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# Essays on the use of external revenues in Sub-Saharan Africa

Mahamat Abdramane Moustapha

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**THÈSE DE DOCTORAT**  
**DE L'UNIVERSITÉ PSL**

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**Essays on the use of external revenues in Sub-Saharan  
Africa**

Soutenue par

**Mahamat MOUSTAPHA**

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*A ma mère*  
*A mon défunt père*  
*A mes frères et soeurs*  
*A mes oncles*



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## 0.1 Context

Poverty reduction is the main objective of all development programs and projects in Sub-Saharan Africa. However, despite a downward trend over the past 25 years, the incidence of poverty remains high. According to World Bank estimates, in 2018, 40% of the region's population lived below the poverty line of \$1.90 per day. Two thirds of the world's extremely poor people live in sub-Saharan Africa. (SSA). Climate fluctuations and conflicts, which cause high volatility in already low incomes, are the main reasons for this region's slow decline in poverty ([Bank \(2020\)](#)). Moreover, in most SSA countries, credit and insurance markets are still underdeveloped, with less than a quarter of adults having access to formal financial services ([Triki & Faye \(2013\)](#), [Demirgüç-Kunt & Klapper \(2012\)](#)). In the absence of secure savings, loans, or weather risk insurance, many families rely on external assistance to meet their daily needs or make productive investments. Nevertheless, the source of these external funds can vary widely. While some households use informal mechanisms such as migration as an income diversification strategy, others may rely on public transfers.

Using migration to limit risk exposure or diversify income sources in developing countries is not new. Several articles have emphasized the crucial role of migrants in maintaining the standard of living of the original households and increasing household incomes ([Rosenzweig \(1988\)](#); [Reardon et al. \(1992\)](#); [Fafchamps \(1992\)](#); [Udry \(1995\)](#); [Carter \(1997\)](#); [Bardhan & Udry \(1999\)](#); [Dercon \(2002\)](#); [De Vreyer & Lambert \(2014\)](#)). Given the increasing number of people migrating to and from sub-Saharan Africa in recent years, this region is no exception. The share of migrants from this region accounted for about 14% of international migration flows in 2019 ([DESA \(2019\)](#)). According to the World Bank's estimate, the amount of officially registered remittances sent by these migrants to SSA countries in 2019 is around \$47 billion, or about 3% of the region's GDP, making it one of the largest recipients. Only the South Asia region received

more remittances relative to GDP.

While the bulk of external revenue received by households comes from remittances, in the last few years, public transfers such as cash transfers to households or budget support to local authorities have rapidly increased. Whatever the source, only a better use of these revenues by the recipients could improve their standard of living and be beneficial in the long term. Yet, relatively little attention has been paid to how external revenues are used in the literature in Sub-Saharan Africa.

Regarding remittances, three findings emerge. The first category views remittances as compensatory income for recipients. They are therefore used primarily for current consumption rather than for investment (Chami et al. (2005), Adams Jr & Cuecuecha (2010), Clément (2011), Zhu et al. (2012), Cattaneo (2012), Zhu et al. (2014), Thapa & Acharya (2017)). The second category considers remittances as transitory income and, therefore, recipients use them at the margin in more "productive" activities such as human and physical capital (Kabki et al. (2003), Edwards & Ureta (2003), Taylor & Mora (2006), Yang (2008), Aggarwal et al. (2011), Göbel (2013), Mohanty et al. (2014). Musumba et al. (2015) and Azizi (2018), Randazzo & Piracha (2019)). The last category treats remittances like any other source of income. (Castaldo et al. (2007), Tabuga (2007), Ang et al. (2009), and Waidler & Devereux (2019)). Thus, there is no difference in the way remittances are used compared to other sources of income such as labor or capital.

Concerning public transfers, two categories can be distinguished in the literature: transfers to households and transfers to local authorities. In the first category, the vast majority of studies have found a positive effect on education, health and access to labor markets. However, most of the literature on this issue focused on Latin American countries like Brazil and Mexico (Baird et al. (2011), Baird et al. (2014), Parker & Todd (2017)). Very few studies have been conducted in Sub-Saharan Africa. Among the papers targeting this region, Aguero et al. (2006) and Williams (2007) find a positive effect of public cash transfers on child nutrition in South Africa. Levine et al. (2009) discovered that cash transfers significantly reduce poverty and inequality in Namibia. Similarly, Tembo & Freeland (2009) show a positive impact of cash transfers on household welfare, investment and education in Zambia. In Malawi, Miller & Tsoka (2012) reported that public cash transfers increase education and reduce child labour. More recently, Tiwari et al. (2016) find that relatively generous and regular cash transfers increase the quantity and quality of food intake. In contrast, more minor, irregular, and inconsistent transfers have no impact on food expenditures. Other articles have studied the impact of public transfers to local authorities. For instance, Postali (2009) studied the effects of royalties transferred to Brazilian municipalities on their gross domestic product (GDP). Using the difference-in-difference method, he found a negative effect of these revenues on local GDP. In contrast, Postali & Nishijima (2013) showed

a positive and statistically significant impact of public transfers to local governments on household access to electrical wiring, piped water, waste collection, and decreasing illiteracy rates. Similarly, [Munasib & Rickman \(2015\)](#) used a synthetic control method to assess the impact of oil revenues in US counties. They note that oil-rich counties tend to have higher education levels and lower birth rates compared to other counties in North Dakota.

The purpose of this thesis is to contribute to this mixed literature on how recipients use external income by focusing on questions that this literature has not addressed. Specifically, we raise and attempt to answer the following three questions :

1. Do international remittances affect firm performance in Sub-Saharan African countries?
2. Are international remittances shared within the country by recipients, and how does this affect income inequality in Senegal?
3. How does an oil boom and the underlying opportunities affect local education decisions in Chad ?

Each of these issues will be discussed in separate chapters.

## **0.2 Motivation**

### **0.2.1 Remittances and Firm Performance**

The role of the private sector in the economic development process has been widely demonstrated. A vibrant private sector is a source of innovation, productivity growth, and job creation. However, firms in SSA countries are among the worst performers globally, as shown in [Figure 1](#). On average, between 2006 and 2020, sales and productivity declined by 0.70% and 6.50% per year, respectively. Only the Middle East and North Africa (MENA) region is ranked behind SSA. Regarding the barriers faced by firms in SSA, access to finance tops the list. Approximately 23,70% of firms consider access to finance as the biggest obstacle to their performance ([Figure 2](#)). This is followed by access to electricity (14,70%), political instability (10,60%) and competition from the informal sector(10,50%).

Meanwhile, remittances to sub-Saharan Africa have increased dramatically to more than \$47 billion in 2019 ([Figure 3](#)). It is also worth noting that remittances have far exceeded official development assistance or foreign direct investment in recent years. Moreover, unlike the other two sources of external income, remittances appear to be much more stable. This makes the SSA one of the top destinations for remittances. As shown in [Figure 4](#), only the South Asia region received more remittances as a percentage of GDP than this region in 2019.

Given the magnitude of these remittances and the main constraints on businesses in sub-Saharan African countries discussed above, the first chapter of this thesis explores how remittances can affect firms' performance in this region. Specifically, are remittances used for business investment purposes? How do they affect the sales of manufacturing and non-manufacturing firms? What is their impact on firms employment ?

## 0.2.2 Remittances and income Inequality

For a very long time, the debate over poverty reduction in SSA obscured another equally important issue: income inequality. Only recently, with the observed increase in the number of extremely poor people in SSA despite double-digit growth rates over the past decade, has the issue of inequality begun to re-emerge.

In 2020, as shown in figure 5 (panel A), about 57% of national income is held by the richest 10%, while the bottom 50% share less than 10%. This rate makes sub-Saharan Africa the third most unequal region after the Middle East and North Africa (MENA) and Latin America. Sub-Saharan Africa also experiences a large gap between rich and poor. The ratio of the average income of the top 10% to the bottom 50% is about 33.54 (panel B of Figure 5). No other region has such a gap. For instance, the income of the richest 10% is about 9 times higher than the average income of the poorest 50% in Europe. Furthermore, [Chancel et al. \(2019\)](#), in decomposing the levels of inequality in sub-Saharan Africa (using the Theil index), showed that 25% of inequality in this region is due to differences between countries and up to 75% to inequality within countries.

As we showed above, remittances to sub-Saharan Africa have increased dramatically in recent years. Such a flow of financial resources raises questions about how these remittances affect income levels in recipient countries. Many studies have analyzed the effect of remittances on income inequality in countries of origin ([Akim & Robilliard \(2019\)](#), [Bouoiyour & Miftah \(2014\)](#), [Beyene \(2014\)](#), [Margolis et al. \(2013\)](#), [Mughal & Anwar \(2012\)](#), [Gubert et al. \(2010\)](#), [Adams et al. \(2008\)](#), [Acosta et al. \(2008\)](#), [Barham & Boucher \(1998\)](#)), but there is still no consensus on the nature of this effect. While some papers have shown that remittances reduce inequality, others have found positive or no impact. In addition, there is a widespread aspect in developing countries that these articles do not consider: The possibility that international remittances received are not entirely directed to the first recipient. They may benefit others inside or outside the household due to social norms of benevolence or an implicit indication from the senders. For example, [Akim & Robilliard \(2019\)](#) argue this possibility to explain the equalizing effect of domestic transfers they observed. Therefore, the second chapter of this thesis investigates the impact of international remittances on inequality by considering the possible redistribution of these transfers at the domestic level in Senegal. More concretely, we attempt to answer the following two

questions: (1) Do recipients of international remittances share a portion of these incomes at the domestic level? (2) How does this potential redistribution affect income inequality?

The focus on Senegal is not only due to the availability of data but also, and more importantly, to the fact that Senegal is one of the main recipient countries for remittances. As shown in figure 6, in 2020, remittances received in Senegal amounted to more than \$2.56 billion (Top chart). Only Nigeria ( \$ 17,21 billion), Ghana(\$ 4,29 billion), and Kenya(\$ 3,10 billion) received more remittances than this country. This amount accounts for 10% of the country's GDP (Bottom chart). In comparison, only small economies such as Somalia, Lesotho, Gambia, Cape Verde, Comoros, and Liberia are ahead of Senegal in terms of remittances received to the GDP. International remittances to Senegal have risen steadily over the past two decades, as depicted in Figure 7. Between 2000 and 2020, they increased from \$230 million to \$2.56 billion. Their share of GDP also more than doubled over the same period, from 4% in 2000 to 10% in 2020.

### 0.2.3 Oil boom and schooling decision

Education plays an essential role in the development process. Numerous studies have shown that higher levels of education are associated with greater growth and improved overall well-being (Lucas (1998), Mankiw et al. (1992)). In light of this, Sustainable Development Goal 4 (SDG 4) aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030.

