated, may enable people to have a forward-looking behavior and to care more about their future. We test this assumption on the investment in children's education and find that a decent job allows to invest more in children's education whereas we find little support of an impact of migration on education.

Keywords: poverty, migration, decent work, education, instrumental variable, network
JEL Classification: D12, I20, I32, J81, O15

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3.1 Introduction

Developing countries face many challenges to reduce poverty and to take the path of economic development. Labor market issues are known as one of the main challenges faced by these countries. In Senegal in particular, access to jobs represent a crucial problem. The unemployment rate according to the International Labor Organization (ILO) definition is estimated about 10.3% (ANSD, 2013), well above the overall average in sub-Saharan Africa which stands for 7.6%. The economic system produces so few jobs for the rising young population entering the labor market. Furthermore, the unemployment rate is only partially informative of the functioning of the labor market. The precariousness of employment is a major concern, 32% of workers are underemployed (ANSD, 2013) and 87% are employed in the informal sector. The 2013 census data indicate that 60% of unemployed are aged between 15 and 34 (ANSD, 2016). This situation makes migration a valuable alternative for young people. Thereby, many young people opt to migrate and try to lead a better life beyond the borders of their country. Even when migration policies are more restrictive, people are moving towards illegal roads to reach Europe. Young Senegalese were particularly involved in the waves of illegal migration in the early and mid-2000s. Mbaye (2014) indicates that, in 2006, half of the 30,000 illegal migrants landed in the Canary Islands were Senegalese and argues that illegal migrants overstate the returns to migration. These aspects lead us to wonder about the real values of the returns to migration. In this paper we attempt to analyze which alternative between migration and access to a decent local job has greater impact on poverty reduction and human capital investments.

The positive impact of migration on poverty is a well-known fact as it was so widely demonstrated in the economic literature in different parts of the World: Acosta *et al.* (2008) in Latin America, Gupta *et al.* (2009) in sub-Saharan Africa, Imai *et al.* (2014) in Asia and the Pacific etc. In West Africa in particular, micro studies find substantial positive impacts of migration. Lachaud (1999) shows a 14.9% reduction effect of remittances on poverty in rural Burkina Faso. Gubert *et al.* (2010) in the case of Mali find that remittances reduce poverty by 11%. In Nigeria, Chiwuzulum Odozi *et al.* (2010) find that remittances decrease poverty by 20%.

With its large diaspora, Senegal holds a wide stock of remittances which constitute an important source of income. Indeed, the share of remittances over GDP is about 11% (WorldBank, 2015) placing Senegal at the fifth position in sub-Saharan Africa after Gambia, Leshoto, Liberia and Comoros.

On the other side, there is a strong link between labor market status and poverty. Having a good job is definitely one of the main drivers of poverty eradication. According to Salazar-Xirinachs Executive Director in the International Labor Office "having access to stable and protected employment is the most sustainable path to exiting poverty and promoting inclusion" (Cazes & Verick, 2013). Gutierrez *et al.* (2007) find that creating intensive jobs in the secondary sector and productive employment in agriculture lead to poverty reduction. Ernst & Berg (2009) argues that a raise in productive and remunerative employment increases poor's incomes which leads to a reduction of poverty.

Beyond the pecuniary aspect, a decent job contributes to reduce poverty through the stability of labor income, the security and the protection of employment. In fact, a secure job, even if

it is not very highly paid, allows people to manage smartly their income and to invest more in their family well-being. Banerjee & Duflo (2012) argues that when a member of the family gets a stable job, schools are more likely to accept his children, hospitals are more likely to provide high quality and more expensive cares for sick family members and the other relatives may be able to invest more adequately to develop their business.

To the best of our knowledge this is the first study which attempts to compare explicitly the impact of access to a decent job and migration on poverty. Some papers rely on the seminal work of Barham & Boucher (1998) to create a counterfactual scenario in which migrants would be employed in local jobs. Margolis *et al.* (2015) in a study conducted in two towns in Algeria show that even in the more optimistic scenario where all migrants would have a formal work, migration would still have a significant and positive impact on poverty. However, these studies cannot account for all the general equilibrium effects that will result in a massive integration of migrants in the local labor market. Our empirical strategy is different and analyzes more specifically the impact of access to decent employment on poverty. Basically, the idea is to consider migration and access to a decent job as two distinct programs implemented in a given population. Some households are exposed to one the two programs and a third group of households has not experienced any of the two programs, and so represents the control group. The purpose is then to assess the impact of these two programs in terms of poverty reduction and improvement of living standards. It is worth mentioning that in this analysis, the earnings abroad of the migrants are not considered. The focus will exclusively be on the well-being of the origin households. Obviously, endogeneity problems are very likely to arise. In fact people are self-selected in the access to decent employment and migration as well. Not considering this issue can bias the estimates of the effect of migration and decent work on poverty. Controlling this endogeneity problem is often a tricky econometric challenge. We rely first on a propensity score weighting method to deal with the self-selection bias due to migration and access to decent work. We also use an instrumental variable strategy. The instruments are proxy of the network of decent employment and the network of migration using geographical proximity and membership to ethnic group.

We use the Senegalese Survey of Monitoring Poverty (ESPS 2011) conducted in 2011 by the National Agency of Statistics and Demography (ANSD) and construct an index of decent employment using variables related to underemployment, social protection and stability of employment. We find significant and positive impacts on poverty reduction both for migration and access to decent employment and the magnitudes of the two effects are very close even when restricting migration to developed countries.

We also test the impact of these two alternatives on human capital investments and particularly on children education. The economic literature on the effect of migration in the education of children left behind is mitigated (see Dustmann & Glitz (2011) for a thorough discussion). Parental migration can reduce the incentives to pursue education for children left behind if they plan to migrate and if the return to education in the host country is low (McKenzie & Rapoport, 2011). The absence of parent and the credit constraints in the period of job search of the migrant can reduce children's school attendance in the short run (Antman, 2011). Yang (2008)

and Alcaraz *et al.* (2012) find that remittances rise child schooling and educational expenditure. Regarding the impact of employment on children's education, Ruhm (2004) find evidence that maternal employment has negative impact on schooling while Schildberg-Hoerisch (2011) find no significant impact of parental employment on children's education.

Our results show a high impact of decent employment on investment in children's education and little support of a positive impact of migration.

The remaining of the paper is organized as follows. Section 3.2 presents a theoretical framework, section 3.3 presents the data and some descriptive statistics. Section 3.4 describes the empirical strategy. Section 3.5 discusses the results and section 3.6 concludes.

3.2 Conceptual framework

A household has n adults and c children and so $n + c$ members. Suppose all adults are active in the labor market . A worker can be low-skilled or high-skilled.

The household's welfare is represented by the total consumption per capita C. Suppose first that the economy has only one sector, the labor market is not segmented and w is the unique wage in this sector. The household's welfare is:

$$C = \frac{nw}{n+c} \tag{3.8}$$

High skill workers can get a decent job that is a high quality employment qualified as stable, secured and protected. Let w_d be the earning of a decent job such that $w_d = aw > w$ so $a > 1$.

However it is difficult to get a decent employment, not all high skill workers can have access to this kind of job. There is a queue in the labor market for getting a decent job. It exists then an opportunity cost to access a decent job which is the renounced wage during the period of job search. This opportunity cost is equal to uw where u is the unemployment duration and w the wage the worker would have if he decided to work in the low quality sector.

If one high-skill worker in the household has a decent job, the household's welfare $C_{(d)}$ becomes:

$$C_{(d)} = \frac{(n-1)w + w_d - uw}{n+c} \tag{3.9}$$

Instead of trying to get a decent work, the household may choose to send one member into migration. Our goal is to compare these two situations. Suppose that the migrant can be a high-skill or a low-skill worker. Let w_m be the earning of the migrant abroad. Migration is a risky activity and the migrant cannot know the exact salary he will get abroad. Thus w_m has a deterministic component w_e and a random component ϵ such that the expectation of ϵ is null and its variance is equal to σ_ϵ^2.
The wage equation for a high-skilled migrant can be written as:

$$w_m = w_e + \epsilon \tag{3.10}$$

And the wage equation for a low-skill migrant:

$$w_m = \frac{w_e}{2} + \epsilon \tag{3.11}$$

The migrant send to the origin household a share of his earning. Let r be this share such that $0 < r < 1$, so the amount of remittances received by the household is: rw_m. In unit of local wage, let $rw_m = bw$.

Denote K the total cost of sending a migrant abroad including monetary and psychic costs, the household's consumption per capita for a household with a migrant is:

$$C_{(m)} = \frac{(n-1)w + Exp(rw_m) - K}{n-1+c} \tag{3.12}$$

Where Exp is the Expectation operator.

For a low-skill migrant, the household's consumption per capita is:

$$C_{(m)} = \frac{(n-1)w + \frac{rw_e}{2} - K}{n-1+c} \tag{3.13}$$

For a household with only low-skilled adults, not sending a migrant is the best strategy if:

$$\frac{nw}{n+c} > \frac{(n-1)w + \frac{rw_e}{2} - K}{n-1+c} \tag{3.14}$$

$$(7) \implies \frac{nw}{n+c} > \frac{(n-1)w + \frac{rw_e}{2} - K}{n+c} \implies nw > (n-1)w + \frac{bw}{2} - K \implies \frac{K}{w} + 1 > \frac{b}{2}$$

Proposition 1:
For a household with only low-skilled adults, not sending a migrant and staying employed in the low level sector is the best strategy if the migration costs in local wage units plus one is higher than the amount of remittances sent by a low-skilled migrant.

$$\frac{K}{w} + 1 > \frac{b}{2} \tag{3.15}$$

The consumption per capita for a household with a high-skilled migrant is:

$$C_{(m)} = \frac{(n-1)w + rw_e - K}{n-1+c} \tag{3.16}$$

The household will choose a decent job if:

$$C_{(d)} > C_{(m)} \implies \frac{(n-1)w + w_d - uw}{n+c} > \frac{(n-1)w + rw_e - K}{n-1+c} \tag{3.17}$$

$$(10) \implies \frac{(n-1)w + w_d - uw}{n+c} > \frac{(n-1)w + rw_e - K}{n+c} \implies (n-1)w + aw - uw > (n-1)w + bw - K$$

$$(10) \implies a - u + \frac{K}{w} > b$$

Proposition 2:
For households with high-skilled workers, getting a decent work is a best strategy to improve the household's welfare if the decent work premium $(a - u)$ plus the migrations costs $(\frac{K}{w})$ is higher than the amount of remittances (b).

$$a - u + \frac{K}{w} > b \tag{3.18}$$

u represents the difficulty to get access to a decent job. So if this difficulty is increasing, migration appears as a more valuable alternative.
Similarly, it is very intuitive to turn out that high migration costs and low expected values of remittances make migration a costly decision and a less worthy alternative.

We consider now the comparative impact of access to a decent work and migration on human capital investment or more specifically on children education.

Denote E as the household's investment in education. This type of investment is particular in the sense that, educational spending for a given child is very likely to last for many years and returns are produced in the very long run. In a developing context, such an investment is not affordable for many households.

So we assume that E depends not only on the household's welfare but also on the perception of the future welfare depicted by the fluctuation of the present welfare.

Thus E is a positive function of C and a negative function of $Var(C)$ (Variance of C). This negative relation between education spending and consumption volatility can be understood as a premium for stability.

$$E = function(C^{+}; Var(C)^{-}) \tag{3.19}$$

We analyze previously the conditions under which accessing a decent job is a more valuable alternative than migration, we are now interested in which alternative yields higher investments in education.
Suppose two households: a household with a decent worker and a household with a high-skill migrant which have equal level of consumption per capita. Education spending will then depends on the volatility of C.

The welfare for a decent worker household is deterministic so its variance is null:

$$Var(C_{(d)}) = Var(\frac{(n-1)w + w_d - uw}{n + c}) = 0$$

This variance for a high-skilled migrant household is:

$$Var(C_{(m)}) = [\frac{r}{n-1+c}]^2 Var(\epsilon) = [\frac{r\sigma}{n-1+c}]^2 > 0$$

Proposition 3:

$$Var(C_{(d)}) < Var(C_{(m)}) \tag{3.20}$$

The consumption of a migrant's household is more volatile than that of a decent worker's household. In this case due to the stability premium, the investment in education of the decent worker's household is expected to be higher.

However it is worth noting that some risk lovers households may migrate even if it is irrational to do so; i.e. even if $a - u + \frac{K}{w} > b$ (Proposition 2) because earning from migration has larger fluctuations. For these households, the stability premium no longer holds and they are more likely to invest more in education or in any other type of investment compared to other households. Thus the result on investment in children education between decent and migrant household may be ambiguous .

3.3 Data and Descriptive Statistics

3.3.1 Data and measurement of the main variables

We use data from the 2^{nd} Senegalese Survey of Monitoring Poverty (ESPS 2011) conducted in 2011 by the National Agency of Statistics and Demography (ANSD). The survey is representative of the whole country. Two different questionnaires are used with two sub-samples. A reduced questionnaire was submitted to households in the first sub-sample. Households in the second sub-sample, which represents about one third of the overall sample, were interviewed with an extended questionnaire. The extended questionnaire provides more detailed information on household consumption. We work in this paper with the second sub-sample of 5605 households distributed in all the 14 regions of Senegal.

The measurement of the three key variables: poverty, decent work and migration are described below.

Poverty

Our main indicator of poverty is the annual household consumption per adult equivalent. This indicator is considered as a good proxy of household's revenues. Specifically in developing countries, the household consumption could be a better indicator of poverty. As so well stated by Ravallion (1992), due to a large variability of revenues particularly in rural areas and many measurement errors like recall bias "current consumption will almost certainly be a better indicator than current income of current standard of living". The adult equivalent allows to take into account the size of the household, the age of its members and the economies of scale in

consumption. This indicator is directly taken from the computation of the National Agency of Statistics and Demography (ANSD).

As robustness analysis, we also use a dummy variable indicating whether the household is poor or not. The poverty line is also computed by ANSD and stands for 879 FCFA (1.34 euro) for urban Dakar, 713 FCFA (1.09 euro) for the other towns and 478 FCFA (0.73 euro) for rural area.

Decent Work

The concept of decent work is since the early 2000s in the heart of the International Labor Organization (ILO) activities. The ILO (1999) describes decent work as "opportunities for women and men to obtain decent and productive work in conditions of freedom, equity, security and human dignity". Anker *et al.* (2003) highlight ten aspects to characterize a decent work: "Employment opportunities", "Unacceptable works", "Adequate earnings and productive work", "Decent hours", "Stability and security of work", "Combining work and family life", "Fair treatment in employment", "Safe work environment", "Social protection", "Social dialogue and workplace relations".

According to data availability, we try to compute a simple indicator of decent work, easily understandable and which best approximates the ILO descriptions. We consider that a worker has a decent work if his/her work meets the following three criteria:

1. The worker should not be underemployed

2. The worker should be affiliated to a social security system

3. The worker should have a stable and secured employment

Underemployment is considered according to the ILO definition. A worker is classified as underemployed if he/she work less than 40 hours per week whereas he/she may wish to work more. This concept is very important to better understand the functioning of the labor market in developing countries characterized by low unemployment rates and a large share of precarious jobs.

The affiliation to a social security system reflects the social protection aspect which is an important feature of decent work. Social security system in our data refers typically to pension fund or health care mutual.

A worker is considered to have a stable and secured employment if he/she has a permanent contract. Permanent contract indeed reflects a sense of stability since it limits frequent job changes and unstable labor incomes. We are aware however that permanent contract is not the only mean to have a stable job.

Robustness tests are performed on the decent work indicator in order to check whether there is not a criterion which alone captures a significant variation of the impact on poverty.

Migration

We aim to consider only economic migration. To qualify a migrant as economic migrant, we take into account two aspects: the age of the migrant and the reason of migration.

1. The migrant should be aged between 20 and 60 and should migrate for other reasons than health or study

2. To not account for students, we just include migrants aged between 25 and 60 among those who have migrated to pursue their study.

3.3.2 Descriptive Statistics

The annual household consumption per adult equivalent is about 390,800 CFA i.e. 590 euros. With the national poverty thresholds, 30% of households in the study sample are considered as poor.

322 households (5.7%) have at least one member employed in a decent work, 5.2% have exactly one decent worker and very few have two decent workers or more (less than 0.6%).

319 households have at least one migrant, nearly the same proportion as households with decent workers (5.7%). Similarly, very few have two migrants or more (0.6%).

We first drop in the analysis the 32 households that have both decent workers and migrants. We study in a second stage the impact of having both a migrant and a decent worker.

As shown in figure 4.18, the average annual consumption per adult equivalent in households with a decent worker is 1.6 time higher compared to migrant households and two times higher compared to households without decent worker and without migrant, hereafter referred to as control households. The difference of means between migrant households and control households is estimated at 90,429 CFA and is statistically significant. The difference between households with decent worker and migrants' households is about 286,520 CFA. Those differences are statistically significant at the 1% level.

Regarding the educational expenditure of children aged 6 to 16, households with a decent worker spend four times more in children's education compared to control households and 2.5 times more compared to migrant households. The overall average of annual educational expenditure of children aged 6 to 16 is about 12,451 CFA. The differences in educational expenditure between the three groups are statistically significant at the 1% level.

Tables on descriptive statistics for other variables can be found on Appendix.

These large differences of consumption and educational expenditure between households with a decent worker and households with migrant do not definitely reflect the sole effect of access to a decent job. These households are different in some observable characteristics as shown in table 4.51 and maybe in terms of unobservable factors. Households with migrant live mostly in rural area compared to households with a decent worker. They have also larger household size, older household head and greater chances to be headed by a woman. Members of households with a decent worker are more literate and more educated than members of migrant households. These two households are not different in terms of internal transfers received.