The number of children in school has increased dramatically worldwide in recent years. As shown in Figure 8, the gross enrollment rate (left chart) in primary school is about 100% in all regions of the world. Despite this high rate of primary school attendance, many children continue to drop out of school early, as shown in Figure 8 (right-hand chart). The gross secondary school enrollment rate averages about 70%. The other striking aspect of this graph is the wide regional disparity at the secondary level. While the rate is close to 90% in North America, Europe and Central Asia, it is less than 60% in South Asia and Sub-Saharan Africa. Specifically for SSA, the rate is structurally low and has been around 30% since 2000. These rates are even lower when considering the net enrollment rate. According to Unesco (2016), there are three major barriers to secondary school attendance in this region : (1) lack of adequate infrastructure, especially in rural areas, (2) low expected or hoped-for returns to education, due in part to the lack of job prospects for youth, and (3) social pressure for immediate income. Thus, any measures likely to alleviate these constraints could increase school attendance. While the impact of infrastructure on schooling decisions has been widely studied (Akresh et al. (2018), Duflo (2001)), the effect of job prospects on education demand has received little attention in the literature.

This chapter aims to fill this gap by exploiting the Chadian oil project, which provides a quasi-natural experimental setting for estimating the effect of the oil boom on demand for education.

The oil boom can affect schooling in several ways. Firstly, it may have an effect related to oil revenues. Indeed, the oil boom may lead to an increase in the region's budget and the local population's income. In both cases, an increase in schooling can be expected through the supply of and demand for education. Secondly, the oil boom can affect education through the employment opportunities it is likely to generate. Suppose that the oil boom significantly increases opportunities for skilled employment. In this case, there will be an incentive to extend the duration of education as the expected returns to schooling become higher. Therefore, the predicted effect is an increase in education, especially at the secondary level. On the other hand, if the oil boom creates immediate job opportunities for low-skilled workers, an adverse effect is expected as the opportunity cost of staying in school may increase.

The choice of Chad as a study area is interesting for several reasons. In addition to providing a quasi-natural experiment to assess the causal link between the oil boom and education, the country faces high rates of early school dropout. In 2010, while the primary school enrollment rate was 50.9%, only 19.6% of secondary school-age children were enrolled ([EDS-MICS \(2014\)](#)). According to the UNESCO Institute for Statistics, the completion rate was approximately 32% for elementary school and 16% for secondary school. School life expectancy was currently less than six years ([Unesco \(2015\)](#)). Furthermore, despite being one of the poorest countries in the world, Chad has been very poorly studied.

### **0.3 Contributions and main findings**

This thesis contributes to understanding how recipients use private and public transfer income by studying their effects on firm performance, income distribution, and schooling decisions.

#### **Chapter 1 : Remittances and firm performance in sub-Saharan Africa: evidence from firm-level data**

The first chapter empirically investigates how international remittances affect firms' performance. Specifically, we investigate the role of remittances on capital accumulation, sales, and employment in 34,010 firms operating in 42 Sub-Saharan African countries between 2006 and 2020. This paper makes three clear contributions to the literature. First, to the best of our knowledge, this article is the first to analyze the effect of remittances on firm development in Sub-Saharan Africa. Second, it is also the first to focus on firm-level data rather than household or macroeconomic data. The strength of this approach is that it allows us to directly examine the effect of remittances on several firm-level outcomes (capital accumulation, sales, employment, etc.). Third, we analyze the impact of remittances on both manufacturing and non-manufacturing sectors. This approach will allow policymakers to clearly understand the impact

of remittances on firm activities across industries and thereby better target economic policies.

Using a fixed-effect instrumental variable approach to control for the endogeneity of remittances, we find that international remittances positively affect the share of capital held by nationals in manufacturing firms. Our results also show that international remittances positively affect the sales of non-manufacturing firms, while a negative effect on the sales of manufacturing firms is observed. Regarding the impact of remittances on employment, we found a positive effect on manufacturing and non-manufacturing firms. Heterogeneity tests suggest that the effect of remittances on firm performance is larger in less financially developed and non-resource-rich countries. As for the negative effect of remittances on the sales of manufacturing firms, the results show that it is entirely driven by small firms. Finally, we obtain similar results using remittances per capita instead of remittances relative to GDP.

## **Chapter 2 : Do international remittances increase internal cash transfers? Evidence from Senegal**

In the second chapter, I use household survey data collected in Senegal to explore the impact of remittances from incoming international migrants on inequality. This is not a new topic, but my work adds something really new to the literature, as it examines the internal transfers made, or not made, by recipients of international remittances. To my knowledge, this is the first paper to do so. In addition, my econometric approach tackles endogeneity bias concerns by using two original instruments : the magnitude of the 1983 Great Drought in Senegal and the GDP growth rate in migrant destination countries weighted by the migration rate in the location district.

Using the instrumental variable approach and a large sample of individuals over the age of 13, I found that international remittances have a direct internal sharing effect. First, the results show that individuals who receive international remittances are more likely to make internal cash transfers. Specifically, I noticed that receiving international remittances increases the probability of sending internal cash transfers by about 26%. Second, I found that the wealthy who receive international remittances are the most likely to send internal cash transfers. Regarding the recipients of this internal sharing, the results show that the poorest benefit the most. The results also show that international remittances increase inequality when only recipients' income is considered, but the finding is reversed when recipients' internal transfers are considered. Furthermore, the positive impact of receiving international remittances on sending domestic transfers remains regardless of the recipients' location. The results are also robust to the variables of interest since I observed a positive and significant effect using intensive and extensive margins. Finally, I found similar results using several alternative specifications and econometric approaches.



### **Chapter 3 : Oil boom and schooling decision**

The final chapter of this thesis examines how a natural resource boom affects adolescent education. Specifically, I explore the effect of oil-related job prospects on secondary school enrollment decisions in the oil-rich region of Chad. This study offers three clear contributions to the literature. First, in contrast to existing research, which focuses on the effect of information about the actual returns to education on schooling, I assess the impact of promised jobs on education decisions. These jobs are more likely to influence education decisions than information about actual returns to education. Second, to the best of my knowledge, this is the first study on the oil boom and education decisions to focus on a sub-Saharan African country. Indeed, the existing literature has focused on countries like the United States or Canada. This article is also the first to highlight the effect of the Chad oil project, which is held up as a model for resource-rich fragile countries, on educational outcomes.

First, I used administrative data and the synthetic control method to create a synthetic oil region, indicating what would happen in the oil region without these possibilities. I then compared the results for the synthetic oil region with the actual results for the oil region. I have found a positive and statistically significant effect of oil-induced employment opportunities for natives on the secondary school enrollment rate in the oil region. This rate increased by around 5% in the oil region compared to its synthetic control. Next, I used the difference-in-differences method to compare the evolution of secondary school enrollment in the oil region before and after the oil boom with that of the control regions over the same period. This second analysis confirms previous results by using the synthetic control method. Specifically, the treatment increased secondary school enrollment by 6% in the oil region. I got similar results when using nationally representative survey data rather than administrative data.

In terms of mechanism, I firstly found that the observed effect is not an income effect since none of the regions that received more rent than the oil region experienced an increase in enrollment equivalent to that of the oil region. Secondly, I showed that the observed rise in enrollment results from an increase in demand for education rather than an increase in education spending. Indeed, no region that spent the most per student experienced a similar increase as the oil region. These results confirm the role of labor market incentives on schooling decisions. Furthermore, I investigated whether this result was due to a decrease in the dropout rate in the oil region or increased enrollments at all levels of education. When I analyzed primary and middle school enrollment, I found that the observed effect was more due to a decrease in dropouts than an overall increase in enrollments at all levels.