Figure 4.18: Household's Annual Consumption

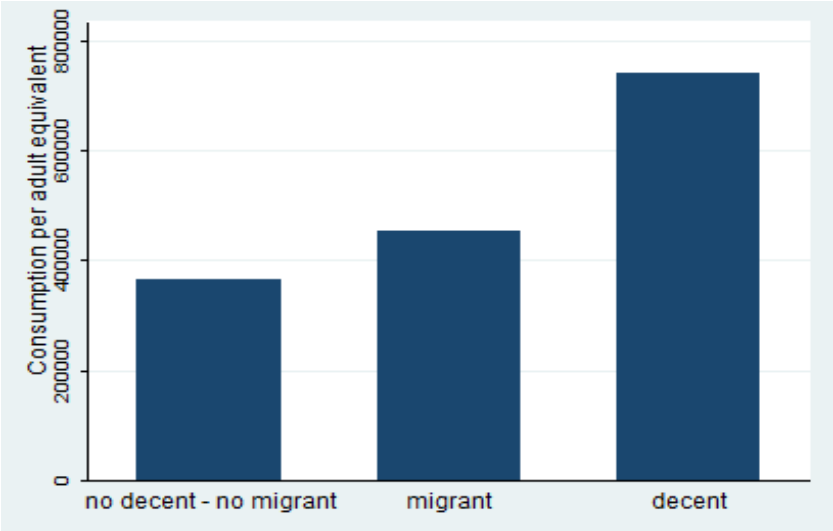

Figure 4.19: Educational Expenditure of children aged 6 to 16

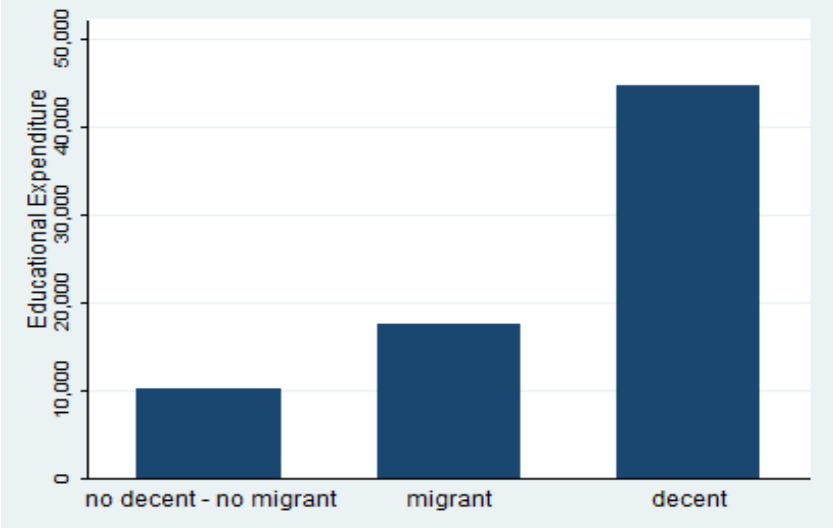

Table 4.51: Differences between households with decent worker and households with migrant

Variables	**Decent work**	**Migrant**	**Difference**
Urban	0.88	0.61	-0.28***
Household size	8.82	10.94	2.12***
Age of household head	50.54	54.57	4.03***
Household head female	19.88	39.19	19.31***
% of literate	0.81	0.51	-0.30***
% primary school degree or more	0.68	0.33	-0.36***
Internal Transfers received	317,080	256,728	60,352

To isolate the true effects of migration and access to a decent work, it is important to control for all these characteristics in the econometric framework and to find an appropriate identification strategy to deal with non-observable characteristics which may confound the impact of a decent work and migration on poverty.

3.4 Empirical Strategy

To capture the impact of access to decent employment and migration, we estimate the following equation:

$$Y_i = \alpha + \beta * D_i + \gamma * M_i + \lambda * X_i + \epsilon_i \tag{3.21}$$

Index i represent a household.

Y_i is an indicator of poverty. In most specifications it represents the logarithm of the annual consumption of the household per adult equivalent. In robustness analysis, we replace it by a binary variable taking 1 if the household is poor and 0 otherwise. In the second part of the empirical analysis, Y_i is the spending in education per child aged between 6 and 16.

D_i is a binary variable equal to 1 if the household has at least one person employed in a decent job and 0 otherwise. The previous subsection has described what is meant by a decent job. Considering a dummy variable is relevant since very few households (nearly 0.6%) have more than one person employed in a decent job.

M_i is a binary variable equal to 1 if the household has at least one migrant and 0 otherwise. Similarly, only 0.7% of households have more than one migrant which led us to use a binary variable.

X_i is a vector of control variables at the household level susceptible to explain the household income. X_i contains: the residence area (urban vs rural), the number of children (less than 15), the number of adults (more than 15), the age and the sex of the household head, received transfers from non-migrants, the proportion of literate adult household members, the proportion of adult household members with a primary school degree or more and finally dummies for ethnic groups and regions.

ϵ_i is an error term.

We estimate (1) using Ordinary Least Squares or Linear Probability Model if Y_i is the dummy poor or not.

The estimation of β and γ is likely to be biased and non-convergent since ϵ_i certainly contains non-observable susceptible to be correlated with both the interest variables D_i and M_i and the dependent variable Y_i. Thus we have $cov(\epsilon_i, D_i) \neq 0$ and $cov(\epsilon_i, M_i) \neq 0$.

It is possible in fact that households with persons employed in a decent job or with migrants are selected into some unobservable characteristics that may be motivation, ability, and personal relationships etc. creating and endogeneity bias in the estimation of β and γ. Endogeneity can also be due to the reverse causality between decent employment and poverty, and between migration and poverty. Indeed, poorer households are less likely to meet the necessary conditions to access decent jobs. And similarly, as migration requires high costs, poorer households have more difficulties to finance the migration of one of their household members.

3.4.1 Propensity score weighting

Basically we would like to evaluate the impact of two different programs in a non-experimental context: having a decent worker D_i and having a migrant M_i in the household i. Y_i is the observed outcome, the consumption per capita or the education expenditure per child. Given that there are two treatment variables which we wish to compare their effects, we rely on a propensity score weighting approach, a widely used strategy in a case of multi-valued treatments.

The first empirical strategy relies on the Marginal Mean Weighting through Stratification (MMWS). This method introduced by Hong (2010) combines and Inverse Probability Weighting Model (IPW) with a poststratification adjusted based on propensity score estimation.

Considering the general framework by Rosenbaum & Rubin (1983), denote Y_{id} the potential outcome if the household has one decent worker, Y_{im} the potential outcome if the household has one migrant, Y_{idm} the potential outcome if the household has both a decent worker and a migrant, and Y_{i0} the outcome if the household has no decent worker and no migrant. Let Y_{it} be the vector of these potential outcomes $Y_{it} = (Y_{i0}, Y_{id}, Y_{im}, Y_{idm})$ and T_{it} is a categorical variable that indicates the treatment category of household i, $t \in \{0, 1, 2, 3\}$. Thus, the average treatment effect of the treatment t is:

$$\Delta_{t0} = E(Y_{it} - Y_{i0}) \tag{3.22}$$

We are facing the classical missing-data problem in observational data because each household is observed only in one treatment. In addition for reasons mentioned above, the outcome variables (consumption and education spending) are likely to be correlated with the treatment status. Following Rosenbaum & Rubin (1983) and the extension for multi-valued treatments by Imbens (2000), we rely on two assumptions:

1. The common support or overlap assumption: $P(T_{it}|X) > 0$ for all values of X suggesting that each household in a treatment group can have a comparable match in the control group.

2. The conditional independence assumption: conditioning on the propensity score which is

the probability of receiving the treatment t, $P(T_{it}|X)$, the outcome and the treatment are orthogonal:

$$(Y_{it} \perp T_{it})|P(T_{it}|X)\forall t$$

Lacking data on pre-treatment characteristics, X stand for fixed variables that are variables not susceptible to be affected by the treatment T.

When these two assumptions are met then the average observed outcome of the control group can be a good proxy of the potential outcome of the treated households if they were not treated.

Identification can be achieved by weighting the observed outcome by the conditional probability of the given treatment:

$$E(\frac{Y_i T_{it}}{P(T_{it}|X)}) = E(Y_{it}) \tag{3.23}$$

Given this framework, we apply the Marginal Mean Weighting through Stratification (MMWS) method by following three steps.

1. We first estimate the propensity score for each treatment group. Given that the decisions to send a migrant or to get a decent job may be made simultaneously and thus correlated, we estimate jointly the probability of having a migrant and the probability of having a decent worker using a bivariate probit model. This model allows us to estimate a propensity score for each treatment status: decent work, migration and households with no decent worker and no migrant. It is crucial in this estimation to use covariates not susceptible to be affected by migration or employment in a decent work. Same regressors listed in equation 3.21 are used for the two equations except that for the migration equation, we do not include the age and gender of the household head as they are probably correlated to the migration status[21].

2. Each of the three estimated propensity scores are then stratified into equal sized quantile categories. We use quintiles as they are more often used in the literature and are shown to reduce about 90% of the initial selection bias (Hong, 2010). The Marginal Mean Weight (MMW) is computed as follows:

$$MMW = \frac{n_{s_t} Prop(T = t)}{n_{T=t,s_t}} \tag{3.24}$$

n_{s_t} is the number of households in the stratum s_t. $Prop(T = t)$ is the proportion of households actually receiving the treatment t and $n_{T=t,s_t}$ is the number of households in the stratum s_t actually receiving the treatment t.

The basic advantage of this stratification is that, even when propensity scores are misspecified, the distribution of households between strata remain consistent and then the computed weights are robust.

[21] When for example the true household head is the more likely to migrate

3. These weights are finally used to estimate the outcome equation with a linear weighted least square regression. Each treatment is then compared to others. The Bonferroni correction is applied to adjust confidence intervals in order to take into account the multiple comparisons feature.

3.4.2 Instrumental Variable Strategy

We also use an instrumental variable strategy as second alternative to deal with these endogeneity problems. Proxies of network in labor market and network in migration are used as instruments. Lacking information about the true social network, we use an approximation with geographical proximity and ethnic group.

The instrument for D_i is the proportion of other households (excluding household i) in the county and in the ethnic group which have at least a member employed in a decent job. Similarly, the instrument for M_i is the proportion of other households (excluding household i) in the county and in the ethnic group which have at least one migrant.

We name county the second administrative subdivision of Senegal ("département" in French) after the region. There are 45 counties in Senegal and the survey is representative at the county level. The number of households by county in our sample varies from 63 to 162. We can imagine that a given household is more likely to have a decent job if a high number of households in the same county have access to a decent job. The same reasoning applies for migration. So the instruments are very likely to be correlated with the interest variables D_i and M_i. Several studies in labor market emphasize the role of network in finding jobs (Montgomery, 1991; Calvo-Armengol & Jackson, 2004). Some use spatial interactions to capture the influence of these networks (Patacchini & Zenou, 2012; Bayer *et al.*, 2008). In migration also, many papers demonstrate the importance of network to overcome migration costs (Munshi, 2003; Bertoli, 2010; McKenzie & Rapoport, 2010).

To ensure the exogeneity of the instruments it is necessary to control for geographical factors and ethnic groups characteristics otherwise a high number of households with decent jobs or a high number of households with migrants can simply denote the fact that a given county or a given ethnic group is richer or has some unobservable characteristics correlated with poverty. In this case the instrument affects directly the household's income.

We add regions and ethnic group fixed effects to strengthen the identification assumption. Still some geographic factors can weaken the exclusion restriction since regions are larger than counties. In fact Senegal has 14 regions and 45 counties in 2011, thus an average of three counties by region. Controlling by counties fixed effects will be too restrictive since counties and ethnic groups fixed effects will absorb a large variability of the instruments. So in addition to regions and ethnic groups fixed effects, we control for the average consumption in the county which is a good proxy of the county's wealth. However in some specifications, both counties and ethnic group fixed effects are included.

3.5 Results

The comparative impact of access to a decent work and migration on poverty is presented in a first subsection, the second subsection analyzes the comparative impact on investment in education, and some robustness analysis are presented in the last subsection.

3.5.1 Impact on poverty

Propensity score weighting method

Following the different steps detailed in the methodology, we use a bivariate probit model to estimate the joint probability of having a decent job and having a migrant. Results are shown in the appendix table C65. Results show that the residence area affects only the probability to have a decent job. Residing in urban Dakar increases the probability to get a decent job but has no impact in the probability to migrate. The number of male adults in the household is positively related to access to a decent job but negatively related to migration. The number of female adults increases both probabilities. The internal received transfers is negatively associated with migration but not significant regarding access to a decent work. The proportion of adults with primary school degree or more in the household is positively associated with both the probability of having a decent worker in the household and the probability of having a migrant. As shown in the bottom of the table, the error terms of the two equations are not significantly correlated suggesting that the decision to migrate or to have a decent work can be made independently.

Results of this estimation are used to predict these three propensity scores: having a decent worker in the household, having a migrant or not having neither a decent worker nor a migrant. The two former categories represent the two groups of treated households and the last category is the control group.

Weights are computed for each household using the marginal mean weighting through stratification method described in the methodology. We run the outcome equation with a Weighted Least Square (WLS) to assess the impact of each treatment in the household consumption per adult equivalent. The sample is restricted to the region of common support. In all the specifications, having a decent worker in the household and having a migrant have positive effect significant at the 1% level on the household consumption per capita. The average treatment effect stands for 29.3% for employment in a decent work and 19.9% for migration. Table 4.52 compares ATEs between the three groups. While household consumption is significantly larger for decent workers' and migrants' households comparing to non-treated households, there is no significant difference of the household consumption between households with a migrant and households with a decent worker.

Table 4.52: Comparing Average Treatment Effects on household consumption - Bonferroni correction

	ATE	**Standard-error**
decent work vs control group	0.293***	0.045
migrant vs control group	0.199***	0.037
migrant vs decent work	-0.094	0.058

* p<0.1, ** p<0.05, *** p<0.01

Instrumental Variable Strategy

We assess first the validity of the two instruments used to identify a causal effect of having access to a decent job and migration on poverty. Table 4.54 report results of a linear probability model for the first stage regressions with all control variables and fixed effects for ethnic groups and counties. Results show that the two instruments are highly correlated with their respective endogenous variables. Indeed, the proportion of other households in the county with the same ethnic group having at least one person employed in a decent job affects significantly, at the one percent level, the probability of having a decent job in the household. Similarly, the proportion of other households in the county with the same ethnic group having at least one migrant impacts significantly the probability to have a migrant. This picture shows that our instruments are good predictors of "decent households" and "migrant households" and therefore the identification strategy does not suffer from the weak instrument problem. In addition the Angrist-Pischke test of weak identification is reported in all estimation results and conclude that instruments are not weak.

Impact on household consumption

In the first set of results we compare the effect of decent job and migration on the annual household's consumption per adult equivalent (table 4.55). We discuss below the relevance to use this indicator as measure of poverty. In all specifications, the impact of decent job and migration is positive and significant at the 1% level (except in column 5 for migration) and the elasticity of decent job is always higher.

OLS estimation in column 1 with only the two interest variables indicates a point estimate of 0.70 for having a decent worker in the household and 0.25 for migration. In column 2 to 6, we implement a two-stage least squares estimation instrumenting decent job and migration using respectively proxies of network of access to decent work and network of migration. The two elasticities highly increase with the instrumental variable estimates in column 2. In the two first columns, the test of difference between the two variables is significant at the 1% level indicating that the impact of decent work in the household's consumption is much higher than that of migration (p-value reported at the bottom of the table). In column 3, a set of controls are included. The elasticity of decent work highly decreases from 4.1 to 2.1 while the elasticity of migration increases. The test of difference is no longer significant. In column 4, dummies for

Table 4.53: Impact on log total household consumption per capita-MMWS method

	1 WLS	2 WLS	3 WLS
decent work	0.395***	0.331***	0.293***
	(0.0620)	(0.0510)	(0.0454)
migrant	0.231***	0.214***	0.199***
	(0.0513)	(0.0384)	(0.0371)
Zone (ref=Urban Dakar)			
Other Cities		-0.461***	0.501***
		(0.0282)	(0.133)
Rural		-0.773***	0.198
		(0.0324)	(0.132)
number of children		-0.0342***	-0.0307***
		(0.0034)	(0.0030)
number of male adults		-0.0789***	-0.0781***
		(0.0057)	(0.0054)
number of female adults		-0.0321***	-0.0386***
		(0.0055)	(0.0053)
Age of Household Head		-0.0007	-0.0006
		(0.0007)	(0.0006)
Household Head female		0.0314	0.0287
		(0.0209)	(0.0198)
Log Internal Transfers		0.0050***	0.0018
		(0.0017)	(0.00177)
% of literate		0.294***	0.294***
		(0.0413)	(0.0411)
% primary school degree or more		0.203***	0.346***
		(0.0408)	(0.0394)
Constant	12.62***	13.35***	12.75***
	(0.0117)	(0.0487)	(0.150)
Ethnic group fixed effects	No	No	Yes
County fixed effects	No	No	Yes
No. of Observations	4383	4383	4383
R-Squared	0.0257	0.426	0.515
F	29.26***	228.5***	64.67***

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 4.54: First stage regressions with all control variables and fixed effects

	(1) decent work	(2) migration
Network decent work	**0.295*** **	-0.056
	(0.072)	(0.035)
Network migration	-0.096**	**0.291*** **
	(0.046)	(0.075)
Ethnic group fixed effects	Yes	Yes
Region fixed effects	Yes	Yes
No. of Observations	5605	5605
R-squared	0.1464	0.0517
Angrist-Pischke F-test	14.37	12.91

ethnic groups and regions are added to strengthen our identification strategy. These dummies control for geographical factors and ethnic group features that can be correlated simultaneously with the instruments and household's consumption. The effects of decent work and migration are now quasi equal and the two elasticities remain positive and significant at the 1% level. In column 5, we replace regional dummies by counties fixed effects which are more disaggregated than regions. Since the two endogenous variables are predicted by the instruments constructed at the county level, controlling by ethnic groups and counties fixed effects can absorb a big part of the variability of decent work and migration related to household's consumption. Column 5 shows that the effects of migration are absorbed by the fixed effects whereas the elasticity of decent work increases slightly and remain significant at the 1% level.

Column 6 displays our preferred specification with a more parsimonious model. We replace counties fixed effects by regional fixed effects, and to ensure that the exclusion restriction is not violated, we control for the logarithm average of households consumption in the same county. This variable controls for the county's wealth which can affect simultaneously migration or decent work and consumption. Results show very similar impacts of decent work and migration on poverty. Having at least one person with access to decent work allows to multiply by more than 5 the household's consumption (an increase of of 406%). Having at least one migrant in the household increases the household's consumption by 390%. The magnitude of the two effects is very similar and quite high reflecting a huge impact of both migration and decent work on household's consumption. The size of these elasticities are quite different from the average treatment effect (ATE) estimated with the propensity score weighting method. This difference may not be disturbing since the two methods estimate different effects. While the weighting method estimate and ATE, the instrumental variable estimates can be interpreted as a Local Average Treatment Effect (LATE). Indeed the IV estimates reflect the impact of a decent work or migration for the households with high values of the instruments, which are households with a big network.