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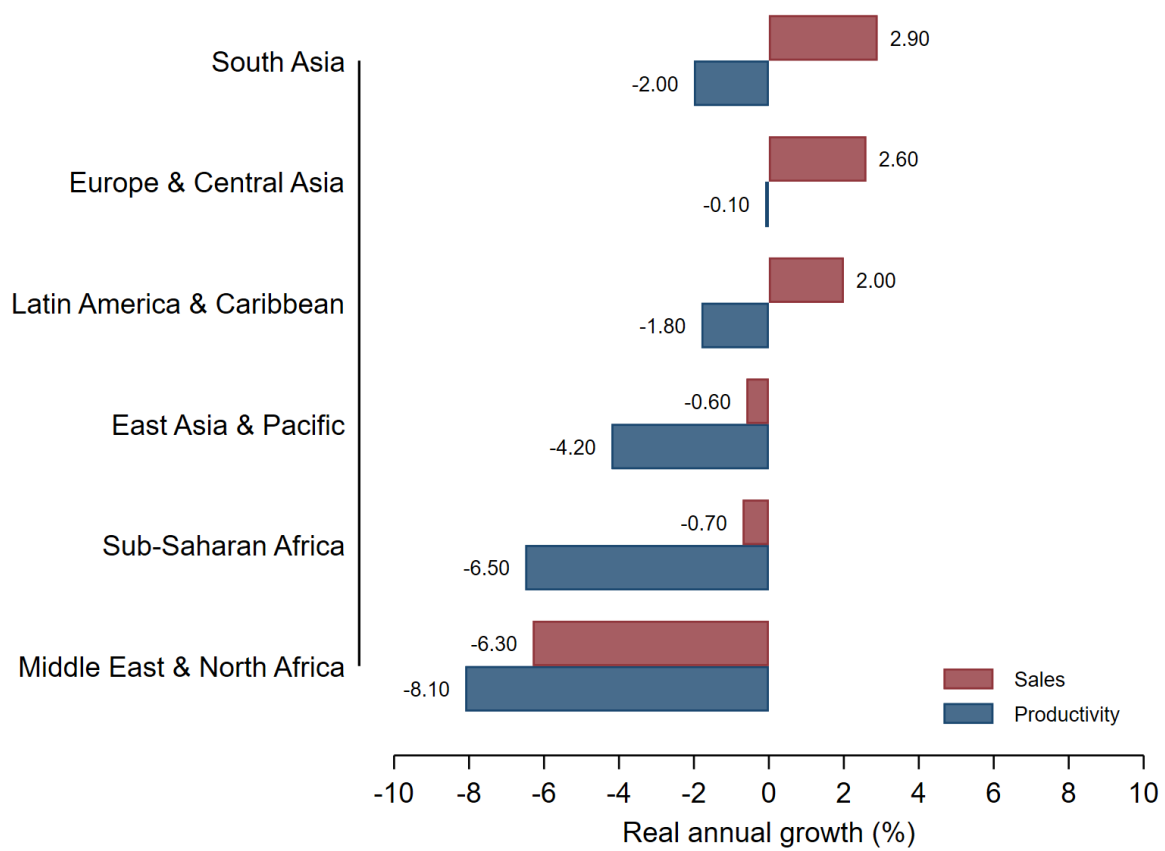
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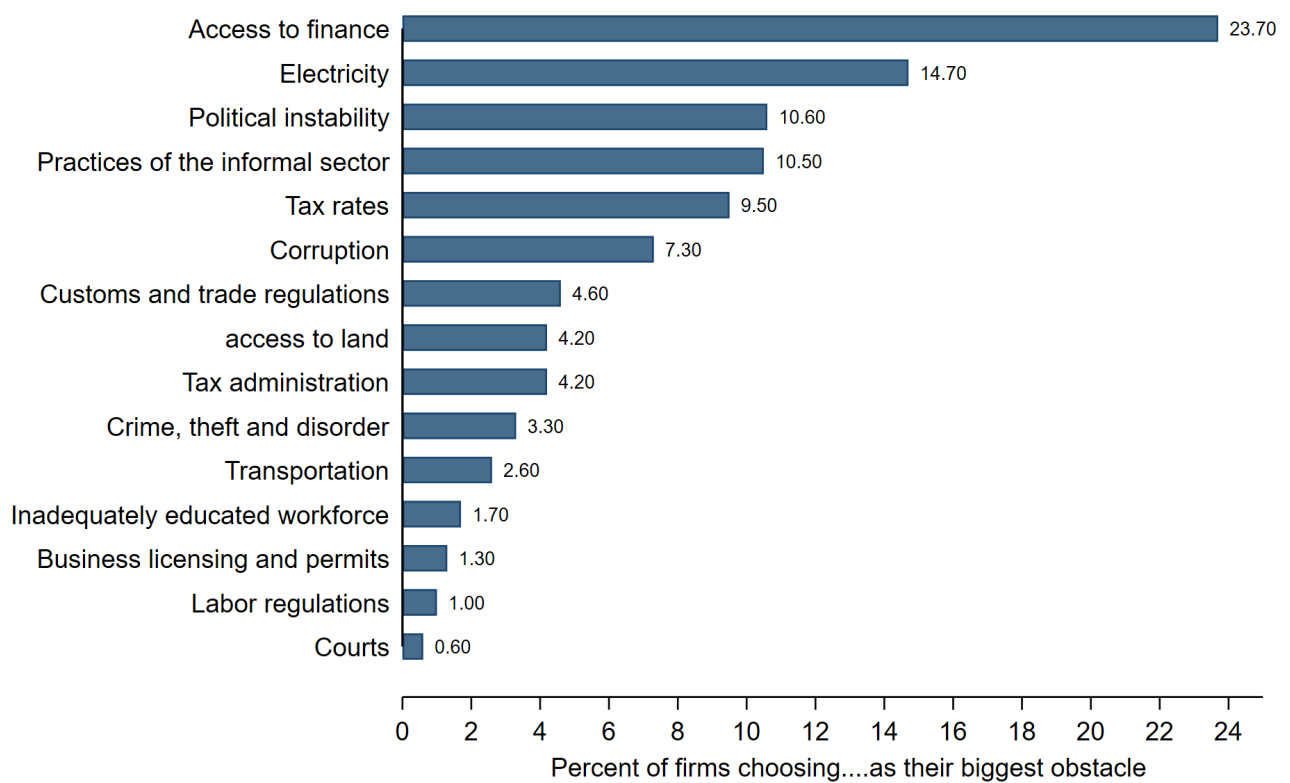
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Figure 1: Real annual sales and productivity growth (%) across world regions, 2006-2020



Source: Enterprise Surveys, The World Bank, <http://www.enterprisesurveys.org>

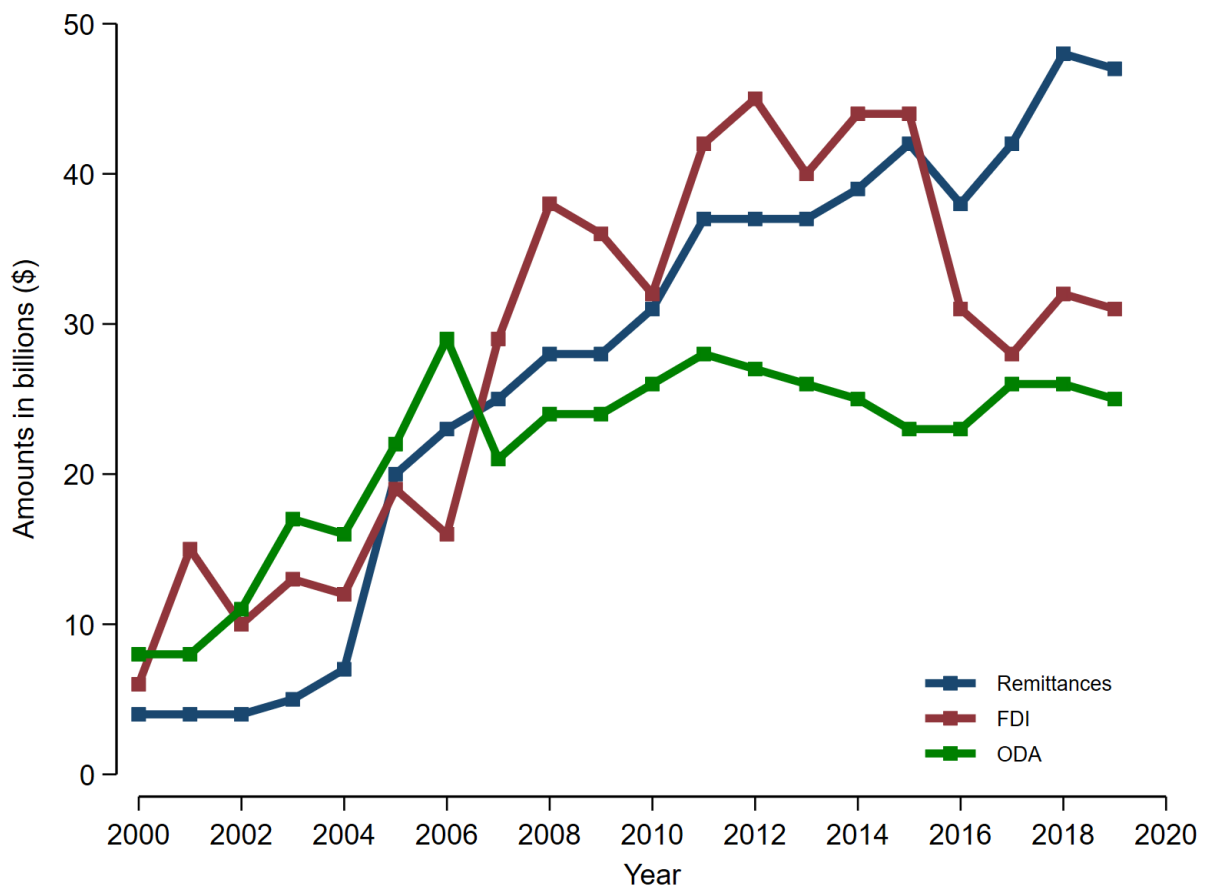
Figure 2: Main Obstacles Faced by Firms in Sub-Saharan African Countries, 2006-2020



Source: Enterprise Surveys, The World Bank, <http://www.enterprisesurveys.org>

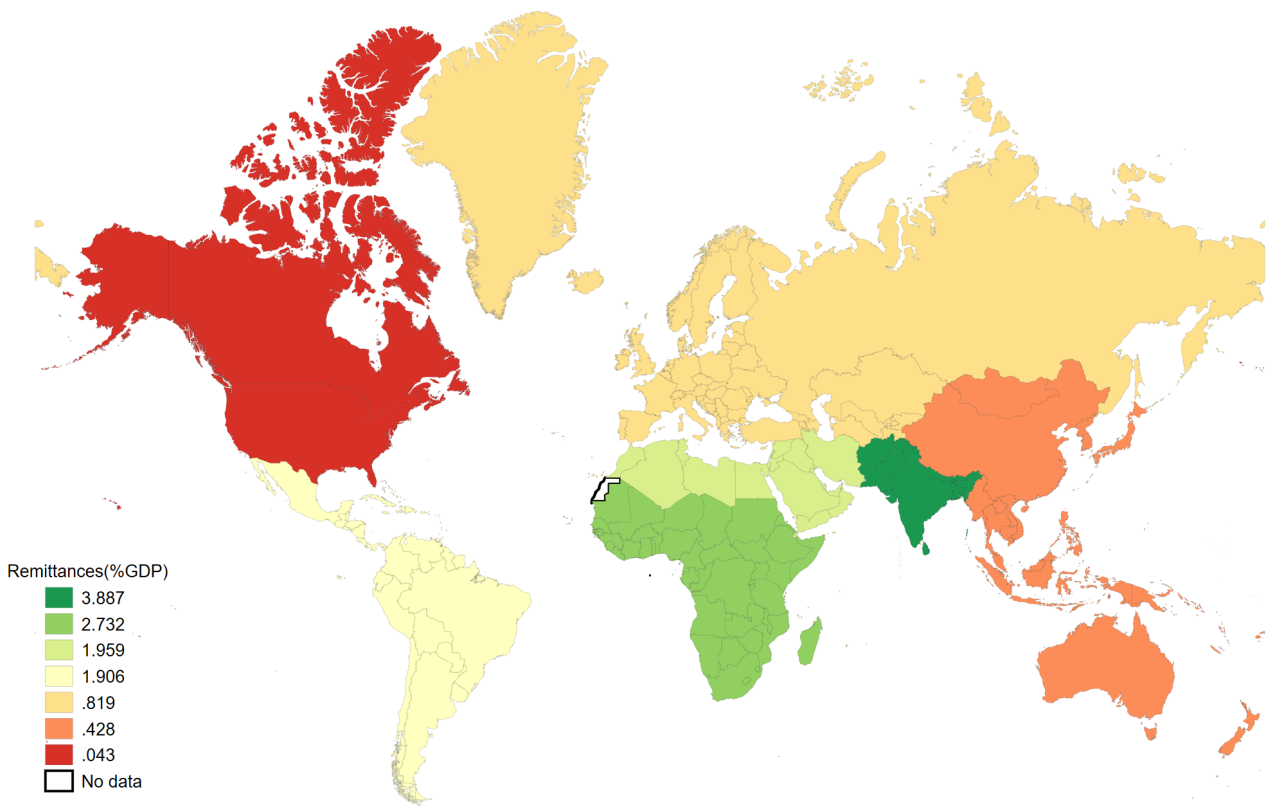


Figure 3: Remittances flows, Foreign Direct Investments and official development assistance to Sub-Saharan Africa