Regarding the control variables, living in rural area or in the other towns (out the capital) denotes surprisingly positive effects on consumption compared with living in the capital (urban Dakar). This effect is confounded by the inclusion of region fixed effects which are clearly highly correlated with the residence area. As shown in the other specifications dwelling in rural areas or other towns has negative effects on consumption. The size of the household

has negative effect on consumption. One more child (less than 15) in the household reduces household consumption by 3.2%. The effect of an additional adult is larger. An additional adult male reduces consumption by 7.6% and additional female by 6.9%. The age of the household head and transfers received from other households inside the country have no significant effect on consumption. Households headed by women seem to be richer than those headed by men. Education plays an important role for the household consumption. A percentage point increase in the proportion of literate adult members in the household increases consumption by 14.1%. The average consumption of other households in the county is positive but not significant.

Table 4.55: Impact on log total household consumption per capita

	(1) OLS	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV
Decent work	0.696***	4.067***	2.103***	1.675***	2.308***	1.622***
	(0.0413)	(0.490)	(0.569)	(0.531)	(0.832)	(0.543)
migrant	0.249***	1.338***	1.861***	1.664***	1.478	1.589***
	(0.0395)	(0.442)	(0.394)	(0.563)	(1.199)	(0.601)
Zone (ref=Urban Dakar)						
Other Cities			-0.329***	0.506***	0.729***	0.503***
			(0.0638)	(0.114)	(0.173)	(0.114)
Rural			-0.568***	0.278**	0.505***	0.274**
			(0.0759)	(0.119)	(0.186)	(0.119)
number of children			-0.0356***	-0.0319***	-0.0316***	-0.0320***
			(0.0040)	(0.0037)	(0.0039)	(0.0036)
number of male adults			-0.0775***	-0.0759***	-0.0785***	-0.0763***
			(0.0076)	(0.0070)	(0.0088)	(0.0070)
number of female adults			-0.0683***	-0.0699***	-0.0709***	-0.0686***
			(0.0103)	(0.0119)	(0.0208)	(0.0125)
Age of Household Head			-0.0013	-0.0010	-0.0005	-0.0010
			(0.0008)	(0.0008)	(0.0010)	(0.0008)
Household Head female			0.0835**	0.0563*	0.0972**	0.0564*
			(0.0370)	(0.0329)	(0.0478)	(0.0321)
Log Internal Transfers			0.0092***	0.0027	0.0032	0.0025
			(0.0024)	(0.0023)	(0.0034)	(0.0024)
% of literate			0.163***	0.138***	0.147***	0.141***
			(0.0435)	(0.0432)	(0.0518)	(0.0432)
% primary school degree or more			-0.221*	-0.00155	-0.137	0.0112
			(0.134)	(0.132)	(0.207)	(0.135)
log average county's consumption						0.0529
						(0.0870)
Ethnic group fixed effects	No	No	No	Yes	Yes	Yes
County fixed effects	No	No	No	No	Yes	No
Region fixed effects	No	No	No	Yes	No	Yes
Constant	12.56***	12.30***	13.28***	13.37***	12.45***	12.66***
	(0.00984)	(0.0404)	(0.0833)	(0.0764)	(0.252)	(1.166)
No. of Observations	5605	5605	5605	5605	5605	5605
R-Squared	0.0557	-	-	0.1258	0.0061	0.1577
F	156.2***	36.13***	139.8***	74.08***	36.27***	75.03***
p-value test stable=migrant	0.0000	0.000	0.6860	0.9847	-	0.9541
Angrist-Pischke F-test for weak instruments (network decent work)	-	78.84***	20.28***	15.50***	9.28***	14.37***
Angrist-Pischke F-test for weak instruments (network migrant)	-	47.37***	37.42***	15.88***	2.63*	12.91***

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Impact on the living standard's index

In this section, we replace household consumption by some indicators that reflect the standard of living of the household using Multiple Correspondence Analysis (MCA). The indicators are constructed from dwelling characteristics and assets owned by the households. These characteristics are very likely to capture involvement of migrants in the household's standard of living as well as involvement of a decent worker present in the household. Indeed migrants, even if they do not reside in the household, may certainly invest in long run assets if they have the capacity to do so.

We construct three different indicators: an indicator of the housing characteristics, another for the owned assets and the last one is the aggregation of the two first indicators and reflect general standard of living of the household.

For the construction of the housing and the assets indicators, we firstly choose variables that discriminate poor and rich households. Variables that concern less than 1% of households are excluded from the analysis. Secondly we run a preliminary MCA and eliminate variables with smaller contributions in the formation of the first axis. Finally, selected variables for the housing index are: type of housing, roof material, wall material, flooring material, water source, light source, type of toilet, access to internet and access to private TV channels. For computing the asset index, we use the following assets: ventilator, table, chair, wardrobe, bookcase, living room, phone, computer and fridge. The standard of living index is built with all the variables used for the housing and assets index.

In table 4.56, these indicators are considered as dependent variables in columns 1 to 3. Column 4 reports our preferred specification with all controls in column 6 of table 4.55 for comparison purpose. We run an IV estimates in all columns with all control variables with regions and ethnic groups fixed effects. Access to a decent job and migration have both a strong positive and significant effect for all the three indexes. The elasticity of decent job is lesser than that of migration for the housing index and higher for the asset's index but the difference between the two is not significant in the two cases. Compared to the impact on consumption, decent job and migration seem to have higher effect on the standard of living index with respective point estimates of 2.3 and 2.7. Results for control variables are almost the same than for previous results on consumption except the positive effect of internal transfers on the asset and on the standard of living indexes and a positive effect of the average consumption in the county for the three indexes. These results show the importance of decent work and migration in improving the living conditions of households.

3.5.2 Impact on investment in education

Results in the previous sub-section have shown that access to a decent job has a similar impact on poverty than migration. This result may be surprising as gains from migration are usually documented to be very high and to raise the well-being of the migrant's origin household. An interesting research question is then to know through which mechanisms a decent work enhances the household's consumption and standard of living. Our assumption is that the security and the stability of work may allow people to invest more in economic activities and human capital formation. Indeed the stable nature of the job helps have a prospective approach and be more

Table 4.56: Impact on household's standard of living's indicator

	(1) Housing	(2) Assets	(3) Standard of living	(4) log consumption
Decent work	1.801***	2.704***	2.329***	1.622***
	(0.612)	(0.837)	(0.700)	(0.543)
migrant	2.597***	2.654***	2.720***	1.589***
	(0.875)	(0.961)	(0.907)	(0.601)
Zone (ref=Urban Dakar)				
Other Cities	0.805***	1.030***	0.935***	0.503***
	(0.0933)	(0.145)	(0.111)	(0.114)
Rural	0.0918	0.511***	0.259**	0.274**
	(0.0998)	(0.153)	(0.118)	(0.119)
number of children	-0.0005	0.0014	-0.00001	-0.0320***
	(0.0048)	(0.0057)	(0.0051)	(0.0036)
number of male adults	-0.0131	0.0196*	-0.0008	-0.0763***
	(0.0099)	(0.0116)	(0.0106)	(0.0070)
number of female adults	0.0137	0.0375*	0.0263	-0.0686***
	(0.0174)	(0.0195)	(0.0183)	(0.0125)
Age of Household Head	0.00003	-0.0007	-0.000211	-0.000981
	(0.0010)	(0.0012)	(0.0011)	(0.00075)
Household Head female	0.141***	0.0961*	0.134***	0.0564*
	(0.0436)	(0.0521)	(0.0468)	(0.0321)
Log Internal Transfers	0.0034	0.0105***	0.0064*	0.0025
	(0.0033)	(0.0037)	(0.0034)	(0.0024)
% of literate	0.310***	0.318***	0.332***	0.141***
	(0.0542)	(0.0636)	(0.0568)	(0.0432)
% primary school degree or more	0.112	0.0894	0.117	0.0112
	(0.156)	(0.210)	(0.177)	(0.135)
log average county's consumption	0.680***	0.241*	0.530***	0.0529
	(0.117)	(0.131)	(0.121)	(0.0870)
Constant	-8.757***	-3.539**	-6.979***	12.66***
	(1.578)	(1.755)	(1.630)	(1.166)
Ethnic group fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
No. of Observations	5588	5582	5596	5605
R-Squared	0.247	-	0.159	0.158
F	149.2***	69.01***	123.8	75.03
p-value test stable=migrant	0.3054	0.9559	0.6347	0.9541
Angrist-Pischke F-test for weak instruments (network decent work)	14.49***	14.54***	14.39***	14.37***
Angrist-Pischke F-test for weak instruments (network migrant)	12.92***	13.14***	12.99***	12.91***

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

concerned about the well-being in the long run. In this section, we focus specifically on the effects of decent employment and migration on the investments in children's education. The dependent variable is now the logarithm of total expenditure for the education of children aged between 6 and 16 in the schooling year 2010-2011. In line with the theoretical framework, we expect a decent work to foster children's schooling while the impact of migration can be ambiguous.

Propensity score weighting method

The propensity score weighting strategy applied above is used to assess the comparative effect of a decent work and migration on the expenditure in children education in the household. We use the same weights computed previously to run a Weight Least Square (WLS) model. The outcome variable is now the education spending per child aged between 6 and 16 in the household. Results are presented in table 4.58. As in the consumption estimates, the elasticities of having a decent work and having a migrant are both positive and statistically significant at the 1% level. But the impact seems higher compared to the impact on consumption. The average treatment effect of a decent work is about 66.3% and the average treatment effect for migration is about 32.9% and are all significantly higher compared to the control households. The Bonferroni correction test of comparison indicates that despite the ATE of a decent work is almost twice the ATE of migration, the difference between the two is not statistically significant as shown in table 4.57.