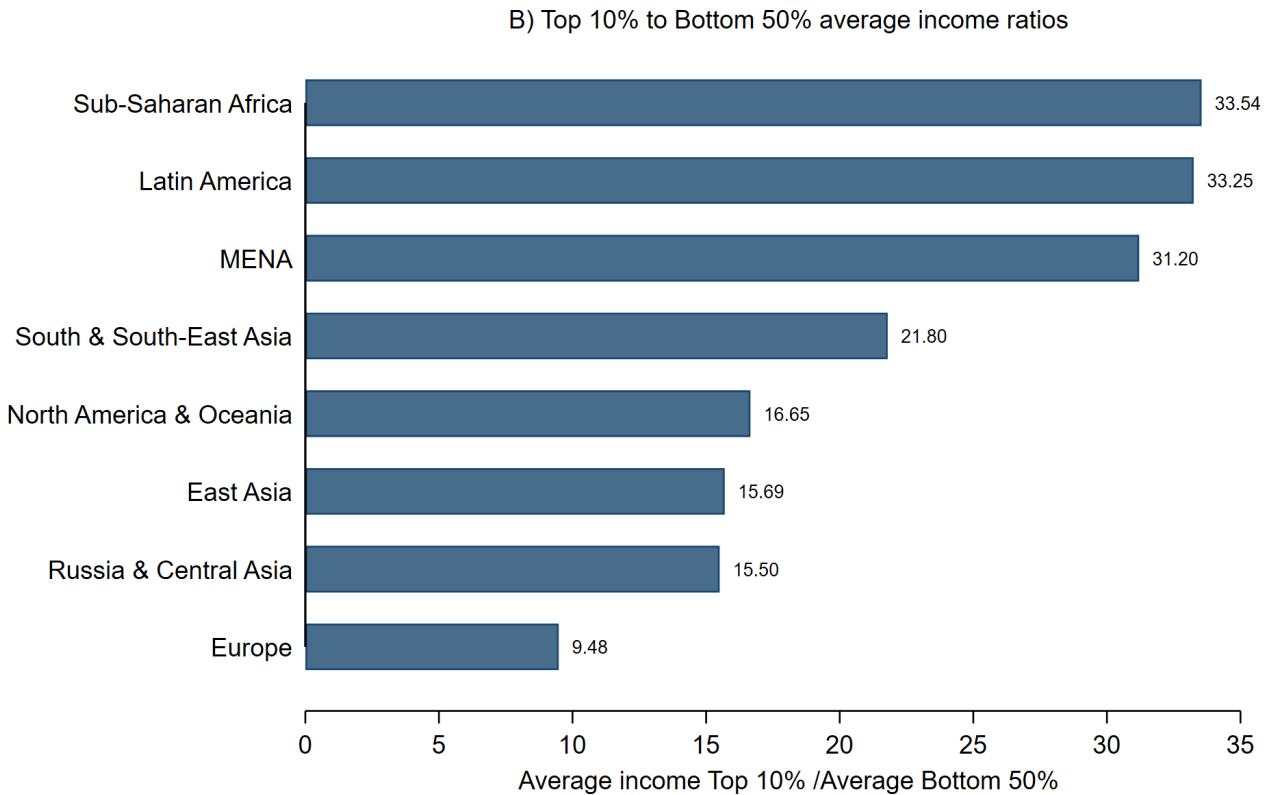
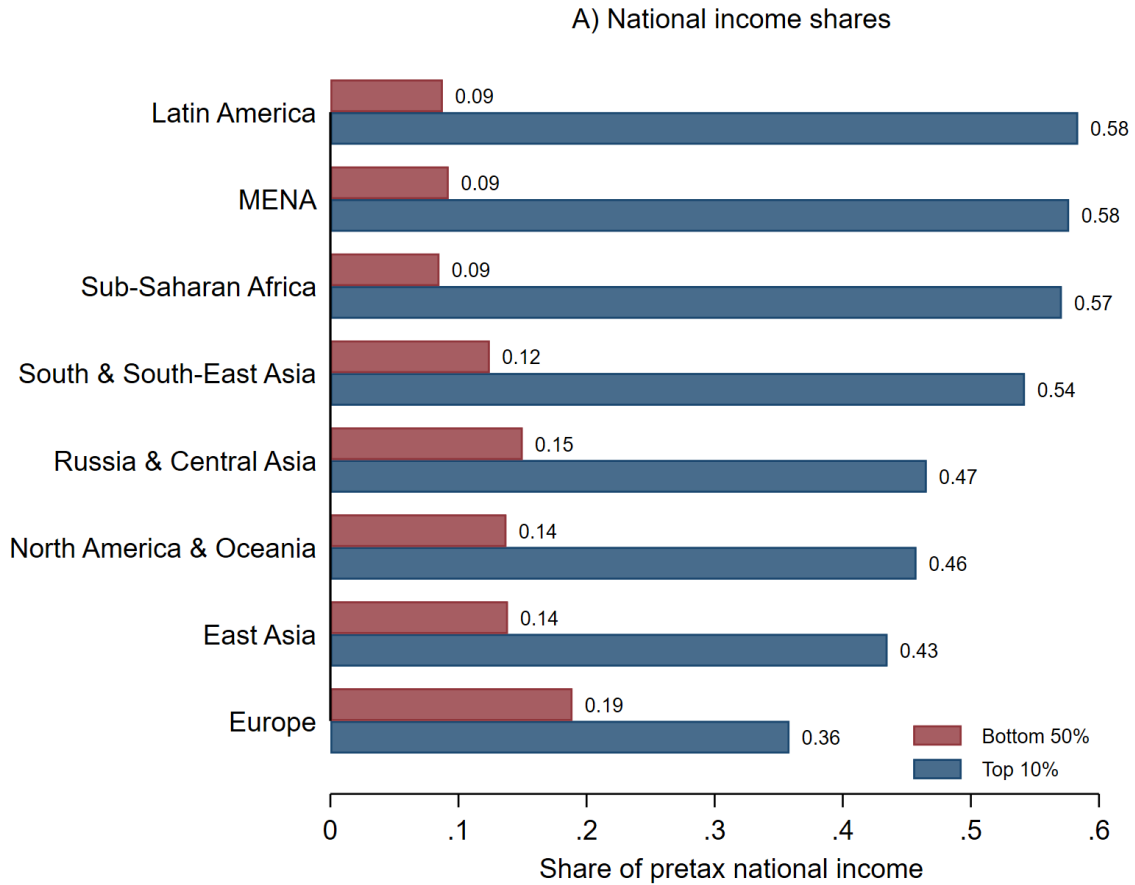
Source: Author using WDI data

Figure 4: Remittances, received (% of GDP) by world bank regions classification, 2019