Table 4.57: Comparing Average Treatment Effects on educational expenditure - Bonferroni correction

	ATE	**Standard-error**
decent work vs control group	0.653***	0.150
migrant vs control group	0.329***	0.088
migrant vs decent work	-0.324	0.177

* p<0.1, ** p<0.05, *** p<0.01

Instrumental Variable Strategy

Results are presented in table 4.59. OLS estimation in column 1 shows significant effect of both migration and decent work but the effect of decent work is statistically higher. Instrumental variable estimates are recorded in column 2 to 4 using the same instruments as in the previous section. Control variables are included in column 3 and the average county's consumption and fixed effects are included in column 4. From column 2 to 4, migration has no significant effect in education spending whereas the effect of decent work remains positive and statistically significant at least at the 10% level in column 4. The impact of a decent work is quite high with a point estimate of 3.2.

Table 4.58: Impact on log total expenditure in education per child

	1 WLS	2 WLS	3 WLS
decent work	0.807***	0.660***	0.653***
	(0.219)	(0.166)	(0.150)
migrant	0.328***	0.306***	0.329***
	(0.106)	(0.0884)	(0.0884)
Zone (ref=Urban Dakar)			
Other Cities		-1.030***	-0.363
		(0.0854)	(0.283)
Rural		-1.414***	-0.729***
		(0.0871)	(0.279)
number of children		-0.0477***	-0.0430***
		(0.0088)	(0.0084)
number of male adults		-0.0131	-0.0172
		(0.0138)	(0.0135)
number of female adults		0.0408***	0.0412***
		(0.0135)	(0.0133)
Age of Household Head		0.0029	0.0020
		(0.0017)	(0.0017)
Household Head male		0	0
		(.)	(.)
Household Head female		0.130**	0.116**
		(0.0612)	(0.0551)
Log Internal Transfers		0.0109**	0.0046
		(0.0043)	(0.0044)
% of literate		0.402***	0.339***
		(0.114)	(0.114)
% primary school degree or more		0.882***	0.930***
		(0.0952)	(0.101)
Constant	8.875***	9.268***	8.516***
	(0.0236)	(0.144)	(0.330)
Ethnic group fixed effects	No	No	Yes
County fixed effects	No	No	Yes
No. of Observations	3043	3043	3043
R-Squared	0.0329	0.302	0.336
F	11.29***	88.10***	20.86***

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Results for control variables show negative effects for living in rural area and negative effects for the number of children. Households headed by a woman and households with a high proportion of literate members invest more in children's education. These results show that a local decent job can be a good substitute of migration in reducing poverty and seems to be more effective than migration in promoting children's education. Even if in the definition of a decent job, we do not consider an income aspect, a decent job promotes stability in the household and allows household members to look to the future, to invest more in economic activities and in children's human capital.

Some empirical studies find evidence that a sense of stability in the family makes people invest more in children's schooling and in human capital accumulation in general. Atkin (2009) finds in Mexico that women more likely to work in a factory job through an expansion of export manufacturing, have taller children. This effect does not go only through income but also through the expectations of these women about the future earnings opportunities of female children.

Lien *et al.* (2008) study the impact of housing environment on high school and college enrollment in Taiwan. Among a set of housing variables, they find that the residential stability and homeownership yield larger positive impacts on teens' schooling.

In rural Ethiopia and in a context where lands are not secured making people to spend a large amount of time to ensure continuous access to the land, Fors *et al.* (2015) show that awarding a certificate that confirms individuals' property rights to land, increases children school enrollment.

All these evidence demonstrate how the stability of the household, coming not necessarily from employment, helps household members to project into the future and invest more in children's education.

3.5.3 Exploring the interaction effect

We are now interested in the interaction effect of the two treatments: decent work and migration. Are households which have both a decent worker and a migrant better off than other households which receive only one of the two treatments? An increasing impact on consumption and educational expenditure for households with both a decent worker and a migrant would suggest that the two treatments are complementary. If rather households with both a decent worker and a migrant are worse off than households with only one treatment, access to a decent work and migration are then substitutes.
It is difficult in our data to properly estimate this presence of complementarity or substitutability effect between decent work and migration due to the very low sample of households which have the two, as shown in the descriptive statistics. Therefore these results should be considered with caution.

To measure this complementarity/substitutability effect, we modify slightly equation 3.21

Table 4.59: Impact on educational expenditure

	(1) OLS	(2) IV	(3) IV	(4) IV
Decent work	1.337***	7.384***	3.159**	3.248*
	(0.0769)	(1.187)	(1.356)	(1.740)
migrant	0.322***	1.065	0.848	1.633
	(0.0722)	(0.784)	(0.597)	(1.004)
Zone (ref=Urban Dakar)				
Other cities			-0.679***	-0.299
			(0.169)	(0.296)
Rural			-0.991***	-0.585*
			(0.205)	(0.323)
number of children			-0.0445***	-0.0400***
			(0.0082)	(0.0088)
number of male adults			-0.0177	-0.0164
			(0.0144)	(0.0153)
number of female adults			0.00622	-0.00883
			(0.0205)	(0.0283)
Age of Household Head			0.0022	0.0014
			(0.0016)	(0.0018)
Household Head female			0.263***	0.226***
			(0.0789)	(0.0866)
Log Internal Transfers			0.0102**	0.0065
			(0.0045)	(0.0053)
% of literate			0.276***	0.220*
			(0.0987)	(0.116)
% primary school degree or more			0.378	0.348
			(0.279)	(0.366)
log average county's consumption				0.371*
				(0.199)
Ethnic group fixed effects	No	No	No	Yes
Region fixed effects	No	No	No	Yes
Constant	8.737***	8.294***	9.046***	4.081
	(0.0205)	(0.0989)	(0.194)	(2.629)
No. of Observations	3839	3603	3603	3603
R-Squared	0.0782	-	0.0884	0.0372
F	162.8***	19.35	83.16	28.73
p-value test stable=migrant	0.0000	-	-	-
Angrist-Pischke F-test for weak instruments (network decent work)		42.94***	8.70***	5.34**
Angrist-Pischke F-test for weak instruments (network migrant)		41.30***	31.41***	10.53***

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

and estimate rather:

$$Y_i = \alpha + \beta * D_i + \gamma * M_i + \delta * D_i * M_i + \lambda * X_i + \epsilon_i \tag{3.25}$$

In the propensity score weighting method, we add a third treatment which is having both a decent worker and a migrant. We apply exactly the same methodology as before. The bivariate probit model in table C65 allows us to estimate the propensity scores for each of the four groups. The weights are then derived and we estimate the different outcome equations using WLS. Summary of results are presented in table 4.60.

Regarding the consumption per capita, the results clearly show that there is any gain of having both a migrant and a decent worker in the household. The average treatment effects for households with both a migrant and a decent worker is not statistically different of the average treatment effect of a decent work only or migration only.

Regarding the educational expenditure, we have the same pattern, having both treatments yield any additional impact on investing in children's education. However it is worth noting that in this specification, the average treatment effect for decent work is significantly higher than the average treatment effect for migration. In addition there is statistically no difference between the average treatment effect of migration compared to the control group. This particular result supports the finding with the instrumental variable strategy and raise doubts about the impact of migration on education spending.

Based on these results, there is neither complementarity nor substitutability between migration and access to a decent work.

Table 4.60: Comparing Average Treatment Effects with double treatment - Bonferroni correction

	Household consumption	**Educational expenditure**
decent work vs control group	0.248***	0.568***
	(0.039)	(0.120)
migrant vs control group	0.231***	0.159
	(0.036)	(0.098)
both vs control group	0.280	0.719*
	(0.139)	(0.275)
migrant vs decent work	-0.017	-0.409*
	(0.051)	(0.156)
Both vs decent work	0.032	0.151
	(0.143)	(0.298)
Both vs migrant	0.049	0.560
	(0.143)	(0.290)

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

3.5.4 Robustness checks

Some robustness analysis are presented in this section using the instrumental variable strategy.

Impact on poverty

We implement a number of robustness checks in table 4.61 to test whether the main results always hold. All results come from an IV estimates with all the control variables and fixed effects.

In column 1, we use a dummy variable that takes 1 if the household is poor and 0 if it is not poor. As explained previously, this measure may be more suitable in the analysis of poverty. Results in column 1 show that both access to decent job and migration reduce significantly poverty at the 1% level. The effect of migration seems higher but the two coefficients are not statistically significant. This strongly confirms our main result that decent employment and migration have similar impact in reducing poverty. In columns 2 to 4 we run some robustness analysis in the measure of decent employment. We use three alternative measures and for each we eliminate one of the three criteria keeping only two criteria. "Decent1" keeps the underemployment and the social security system criteria; "decent2" considers underemployment and having a permanent contract; "decent3" coniders the affiliation to a social security system and having a permanent contract. For the three alternative measures, results show significant positive impact of decent job in the consumption per adult equivalent and this impact is always statistically equal to that of migration. The elasticity for "decent1" is smaller and significant at the 10% level but is not statistically different from the effect of migration. We restrict in column 5 migration to developed countries. In fact nearly 40% of migrants in our sample live in other African countries which are developing countries. This pattern tends to lower the overall impact of migration on the living standards of the origin households. So we restrict migration to European countries, the US and Canada. Migration to these countries accounts for 60% of all migrant households. Results show that the point estimate of decent employment remains almost the same as our baseline model but the point estimate of migration rises from 1.59 to 2.57. Thus, migration to developed countries increases the impact of migration on household consumption. But still, the impact of migration to developed countries is not statistically different from the impact of a decent work. This is an interesting result as it shows that access to a decent work can be a good substitute of migration to developed countries.