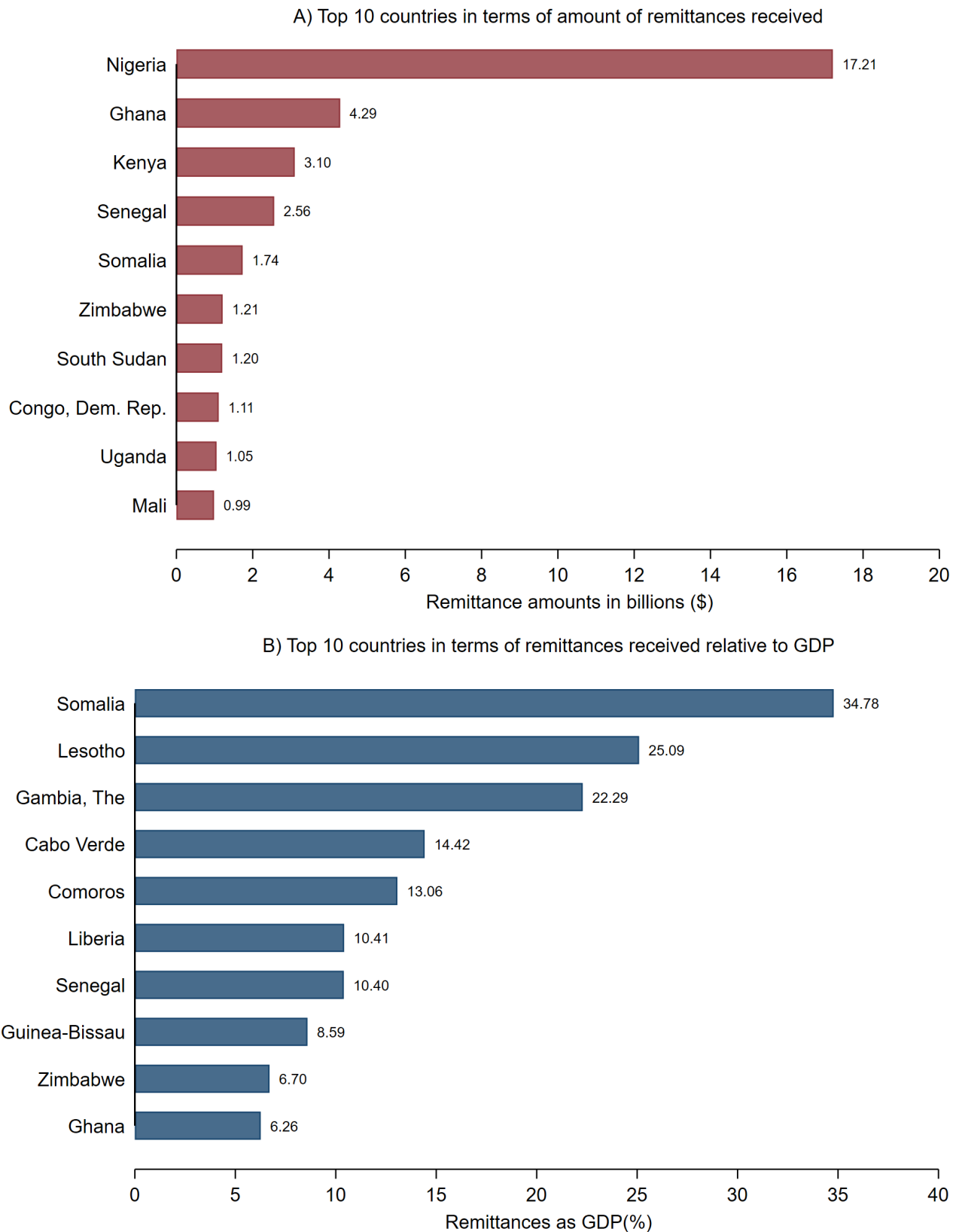
Source : Author using WDI database

Figure 5: Inequality levels across world regions, 2020



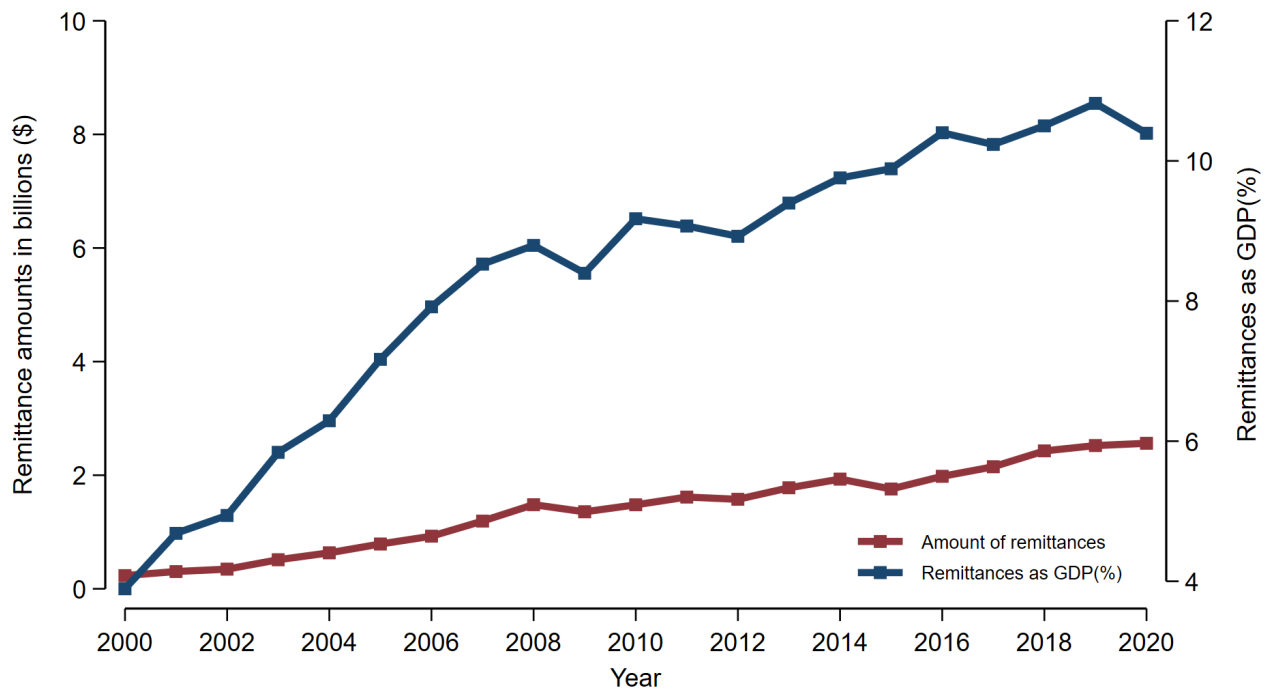
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Figure 6: Top 10 countries receiving remittances in Sub-Saharan Africa, 2020



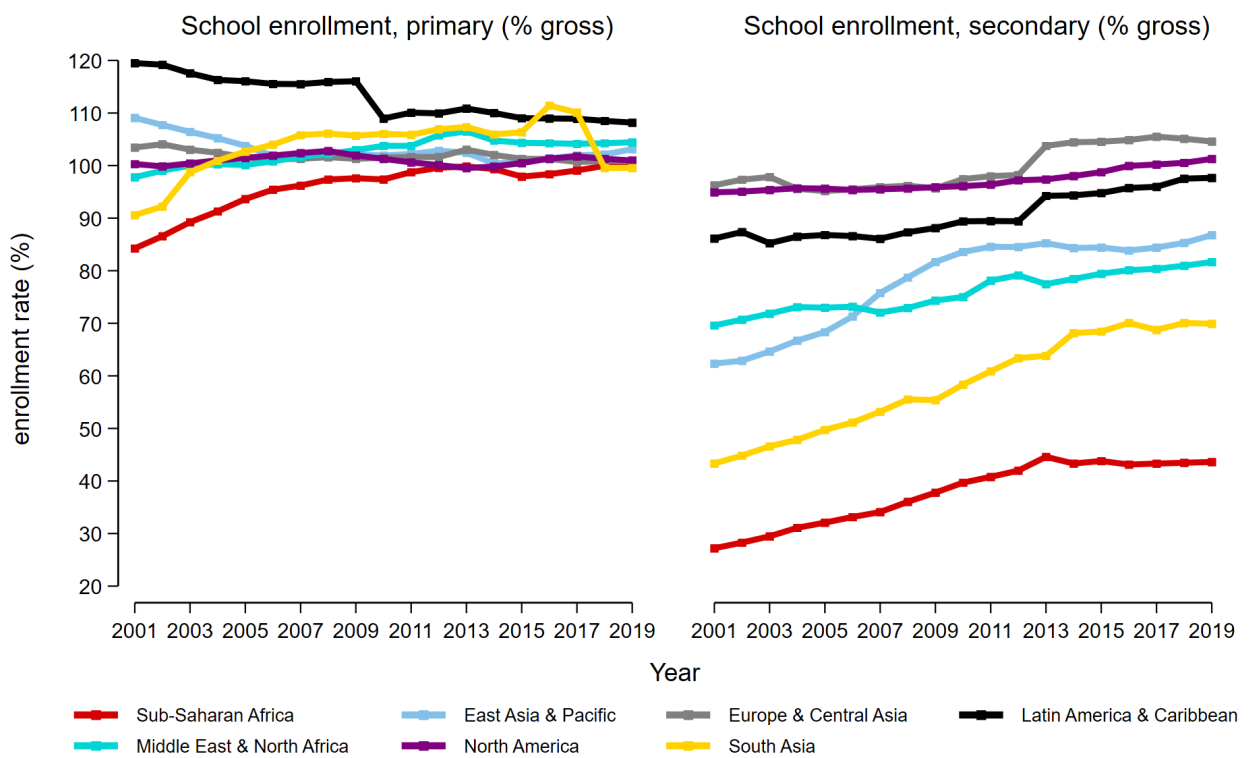
Source: Author using WDI data

Figure 7: Trends in remittances received in Senegal, 2000-2020



Source: Author using WDI data

Figure 8: School Attendance by World Bank Region, 2000-2019



Source: Author using WDI data



CHAPTER 1

REMITTANCES AND FIRM PERFORMANCE IN SUB-SAHARAN  
AFRICA: EVIDENCE FROM FIRM-LEVEL DATA

*This chapter is co-authored with Kabinet KABA( University  
Clermont Auvergne-CERDI)*



## 1.1 Introduction

Firms' growth is a key driver of economic development.<sup>1</sup> Their expansion affects the standard of living by increasing supply, employment, wage and productivity. However, firms in developing countries face several constraints that prevent or slow their growth. The main obstacles reported by firms in these countries are poor access to finance, high tax rates, limited access to electricity, and competition from the informal sector<sup>2</sup> (Figure 1.1). For instance, in Sub-Saharan Africa (SSA), 21% of firms report that access to finance is the main barrier to their operations, compared to 14.36% of firms in developing countries as a whole and 12.55% in developing countries outside SSA (Figures 1.2 and 1.3).

At the same time, remittances from African migrants have continued to increase, making SSA the second-largest recipient of remittances relative to GDP, behind South Asia (Figure 1.4). From \$20 billion in 2005, remittances to Africa more than doubled in 2019 to over \$40 billion. (Figure 1.5). Figures 1.5 and 1.6 show that remittances to SSA have not only increased significantly in recent years but, more importantly, have surpassed the other two sources of external financing, namely foreign direct investment (FDI) and Official Development Assistance (ODA). Furthermore, it can be noted that, unlike FDI, for instance, remittance flows are much more stable. Given the magnitude of these amounts, the question arises as to whether remittances can help alleviate some of the constraints discussed above and promote enterprises development. Specifically, how do remittances affect capital accumulation, domestic supply through domestic demand and employment in SSA countries

There are four main channels through which remittances can affect firms performance. First, they can reduce the liquidity constraints of firms (investment effect) so the obstacles related to financing. Indeed, remittances can enable recipients and senders to invest in the home country by buying shares in existing firms (intensive margin) or creating new firms (extensive margin). Second, remittances can affect firms activities through recipients' expenditures, therefore, domestic demand. As additional income, remittances can enable recipients to increase their demand and thus sales in local companies. The third channel, employment, directly results from the previous two. Indeed, the acquisition of capital in existing firms and the entry of new firms into the market could lead to investments in inputs such as labour, which could increase employment in firms. Similarly, the rise in local demand by the recipients would increase firms' supply and thus their demand for labour. Furthermore, remittances can also affect employment through the labour market participation of recipients (Acosta (2006), Amuedo-Dorantes & Pozo (2006) and Hanson (2005)). Finally, remittances can influence firms performance by sustaining recipients' consumption during recessions, thereby reducing volatility and macroeconomic risk.

<sup>1</sup>The terms firms, enterprises and companies have the same sense in this paper, so they are used alternately.

<sup>2</sup>The competition from the informal sector comes in part from products' imports to meet domestic demand.

This paper is close to the literature on remittances and entrepreneurship and remittances and expenditures. Studies on the effects of remittances on promoting enterprise development in migrants' countries of origin are scarce and mixed. While some papers have found a negative or no effect of remittances on entrepreneurship, others have found a positive impact. In the first set, [Amuedo-Dorantes & Pozo \(2006\)](#), in a study of the Dominican Republic, show that receiving remittances has a negative effect on the probability of owning a business. Similarly, [Ang et al. \(2009\)](#) find no significant impact of remittances on productive investment in the Philippines. Likewise, [Vasco \(2013\)](#) shows that neither migration nor remittances affect the probability of owning a business in rural Ecuador. Conversely, in the case of Mexico, [Massey & Parrado \(1998\)](#) found that remittances from the United States have a significant effect on firm investment. [Lopez-Cordova et al. \(2006\)](#) also found that remittances are an important source of capital for micro-enterprises. Similarly, [Woodruff & Zenteno \(2007\)](#) showed that Mexican small and medium-sized firms benefit financially from their connections to migrant networks in the United States. In the same way, [Yang \(2008\)](#) notes that a positive economic shock in the migrants' destination country leads to higher levels of entrepreneurial investment in origin households in the Philippines. Likewise, [Vaalder \(2011\)](#) finds that international remittances increase venture capital funds and business start-ups in migrants' home countries. More recently, [Efobi et al. \(2019\)](#) assessed the direct and indirect impact of remittances on industrialization using a panel of 49 African countries for the period 1980-2014. They find that remittances can stimulate industrialization through the financial development mechanism.