Impact on investment in education

Some heterogeneity and robustness checks are presented in table 4.62. In column 1, migration is restricted to developed countries (Europe, US and Canada). Unlike the previous result of migration on educational expenditure, migration when restricted to developed countries has a significant impact at the 10% level on educational expenditure and this effect is not significantly different from the effect of a decent work. In column 2 and 3, robustness checks on the definition of migration are performed. Indeed, one possible explanation of the absence of effect of migration overall could be the fact that some migrants may live with their children abroad and in this case,

Table 4.61: Heterogeneity and robustness checks

	(1) poverty	(2) log consumption	(3) log consumption	(4) log consumption	(5) log consumption
Decent work	-0.718**				1.581***
	(0.342)				(0.548)
migrant	-1.224**	1.314**	1.432***	1.938***	
	(0.528)	(0.658)	(0.537)	(0.739)	
decent1		0.727*			
		(0.422)			
decent2			1.245***		
			(0.419)		
decent3				1.717***	
				(0.540)	
Migration to developed countries					2.567**
					(1.118)
Zone (ref=Urban Dakar)					
Other cities	-0.113**	0.465***	0.437***	0.428***	0.488***
	(0.0485)	(0.110)	(0.111)	(0.109)	(0.114)
Rural	-0.177***	0.213*	0.213*	0.235**	0.280**
	(0.0530)	(0.115)	(0.114)	(0.114)	(0.121)
number of children	0.0192***	-0.0330***	-0.0326***	-0.0334***	-0.0326***
	(0.0028)	(0.0033)	(0.0034)	(0.0039)	(0.00395)
number of male adults	0.0388***	-0.0820***	-0.0786***	-0.0778***	-0.0808***
	(0.0056)	(0.0068)	(0.0065)	(0.0077)	(0.0072)
number of female adults	0.0410***	-0.0626***	-0.0644***	-0.0716***	-0.0694***
	(0.0102)	(0.0135)	(0.0110)	(0.0143)	(0.0141)
Age of Household Head	0.00006	-0.0014**	-0.0009	-0.0006	-0.0010
	(0.0006)	(0.0007)	(0.0007)	(0.0008)	(0.0008)
Household Head female	-0.0185	0.0310	0.0476	0.0678*	0.0352
	(0.0250)	(0.0263)	(0.0300)	(0.0352)	(0.0398)
Log Internal Transfers	-0.0061***	0.0026	0.0027	0.0041	0.0049
	(0.00187)	(0.0026)	(0.0022)	(0.0028)	(0.0034)
% of literate	-0.0711**	0.142***	0.158***	0.126***	0.137***
	(0.0315)	(0.0476)	(0.0403)	(0.0480)	(0.0459)
% primary school degree or more	0.0488	0.193	0.0568	-0.184	-0.0134
	(0.0854)	(0.121)	(0.120)	(0.189)	(0.146)
log average county's consumption	-0.0274	0.0533	0.0646	0.0505	0.0599
	(0.0703)	(0.0946)	(0.0811)	(0.0954)	(0.0926)
Ethnic group fixed effects	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	0.483	12.74***	12.49***	12.72***	12.56***
	(0.949)	(1.263)	(1.088)	(1.284)	(1.244)
No. of Observations	5605	5605	5605	5605	5605
R-Squared	0.1934	0.321	0.249	-	0.0343
F	28.99	97.50	86.91	63.27	64.37
p-value test stable=migrant	0.2851	0.2129	0.7211	0.6994	0.3201
Angrist-Pischke F-test for weak instruments (network decent work)	14.37***	19.39***	19.78***	16.25***	14.70***
Angrist-Pischke F-test for weak instruments (network migrant)	12.91***	11.60***	13.55***	11.05***	6.37***

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

their remittances are not firstly directed to children's education. To rule out this hypothesis, we run a new regression in column 2 which restricts migration to migrant households which do not have an additional migrant less than 17 years old and for which the true migrant have gone for five years or less.[22]. In column 3, we apply the same definition but restricting the duration of migration to three years or less. The idea behind this restriction is just to limit chances that the migrant lives with his children abroad. With a small duration of migration, the migrant is less likely to have the time to build a family abroad and to have children. More than 90% of total migrants in our sample have migrated for five years or less and about 62% for three years or less. Nearly 7% of households have at least one child less than 17 years old living abroad. Columns 2 and 3 of table 4.62 show that even for migrants less likely to live with their children abroad, migration has no significant impact on investment in children's education.

[22]Recall from the definition of migration on section 3.3.1, individuals living abroad but less than 20 years old are not considered as migrants

Table 4.62: Robustness and Heterogeneity on the Impact on educational expenditure

	(1) IV Migrant to rich countries	(2) IV Migrant less 5 years	(3) IV Migrant less 3 years
Decent work	3.146*	3.049*	3.196**
	(1.662)	(1.633)	(1.609)
Migrant	2.283*	1.675	2.156
	(1.342)	(1.210)	(1.933)
Zone (ref=Urban Dakar)			
Other cities	-0.315	-0.313	-0.298
	(0.289)	(0.290)	(0.292)
Rural	-0.586*	-0.603*	-0.583*
	(0.318)	(0.314)	(0.313)
number of children	-0.0416***	-0.0389***	-0.0395***
	(0.0087)	(0.0088)	(0.0093)
number of male adults	-0.0218	-0.0196	-0.0217
	(0.0151)	(0.0149)	(0.0153)
number of female adults	-0.0066	-0.0015	0.0018
	(0.0263)	(0.0246)	(0.0240)
Age of Household Head	0.0017	0.0018	0.00112
	(0.0017)	(0.0017)	(0.0020)
Household Head Female	0.199**	0.233***	0.256***
	(0.0840)	(0.0851)	(0.0907)
Log Internal Transfers	0.0087	0.00405	0.00246
	(0.0061)	(0.0049)	(0.0049)
% of literate	0.205*	0.230**	0.245**
	(0.118)	(0.116)	(0.114)
% primary school degree or more	0.352	0.401	0.340
	(0.357)	(0.344)	(0.351)
log average county's consumption	0.346*	0.445**	0.466**
	(0.205)	(0.181)	(0.184)
[1em] Ethnic group fixed effects	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Constant	4.430	3.089	2.813
	(2.714)	(2.401)	(2.451)
No. of Observations	3603	3541	3481
R-Squared	0.0382	0.0776	0.0255
F	29.07	29.67	27.20
p-value test stable=migrant	0.5487	-	-
Angrist-Pischke F-test for weak instruments (network decent work)	5.53**	5.56**	6.17**
Angrist-Pischke F-test for weak instruments (network migrant)	6.64***	7.72***	4.98**

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

3.6 Conclusion

This paper analyzes the impact of decent employment and migration on poverty and schooling for Senegalese households. We measure decent work through variables related to the stability of work and social protection and use different poverty indexes to conduct this study. A propensity score weighting approach and an instrumental variable strategy are used to address endogeneity problems. Results show that migration reduces poverty confirming the existing literature. But access to decent employment is as effective as migration to reduce poverty. Even if migration is restricted to developed countries, a local decent work has the same impact than migration in increasing households' consumption and living standards. This is an important result, as in this context, people seem to overvalue the returns to migration. It is worth noting that a decent job provides the same benefit on the household's wealth.

One possible explanation is that a decent work allows people to have a forward-looking behavior, to think more about their future and to invest more in their family members' human capital and well-being in general. We test this hypothesis and find that while migration has no significant impact in educational spending, except for migration to developed countries, a decent work significantly increases households' expenditure in children education.

In terms of policies, this study follows the recommendation from several studies on the impact of migration about the reduction in the cost of sending remittances which may have important impacts on the origin households' well-being. But the main recommendation to be drawn from this study is the necessity to create decent jobs and to facilitate their access to a large majority of people. For that, it seems important to foster industrial development and to boost the high-quality services sectors to absorb the bulk of working poor in the agricultural and informal sector. Promoting social protection and security at work should certainly be in the forefront of policies dedicated to promote decent jobs. Finally, investing in the relevant education and vocational training is fundamental since skills and education seem to be one of the major determinants of access to decent employment.