Regarding the spending effect of remittances, [Adams Jr & Cuecuecha \(2010a\)](#) show that remittances have a positive impact on marginal spending on food in Indonesia. [Clément \(2011\)](#) finds similar results in Tajikistan. Using a propensity score technique, he shows that international remittances positively affect household consumption. Likewise, [Zhu et al. \(2012\)](#) conclude that remittances are largely used for consumption purposes by Chinese rural households. Similar results were found by [Cattaneo \(2012\)](#) in Albania. In a similar vein, [Zhu et al. \(2014\)](#) study the impact of migrant remittances on consumption patterns in China. Using a large homogeneous sample of rural households surveyed in 2001 and 2004, they find that remittances are spent on non-housing consumption expenditures at the margin, virtually dollar for dollar. [Thapa & Acharya \(2017\)](#) use data from the 2010/2011 Nepal Living Standards Survey to study the effect of remittances on household spending patterns. Their results show that remittance recipient households tend to spend more on consumption. [Abdih et al. \(2012\)](#) also find that remittances positively affect consumption of imported and locally produced goods in the Middle East, North Africa, and Central Asia (MENA) countries. The elasticity of this impact ranges from 0.06 to 0.12. [Farzanegan & Hassan \(2020\)](#) pointed out that remittances have a boomerang effect on imports, increasing the competitive pressure on domestic firms and thus reducing their domestic

sales. Finally, Glytsos (1993) and Steinmann (1991) found a positive effect of remittances on imports in four European countries. Specifically, between 1960 and 1981, remittances increased imports by 1% in Spain and Italy, by 4.9% in Greece, and by 6.2% in Portugal.

Our study differs from the existing literature in several ways and makes three clear contributions. First, to our knowledge, this paper is the first to analyze the effect of remittances on enterprise development in SSA. Secondly, unlike the existing literature on household or macroeconomic data, we focus on firm-level data. The advantage of this approach is that it allows us to directly examine the effect of remittances on several firm outcomes (capital accumulation, sales, employment, etc.). Third, we analyze the impact of remittances on both manufacturing and non-manufacturing sectors. This approach will allow policymakers to clearly understand the impact of remittances on firm activities across sectors and thereby better target economic policies.

Using the fixed effects instrumental variables approach and a large sample of survey data on firms in 42 Sub-Saharan African countries between 2006 and 2020, we examine how international remittances contribute to firms' capital accumulation, sales, and job creation. The results first show that international remittances increase capital acquisition by nationals in manufacturing firms but not in non-manufacturing firms. Second, we find that international remittances negatively affect sales in manufacturing firms and positively impact non-manufacturing firms' sales. Finally, we observe a positive effect of remittances on employment in both manufacturing and non-manufacturing firms.

The remainder of the paper is structured as follows: Section 1.2 outlines the theoretical framework underpinning the relationship between remittances and firm development. The data used and the identification strategy are described in Sections 1.3 and 1.4, respectively. Section 1.5 presents the main results. In Section 1.6, we perform some heterogeneity tests. Section 1.7 presents some robustness checks, and Section 1.8 concludes.

## **1.2 Theoretical framework: remittances and firm performance**

There are four main transmission channels through which remittances affect firms performance namely investment effect, spending effect, employment effect and volatility-reducing effect.

### **1.2.1 Investment effect of remittances**

In countries like SSA, where access to credit is limited, remittances as an additional resource can help overcome some of the liquidity constraints (Mora & Taylor (2006), Kifle (2007), Yang (2008), Adams Jr & Cuecuecha (2010b)) and thus facilitate investment (Woodruff & Zenteno (2007)). Therefore, remittances can affect capital accumulation in firms through both the intensive and the extensive margin. From the intensive side, remittances can be used to acquire shares in

existing firms, thereby increasing the share of firms owned by nationals. From the extensive perspective, remittances can help finance new enterprises, which will increase the number of companies and thus domestic production.

Furthermore, remittances can positively impact investment through access to loans. The idea is that remittances can alleviate the collateral constraints faced by borrowers. Some papers have empirically demonstrated the complementarity between remittances and loan. For instance, [Ratha et al. \(2007\)](#) show that remittances indirectly contribute to a recipient household's ability to engage in business activities by facilitating access to loans for micro or small enterprises. [Richter \(2008\)](#), also finds that the amount of remittances received at the household level positively affects the demand for credit. Similarly, [Aggarwal et al. \(2011\)](#) provide evidence of a positive and significant effect of remittances on loans using data from 109 developing countries over 1975-2007. [Mbaye \(2021\)](#) leads to similar findings in rural areas of Senegal.

### **1.2.2 Spending effect of remittances**

Numerous articles have shown that remittances are primarily used to meet the current consumption needs of recipients ([Adams Jr & Cuecuecha \(2010a\)](#), [Clément \(2011\)](#), [Zhu et al. \(2012\)](#), [Cattaneo \(2012\)](#), [Zhu et al. \(2014\)](#), [Thapa & Acharya \(2017\)](#)). As such, remittances can affect business activities through sales. In particular, if recipients prefer local products, remittances will increase the demand for goods produced by local firms. Thus, one can expect an increase in the production and sales of these firms. However, if, on the contrary, remittance recipients prefer imported products, either because they are of better quality or because they are cheaper, there will be competitive pressure on local firms, which will negatively affect their sales ([Farzanegan & Hassan \(2020\)](#), [Glytsos \(1993\)](#), [Steinmann \(1991\)](#)). In addition, when remittances received increase significantly, the marginal propensity to consume could decrease in favour of the marginal propensity to invest, which could also negatively affect firms' sales.

### **1.2.3 Employment effect of remittances**

The effect of remittances on employment depends on the two previous effects, namely the investment effect and the expenditure effect ([Shapiro & Mandelman \(2016\)](#), [Woodruff & Zenteno \(2007\)](#), [Zachariah & Rajan \(2007\)](#), [Chami et al. \(2005\)](#)). First, acquiring capital in existing firms expands their ability to invest in inputs, including labour. Therefore, this intensive margin could contribute to an increase in the demand for labour by firms. Similarly, the entry of new firms into the market is likely to be accompanied by investments in inputs such as labour and capital, which could also be a source of labour demand. Second, as mentioned above, if remittances are used to purchase local goods, there should be an expansion of business activity through in-

creased sales, ultimately leading to increased labour demand. However, if remittances are spent on foreign goods, the opposite effect will occur. Finally, remittances may also positively affect employment because of their impact on human capital investment.

### 1.2.4 Volatility-reducing effect of remittances

Besides the direct effects described above, remittances can affect firm performance by reducing volatility. Indeed, a vast literature has shown that remittances are counter-cyclical for economic activity in the migrants' home country (De et al. (2019), Mondal & Khanam (2018), Jidoud (2015), Combes & Ebeke (2011), Craigwell et al. (2010), Chami et al. (2009)). They tend to increase during recessions or economic downturns to allow recipients to maintain their consumption. In addition, Mohapatra & Ratha (2011) show that when households face high volatility and income shocks, remittances can also help smooth income and make households more attractive as borrowers. Therefore, by reducing volatility and macroeconomic risk, remittances could positively influence the investment decision.

## 1.3 Variables and Data Description

This paper combines firm-level data with country-level macroeconomic data. The firm-level data come from the World Bank Enterprise Surveys (WBES) and cover the period 2006-2020. The WBES is a nationally representative enterprise survey that provides a wide range of information on firms' characteristics, performance, and constraints in developing countries. The final database contains 34,645 enterprises in 42 countries, and about 90% of countries have at least two survey waves. Macroeconomic data are from the World Bank's World Development Indicators. Subsection 1.3.1 describes the main variables, while subsection 1.3.2 presents some descriptive statistics.

### 1.3.1 Variables Description

#### 1.3.1.1 Firms' Variables

To assess the effect of international remittances on firm performance, we use the following three dependent variables :

- **Capital share owned by Nationals** : This variable is the first dependent variable. It represents the percentage of the firm's capital held by domestic economic agents in the surveyed country. Since our objective is to examine whether remittances affect the performance of firms in recipient countries, the best way to do this is to assess whether recipients

invest in firms. From this perspective, domestic economic agents' share of the firm is a good indicator of productive capital accumulation.

- **Firm's sales:** The second dependent variable is the firm's total annual sales. This variable is initially recorded in the country's local currency. However, we convert it to constant 2015 dollars and deflate it for inflation using the GDP deflator to facilitate cross-country comparisons. This variable allows us to understand whether remittances contribute to the growth of local businesses through the demand for local products.
- **Firms' employment:** The final dependent variable is the number of permanent full-time employees. These are all paid employees, hired for one or more fiscal years, guaranteed re-employment, and work up to 8 hours or more per day. The use of employment growth to measure increased business activity is not new. Several papers have previously used this variable as an indicator of firm performance (Coad (2010), Anyadike-Danes et al. (2009)).

The following variables are used as controls to account for some heterogeneity across firms :

- **Female ownership :** This variable provides information on the majority shareholder's gender, and it takes the value 1 if it is a woman and 0 otherwise. We control for this variable because the literature has shown that the probability of receiving remittances is higher for women in Sub-Saharan Africa (Plaza et al. (2011)).
- **Transport obstacle :** Since the poor quality of infrastructure service is a barrier to entrepreneurship and business output, we control transportation infrastructure quality. This variable is obtained by asking the manager to what extent the poor quality of the infrastructure service is an obstacle to the business. It includes the following modalities : (1) No obstacle, (2) Minor obstacle, (3) Moderate obstacle, (4) Major obstacle, and (5) Very severe obstacle. But in this study, we consider only the major and severe barrier dimensions. Thus, the quality of transportation infrastructure service is measured by a dummy variable that takes 1 if the barrier degree is major or very severe and 0 otherwise.
- **Location :** We also add firm location as a control variable to account for the agglomeration effect. Indeed, we can expect that remittances will not impact firms' activities in large cities as in small towns. The variable location is equal to 1 if the firm is located in a large city and 0 otherwise.
- **Size :** The variable size refers to the firm's size. We distinguish three categories of companies: small firms (less than 20 employees), medium firms (between 20 and 99 employees), and large firms (more than 100 employees). Controlling for this variable allows us to consider the effect of firm size.

### 1.3.1.2 Macroeconomics Variables

- **Remittances from migrants to SSA countries** : This variable is the explanatory variable of interest. It includes personal transfers (current cash or in-kind transfers) and worker compensation (wages of seasonal and other short-term SSA workers employed abroad). In the regressions, we use remittances to GDP in the baseline models and remittances per capita as robustness tests.
- **Trade** : The trade openness indicator represents the sum of exports and imports of goods and services as a percentage of GDP. This variable is included as a control because trade openness provides foreign sales opportunities for local firms on the one hand and imposes competitive pressure on them through imported products on the other.
- **Unemployment rate** : This variable is used as an independent variable because a high unemployment rate may, on the one hand, encourage individuals to turn to entrepreneurship and, on the other hand, reduce the cost of labor and thus the costs to firms. In addition, high unemployment can lead to a decline in people's income, which reduces their ability to invest.
- **Time required to start a business** : Time required to start a business is the number of calendar days needed to complete the procedures to legally operate a business. This variable aims to capture the cost of starting a business. For example, cumbersome procedures can encourage corruption and undermine entrepreneurship.
- **Real exchange rate** : The real exchange rate is the price level of output-based real gross domestic product per capita (CGDPo) at current purchasing power parity (PPP) rates defined relative to the US in 2017. An increase in the exchange rate reflects the depreciation of the local currency. This variable allows us to control for the effect of Dutch disease in remittances.
- **Domestic credit to private** : It refers to the financial institutions' financial resources provided to the private sector as a percentage of the deposit. These credits include loans, purchases of non-equity securities, trade credits and other accounts receivable, which give rise to a demand for repayment. We welcome this variable as an explanatory variable because it measures the ease of access to credit, impacting our dependent variables.
- **Political stability index** : This variable measures people's perception of political instability and violence. It ranges from -2.5 to 2.5. A score of -2.5 indicates a high level of political instability, while a score of 2.5 indicates a high level of political stability. The addition of



this variable among the control variables allows us to consider the quality of the countries' institutions.

- **Control corruption index** : Among the obstacles to entrepreneurship identified in the countries of sub-Saharan Africa, corruption occupies a crucial place. For this reason, we control the level of corruption in the country. The variable used as a corruption index is the percentage of companies identifying corruption as a major constraint.
- **Electricity service quality** : As the quality of transportation infrastructure, power quality can be a critical factor in investing in a business. The quality of electricity access is measured in this paper by the average number of power outages a firm experiences in a typical month in the country.
- **GDP per capita**: is the total gross value added by all resident producers of the country plus taxes on products and less subsidies not included in the value of products relative to the total population. This variable reflects both the size of the economy and the level of national wealth. A higher GDP per capita means a substantial national market to satisfy and resources to invest in entrepreneurship.
- **Domestic investment** : Gross fixed capital formation (GFCF) includes land improvements (fences, ditches, drains, etc.), purchases of plant, machinery, and equipment, and the construction of roads, railroads, and other facilities, including schools, offices, hospitals, private residential housing, and commercial and industrial buildings. We control for this variable because one firm's investment in input is an opportunity for another firm's sales of final goods. Thus, an increase in GFCF can boost demand for local products and create a dynamic for entrepreneurship.
- **Remittances prices**: is the amount one must pay to send \$200, as a percentage of the amount sent. It comes from the Remittance Prices Worldwide database. We use this variable as an instrument for international remittances.
- **Foreign-born employment rates interacted with emigration rates in OECD countries** : This variable serves as a second instrument. It is obtained by interacting two variables : (1) The foreign-born employment rate in OECD countries and (2) the emigration rate from each country to OECD countries. They are collected from the OECD database (DIOC).

### 1.3.2 Data Description

As mentioned earlier, this paper combines firm-level and macroeconomic data. Table [A.1.1](#) shows that about 90% of countries have at least two waves of the enterprise survey. This table also



shows the year of the survey, the total number of firms surveyed, and the manufacturing and non-manufacturing firms surveyed in each wave by country. Overall, the number of firms surveyed per wave is higher in Kenya, Nigeria, and South Africa than in other Sub-Saharan African countries.

In Table A.1.2, we present the number of firms and each industry's share by sector. We can see that non-manufacturing and manufacturing firms represent 55% and 45% of the overall sample, respectively. Wholesale and retail trade (72,61%), hotels and restaurants (12.10%), and construction (6,66%) represent the largest share of industries in the non-manufacturing sector. In the manufacturing sector, the over-represented industries are food (26.39%), clothing (13.33%), and furniture manufacturing (11.50%).

Table 2.1 presents the summary statistics of the main variables used in our study. First, we find that, on average, the share of capital held by nationals, which is the first dependent variable, is 81.84%. This rate stands at 83% in the manufacturing sector and 81% in the non-manufacturing sector. On average, the surveyed firms employ 55 permanent full-time employees. Manufacturing firms (71) have more employees on average than non-manufacturing firms (42). In terms of sales, the annual amounts reported by manufacturing firms are on average higher than those of non-manufacturing firms. Concerning the remittance variables, the amount of remittances received represents on average 3.13 percent of total GDP. The annual per capita amount received is \$ 43.

## 1.4 Empirical Specification

To estimate the effect of international remittances on business activities, the basic econometric model is :

$$Y_{f,i,c,t} = \alpha + \beta R_{c,t-1} + \gamma X_{c,t-1} + \delta F_{f,i,c,t} + \Psi_i + \Theta_c + \Phi_t + \epsilon_{f,i,c,t} \quad (1.1)$$

Where  $Y_{f,i,c,t}$  is one of our three measures of business activity (*Share of the firm owned by nationals, firm sales, and firm employment*) in firm  $f$ , industry  $i$ , country  $c$  at time  $t$ .  $R_{c,t-1}$  is our variable of interest. It represents the international remittances (expressed as percentage of GDP) received by country  $c$  at time  $t-1$ . We use lagged remittances because the effect of remittances on business activities may not be instantaneous. One can imagine, for example, that people who receive remittances will first try to satisfy their daily consumption needs. Only later, when they have saved enough, can they invest in business activities. Therefore, remittances received in year  $t$  do not necessarily affect the capital held by nationals in the same year.  $X_{c,t-1}$  is a vector of country-level control variables that can affect our dependent variables, while  $F_{fict}$  represents a vector of firm-level control variables. To deal with the likely endogeneity of these

control variables, especially because of possible reverse causality, we consider the lags of these variables.  $\Psi_i$ ,  $\Theta_c$  and  $\Phi_t$  are industry, country and year fixed effects, respectively.  $\epsilon_{ict}$  is an idiosyncratic error term.

Although adding industry, country, and year fixed effects and using lagged remittances allows us to control for time-invariant heterogeneity, there may still be an unobserved, time-varying omitted variable that affects remittances and business activities. To overcome the remaining endogeneity issue, we use the instrumental variables approach. Specifically, we use the following two instruments : (1) remittance prices and (2) foreign-born employment rates in OECD countries interacted with the emigrant rate from country  $c$  in OECD countries.

Regarding the first instrument, we use, more specifically, the average cost of sending \$ 200 to country  $i$ . The idea behind this choice is that transaction costs, in particular transfer prices, can be a major obstacle to sending money. If it is more expensive to remit to country  $i$ , the volume of remittances sent by migrants to that country may decrease. Therefore, a negative relationship between the average cost of remittances and the amount of remittances received is expected. Many articles have already highlighted the role of remittance prices on the volume of remittances. For instance, [Freund & Spatafora \(2008\)](#) find that remittances depend negatively on transfer costs and exchange rates restrictions. [Gibson et al. \(2019\)](#) also show that remittances have negative cost elasticity. In addition, the cost of transferring funds consists of a fee for sending a certain amount, a margin on the exchange rate when transfers are made and received in different currencies, and the transfer speed. They can vary from country to country depending on competition and regulatory barriers. Therefore, it is unlikely that these costs affect the performance of firms in the destination country other than through remittances.

Our second instrument is the foreign-born employment rate in OECD countries interacted with the emigration rate of country  $c$  in OECD countries <sup>3</sup>. The use of migrants' economic conditions in destination countries as an instrument for sending remittances is not new ([Acosta et al. \(2008\)](#), [Amuedo-Dorantes & Pozo \(2011\)](#)). The rationale behind this instrument is that if foreign-born employment rates increase in destination countries, migrants' incomes may increase, which means they will have more money to send home. Therefore, one would expect a positive relationship between foreign-born employment rates in destination countries and remittances received in migrants' countries of origin. However, to allow the effect of foreign-born employment rate in OECD countries on remittances to vary across countries, We weight the foreign-born employment rate in OECD countries by the emigration rate from each country  $c$  to OECD countries. We focus on migrants' economic conditions in OECD countries, as they are the main remittance-sending countries to Sub-Saharan Africa ([Ratha et al. \(2020\)](#)). Similarly,

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3

Weight foreign born employment rate =  $\frac{\text{Migrants from country } c \text{ in OECD countries}}{\text{Total population of the country } c}$  \* foreign-born employment rate in OECD country

conditional on the control variables, this variable is less likely to affect firm performance, except through remittances.

Figure 1.7 shows the relationship between remittances received relative to GDP and the cost of sending \$200 to a specific country and the relationship between the weighted foreign-born employment rate in OECD countries and remittances to GDP received. As expected, we can observe in Figure 1.7 that the amount of remittances received is lower when the cost of sending remittances is higher (left graph). In contrast, there is a positive relationship between remittances and the weighted foreign-born employment rate in OECD countries (right chart).

Our claim is that, conditional on the set of control variables included in our specification, the unobserved components of the dependent variables are uncorrelated with these two instruments. Based on the above, we use an instrumental variable fixed effects (IVFE) approach where, first, we estimate the amount of international remittances received in t-1 as follows:

$$R_{ct-1} = \alpha + \beta Z_{ct-1} + \gamma X_{t-1} + \delta F_{f,i,c,t} + \Psi_i + \Theta_c + \Phi_t + \nu_{ct} \quad (1.2)$$

Where  $R_{ct-1}$  is the suspected endogenous variable at time t-1 (Amount of international remittances to GDP).  $Z_{ct-1}$  is a vector of the instrumental variables described above at time t-1.

The second-stage equation estimating the effect of international remittances on business activities can be estimated as follows:

$$Y_{f,i,c,t} = \alpha + \beta \widehat{R}_{c,t-1} + \gamma X_{c,t-1} + \delta F_{f,i,c,t} + \Psi_i + \Theta_c + \Phi_t + \epsilon_{f,i,c,t} \quad (1.3)$$

Where  $\widehat{R}_{c,t-1}$  is the fitted values of  $R_{ct-1}$  from the first stage.  $Y_{ict}$ ,  $X_{ct-1}$ ,  $F_{fict}$ ,  $\Psi_i$ ,  $\Theta_c$  and  $\Phi_t$  are the same variables described in equation (3.2). Our coefficient of interest is  $\beta$ .