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Appendix to Chapter 3

Table C63: Descriptive Statistics: quantitative variables

Variable	Number of observations	Mean	Std. Dev.	Min	Max
annual household consumption	5605	390796	357171	11998.16	5628477
annual household annual expenditure	4650	12451.21	30783.15	0	475500
number of children	5605	4.080285	3.377505	0	43
number of male adults	5605	2.341481	1.764731	0	15
number of female adults	5605	2.850847	2.017558	0	16
Age of Household Head	5605	51.65263	14.51963	17	99
Internal Transfers	5605	201709.1	511802.6	0	9425000
% of literate members	5605	0.4793103	.3274984	0	1
% primary school degree or more	5605	0.2700764	.3099557	0	1

Table C64: Descriptive Statistics: categorical variables

Variable	**Number of observations**	**Mean**
poverty	5605	0.2978
decent work	5605	0.0574
migrant	5605	0.05691
Household Head female	5605	0.2516
Zone		
Urban Dakar	5605	0.0905
Other cities	5605	0.4240
Rural	5605	0.4855

Table C65: Bivariate probit estimation of the joint decision of migration and access to decent work

	(1) decent work	(2) migration
Zone (ref=Urban Dakar)		
Other Cities	-0.481***	0.146
	(0.0852)	(0.106)
Rural	-0.864***	0.00849
	(0.109)	(0.115)
number of children	-0.00559	-0.00904
	(0.0136)	(0.0101)
number of male adults	0.0503**	-0.0547***
	(0.0208)	(0.0182)
number of female adults	0.0583***	0.143***
	(0.0209)	(0.0164)
Age of Household Head	-0.00465*	
	(0.00267)	
Household Head female	-0.394***	
	(0.0840)	
Log Internal Transfers	0.00422	-0.0214***
	(0.00610)	(0.00509)
% of literate	0.761***	0.0510
	(0.183)	(0.131)
% primary school degree or more	1.487***	0.324**
	(0.147)	(0.136)
Constant	-2.166***	-1.919***
	(0.202)	(0.135)
athrho	-2.769	-2.769
	(36.21)	(36.21)
No. of Observations	5605	
chi2	646.6***	
Wald test rho=0	0.0058	

Standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

General Conclusion

4.1 Summary

This thesis attempts to contribute to a better understanding of children's education and the labor market in sub-Saharan Africa. It brings three empirical contributions based on microeconomic data in Senegal and Tanzania. Chapter 1 and chapter 2 seek to identify the main drivers of children's education. Chapter 3 examines the comparative impact of an access to decent work and international migration in reducing poverty and promoting children's education.

Chapter 1 examines how social interactions could impact school attendance of children in rural Senegal. Social groups are constructed using the combination of the caste and the village. This means that children within the same caste and the same village belong to the same social group. Using panel data from 2001 to 2008, we show that social interactions are important in explaining children's school attendance. For a given child, a 1% increase in the attendance rate of his/her social group at year t explains between 0.25% and 0.29% of his/her probability to attend school at year $t + 1$. This result seems not to be driven by confounding factors. We apply a fixed effects model, so all non time-varying factors specific to the children or to the social groups are neutralized. Observable time-varying characteristics are also controlled. We also demonstrate that this result is not affected by geographical confounding factors at the village level nor by the self-selection between villages. Heterogeneity analysis shows that children from the royal caste, the upper level in the social hierarchy, behave in the opposite way regarding school attendance compared to children from the castes of farmers or the griots and artisans. Moreover, social interactions are higher among the royal caste group. We suggest three mechanisms to explain how social interactions can shift schooling decisions. First, strong social norms conveying by the caste or the village may lead parents to enroll (or not) their children. Second, the perception of the returns to education inside a social group may also play a role in the schooling decision. Third, individuals may just imitate what others do. Thus, social interactions could be driven by some ripple effects.

Chapter 2 studies whether orphans and fostered children are disadvantaged in terms of education, child labor and household chores. I use a panel data in rural Tanzania collected between 2009 and 2012. The purpose of this chapter is to estimate the change in the education and the labor outcomes of children after being fostered or becoming orphan compared to the outcomes of children living with their biological parents. The time dimension of the data allows me to overcome many endogeneity problems encountered in previous studies with cross-section data. I apply a difference in difference strategy which also controls for the probability to be treated (either orphan or fostered) at the baseline to address selection issue. My findings show different patterns in how orphans and fostered children are affected. Children face a substantial decrease

in the educational expenditure they receive after the death of their father or after losing both parents. I do not see any impact of losing only one's mother, but this result is weakened by the small share of maternal orphans in the sample. However, for paternal orphans, living with one's mother makes a substantial difference. Paternal orphans have a lower school progression index when they live with their mother (compared to non-orphans). But paternal orphans who live with their mother are more likely to attend school and less likely to do domestic chores. To my knowledge, this heterogeneity regarding orphans' residence with the remaining parent is not studied in the literature. These results may open new research prospects. Regarding child fostering, I do not find on average any adverse impact on education or labor after a fostering experience. However, fostering can reduce the likelihood to attend school if it implies changing household for the child. Overall, evidence shown in this chapter suggest an absence of discrimination against orphans and fostered children. In terms of schooling, child labor and domestic chores, orphans and fostered children are not significantly different from other children. However, the fact that orphans receive less education expenditure, suggests that the income loss following the father's death seems to be the main channel through which orphans are affected.

Chapter 3 attempts to answer the following question: between migration and access to a decent work, what is the best strategy to fight poverty and to promote children's education? Using a nationally representative survey collected in 2011 in Senegal, we measure the impact of having one household member with a decent job and the impact of having a migrant in the household on consumption and education spending. Three criteria are considered to measure a decent work: underemployment, stability of the job and the affiliation to a social security system. We deal with endogeneity issues using a propensity score weighting approach and an instrumental variable strategy. Our findings show that the positive impact of access to a decent job on households consumption and poverty is as high as the positive impact of migration, even when migration is restricted to developed countries. Furthermore, while the evidence of a positive impact of migration on education is limited, access to a decent work has a strongly increasing impact on educational expenditure. We suggest that this differentiated effect on investment in education is related to the fact that the security of a decent work allows households to look into the future and to invest in children's education. On the contrary, although migration has a high impact in increasing household consumption, remittances are less stable and less predictable preventing households to look forward and to invest more in children's education.

4.2 Discussion and Policy implications

Before venturing into the unsafe task of giving policy recommendations, I should first discuss the limitations of the studies presented in this thesis.

Chapter 1 and chapter 2 focus in relatively small rural areas. Data used in these two papers

are not representative of the rural zone in Senegal or Tanzania. Thus, the findings in these two studies are specific to the corresponding areas and the possibility of generalization across the country or across sub-Saharan Africa is not obvious.

Chapter 1 assumes that social interactions go through the groups constructed with the castes and the villages. But social interactions can take place through other dimensions of the social network such as friendship ties, kinship in the extended family etc. Precise data on these dimensions of the social network would allow testing this hypothesis. In chapter 2, few observations are used due to the limited size of the original sample and the difference in difference estimation strategy. In fact, only changes in the orphanhood or the fostering status are considered as treatment. As a result, we have very few maternal orphans in the study sample, preventing robust and more in-depth analysis on maternal orphanhood.

In chapter 3, overcoming self-selection issues and reverse causality in labor market and migration is a difficult task particularly in a cross-section data. Nevertheless, we have used two different empirical strategies to attempt to produce convincing estimates.

I believe that policies should not be based on one single evidence but on a mass of robust and consistent results which give a broader understanding of a given research question. Therefore, to conclude this thesis, I will not pretend influencing economic policies in developing countries, but only discuss some policy implications and insights that flow from my results.

First, a relatively detailed discussion is given in chapter 1 on how social norms could be shaped in a way that they will enhance children's education. Social interactions can have positive externalities and increase school participation. But they can also impede school enrollment if some norms show a certain reticence to the formal education system. Raising the perception about the returns to education may be key to mitigate the impact of some negative social norms. This could be done through well-targeted awareness campaigns on the importance of education. Also in several poor areas, youth cannot afford too many years of education because they have to contribute to their household income. Providing vocational training tailored to the needs of the labor market seems essential in these contexts.

Second, the last two decades have seen the implementation of active policies to increase children's schooling in sub-Saharan Africa. These policies are important and many things could still be done. However, some marginalized households or vulnerable children may not be affected by these policies. This may be the case of orphans as shown in chapter 2. They may need a special targeting and monitoring to receive a good education that will enable them to overcome this vulnerability and to successfully build their future.

Third, the labor market problems in Africa seem to persist over time. It seems to have very little progress and concrete and long-term solutions are strongly needed. Yet, following the results in chapter 3, a bulk of decent jobs could significantly reduce poverty in sub-Saharan Africa. The question is then how to create these decent jobs? To better define employment policies, it is important to target these two specific populations: a majority of low-skilled

workers most often in vulnerable jobs and a second group of university or high-school graduates unemployed or in low-paid jobs not-suited to their training. These following actions could be considered?

- Education is fundamental in creating decent jobs. Each individual entering the labor market should have the basic literacy and numeracy skills and a minimum of vocational training.

- Economic growth in sub-Saharan Africa is the less pro-poor compared to other regions in the world. A 1% increase in the per capita consumption is only associated to a 0.69% reduction in poverty. In other regions, this elasticity is higher than 2% (World Bank, 2013). This is because the growth in sub-Saharan Africa is driven by capital intensive sectors such as gas, oil or mineral exploitation. To create jobs, it is necessary to direct the economic growth on labor-intensive sectors such as agriculture or manufacturing.

- Developing the private sector is essential in enhancing employment. This goes through (among others) a business environment conducive to investment, the development of infrastructure (roads, access to electricity etc.), a tax policy encouraging firms to invest and recruit, as well as policies encouraging young men and women to turn to entrepreneurship.

- Finally, social protection should be central in policies aiming to create decent jobs. Workers and the population in general should have a minimum of protection when they are sick, when they are older or when they lose their job. These protections are a must to reduce poverty in sub-Saharan Africa. The most vulnerable workers easily fall into poverty when, for example, they have an illness that prevents them from working or when they face catastrophic health expenditure following their children's illness. According to the ILO, 45% of health expenditure in Kenya and Senegal is out-of-pocket payments.[23] The large informal sector represents a great challenge. An efficient social protection scheme requires also a competent administration and a good governance. The challenge is great but a minimum of social protection is fundamental in the path of the fight against poverty.

[23]http://www.ilo.org/addisababa/areas-of-work/social-protection/lang–en/index.htm

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