## 1.5 Results

In this section, we present the main results of our analysis, starting with the effect of remittances on investment, followed by that on firm sales, and finally, the impact of remittances on employment.

### 1.5.1 Effect of remittances on capital owned by nationals

The first way to study the productive use of remittances in SSA is to analyze their effect on the participation of nationals in the capital of firms. The point is that if remittances are used for investment purposes, we could observe a positive impact of remittances on the share of firms owned by nationals. The results of this analysis using ordinary least squares (OLS) and the fixed effect model are presented in Appendix Table A.2.1. In the first three columns, where we

report the results of the OLS model, we find a positive effect of remittances on the share held by nationals. Specifically, on average, a 1 percentage point increase in remittances to GDP leads to a rise in capital held by nationals of about 0.556 percentage points in the total sample (column 1). This positive effect is observed in both the manufacturing (+0.680) and non-manufacturing (+0.538) sectors. Results including year, country and industry fixed effects are shown in columns 4, 5 and 6. Overall, we find that remittances positively affect the share held by nationals only in the manufacturing sector with this model.

However, neither model adequately deals with the endogeneity of remittances raised earlier. We use a fixed-effects instrumental variable approach (IVFE) to address this issue. The first and second stages results are presented in Tables 1.2 and 1.3. As expected, Table 1.2 shows that the instruments used predict well international transfers. Indeed, the weighted foreign-born employment rate in the OECD is positively and significantly associated with remittances received in SSA countries, while the cost of remittances affects negatively international remittances. We can also note at the bottom of Table 1.3 that the instruments used are relevant. They pass both weak identification and under-identification tests. Indeed, the Kleibergen-Paap Wald F rk statistic for weak identification is well above the critical values of Stock-Yogo. Moreover, the p-value associated with the Kleibergen-Paap LM rk statistic is below 5% which allows to reject the null hypothesis of no correlation between the instruments and the endogenous variable.

The second stage estimation results are presented in Table 1.3. The first three columns give the results for the entire sample. The following three columns show the manufacturing sector results, and the last three columns report the results of the non-manufacturing sector. First, we find that international remittances have a positive and statistically significant effect on the share of capital held by nationals in the overall sample. More precisely, a 1 percentage point increase in remittances relative to GDP tends to increase the percentage of capital held by citizens by 1.10 percentage points (column 1). We then gradually introduce GDP per capita and domestic investment, as these variables are transmission channels for remittances. The objective is to test the robustness of the effect to the inclusion of these variables. Columns 2 and 3 show that controlling GDP per capita and domestic investment only slightly reduces the effect size.

As for the sectors in which people invest, the results show that remittances have a positive and statistically significant impact in the manufacturing sector only. In the full model (column 6), the effect of a 1% increase in remittances on the share held by nationals in this sector is about 1.40 percentage points.

### 1.5.2 Effect of remittances on firm sales

Since a significant portion of remittances is used for consumption purposes ([Adams Jr & Cuecuecha \(2010b\)](#), [Clément \(2011\)](#), [Zhu et al. \(2012\)](#), [Thapa & Acharya \(2017\)](#)), we examine how remittances affect business sales in SSA in this subsection.

Table [A.2.2](#) displays the results using OLS and the fixed effect model. Both models show a negative effect of remittances to GDP on firm sales. However, the results change when we correct for the endogeneity of remittances, as shown in Table [1.4](#). Contrary to the previous results, we find a positive effect of remittances on firm sales. In particular, a 1 percentage point increase in remittances to GDP leads to a 0.08% increase in firm sales in the full model (column 3). Looking at the effect by sector, we find that remittances increase sales for non-manufacturing firms, while an adverse effect is observed for manufacturing firms. Note that a 1 percentage point increase in remittances to GDP raises sales of non-manufacturing firms by 0.125% and reduces those of manufacturing firms by 0.129%.

These results are not surprising for at least two reasons. First, a large empirical literature has shown that remittances in developing countries are spent more on health, housing, food and services ([Thapa & Acharya \(2017\)](#), [Mohanty et al. \(2014\)](#), [Zhu et al. \(2012\)](#), [Clément \(2011\)](#), [Adams Jr & Cuecuecha \(2010b\)](#), [Yang \(2008\)](#), [Kifle \(2007\)](#), [Mora & Taylor \(2006\)](#), [Lucas \(2005\)](#)). The fact that most of these goods are provided by the non-manufacturing sector could explain the positive effect observed in this sector. Second, the increase in the income of remittance recipients could lead them to prefer foreign products to domestic ones, either because imported products are of better quality or because they are cheaper. This preference for foreign manufactured goods could reduce the domestic manufacturing firms' sales on the one hand and increase the sales of non-manufacturing importing firms, such as wholesale and retail trade, on the other ([Farzane-gan & Hassan \(2020\)](#), [Glytsos \(1993\)](#), [Steinmann \(1991\)](#)). This substitution effect is particularly plausible in the case of SSA countries, given their low level of industrial development.

### 1.5.3 Effect of remittances on employment

In this subsection, we examine whether international remittances affect business employment. We focus on the permanent full-time employment, which are more stable and decent jobs.

Table [A.2.3](#) reports the results using the OLS and fixed-effects models. The OLS results show a positive effect of remittances on employment regardless of the sector of activity (columns 1-3). However, in the fixed-effect models, a positive and significant impact is found only on employment in non-manufacturing firms. The results using the IVFE approach are presented in Table [1.5](#). First, we find a positive and statistically significant effect of remittances on the number of permanent full-time employees. For instance, in the full model, a 1 percent point

increase in remittances to GDP results in a 0.05% increase in the number of permanent full-time employees. Second, when we examine the effect by sector, we find that the positive effect remains regardless of the sector considered. But the magnitude of the effect is much more prominent in the non-manufacturing sector. Indeed, an increase in remittances to GDP of one percentage point leads to an increase in employment in the non-manufacturing sector of 0.08%, compared to 0.04% in the manufacturing sector.

There are two points to note about these results. First, despite the negative effect of remittances on manufacturing sales observed in the previous subsection, we find a positive impact on manufacturing employment. This could be due to the investment effect of remittances in the manufacturing sector observed in subsection 1.5.1. Indeed, the purchase of shares in existing firms, for example, could increase their capital and boost their ability to invest in inputs such as labour. Similarly, the entry of new firms into the market may be accompanied by new investments in labour and capital. Second, for the non-manufacturing sector, it appears that the positive effect of remittances on employment is entirely due to the spending effect of remittances. In general, non-manufacturing firms tend to be more labour-intensive than manufacturing firms. They involve a significant degree of customization or interaction with customers, so their operations depend highly on employees. In this context, an increase in remittance driven demand will push these companies to expand their offerings by hiring more staff to meet these new needs.

## 1.6 Heterogeneity Tests

In this section, we perform several heterogeneity tests. Note that in this section, we focus mainly on the results using the instrumental variables approach.

### 1.6.1 Does the effect of remittances depend on the level of financial development of countries?

This part examines whether the effect of remittances on capital accumulation depends on the country's financial development. Indeed, since remittances alleviate liquidity constraints, one would expect the impact of remittances on firm ownership to be greater in countries with low financial development.

To perform this heterogeneity test, we consider the share of domestic credit to the private sector relative to GDP as an indicator of financial development. We first exclude the top 25% of financially developed countries. Table 1.6 summarizes the results of this first analysis. As previously, we find a positive and statistically significant effect of remittances on capital held by nationals in the manufacturing sector. However, when we compare the impact size, the effect is larger (1.891) than what we found with the entire sample (1.414) in Table 1.3.

Second, we alternately exclude the 25% least financially developed countries. The idea is that if the effect of remittances is larger in the less financially developed countries, we might have a smaller or no effect when we exclude these countries. The results reported in Table 1.7 confirm what we found earlier. The effect of remittances on the share held by nationals is smaller and statistically insignificant. Taken together, these results reveal that remittances are mainly used for investment purposes in countries with low levels of financial development.

### 1.6.2 Exclusion of major remittance-receiving countries

The second test of heterogeneity that we perform concerns the level of dependence of countries on remittances. According to the "Samaritan's dilemma," people who are highly dependent on remittances may substitute entrepreneurship and labour force participation for leisure. Thus, countries that rely heavily on remittances may have low levels of entrepreneurship.

We test this possibility by excluding the major remittance-receiving countries. We consider countries for which remittances represent at least 10% of GDP as the main beneficiaries. The rationale is that if there is a "Samaritan's dilemma", the effect of remittances on firm performance would be higher without countries that are highly dependent on remittances.

Table 1.9 displays the results of this heterogeneity test. Overall, we find similar results to the full sample. For instance, the effect of remittances on GDP on the share held by nationals is 1.396 when we exclude versus 1.402 in the whole model (Table 1.3). As for the effect of remittances on the sales of non-manufacturing firms, the coefficient obtained is 0.098 in the sample excluding top receivers versus 0.125 in the entire sample (Table 1.4). All of these findings reject the "Samaritan's dilemma" risk.

### 1.6.3 Exclusion of resources-dependent countries

According to the Dutch disease phenomenon, in resource-rich countries, resources such as labour and financial flows shift from other sectors to the natural resource sector. This subsection examines whether this is also true for migrant remittances. To do so, we exclude resource-rich countries from the sample and compare the effect of remittances with that found when we include them. Resource-rich countries are countries where rents represent more than 10% of GDP. If the Dutch disease phenomenon also holds for remittances, the effect of remittances on firm performance should be larger when these countries are excluded from the sample.

As expected, Table 1.10 shows that excluding resource-rich countries increases the size of the investment effect of remittances in the manufacturing sector relative to the overall sample. Specifically, an increase of 1 percentage point in remittances relative to GDP leads to an increase of 2.913 percentage points in the capital held by nationals (column 2). In comparison,



the increase in shares held by nationals induced by remittances is 1.402 percentage points for the entire sample. The impact of remittances on manufacturing employment rises from 0.04% in the full model to 0.10% in non-resource-rich countries (column 8). For manufacturing sales, the effect of remittances becomes positive when resource-rich countries are excluded, whereas it was negative in the entire sample. Precisely, a 1 percentage point increase in remittances to GDP increases manufacturing sales by 0.256% (column 5) without resource-rich countries. In contrast, remittances reduce sales of manufactures by 0.129% in the whole model. Moreover, the effect of remittances on non-manufacturing sales (0.752%) is higher in this specification than in the baseline model (0.125%).

#### **1.6.4 Effect of remittances according to firm size**

Finally, we investigate how the effect of remittances on the different outcomes varies according to firm size. We distinguish three categories of firms based on their size: (1) small firms (less than 20 employees), (2) medium firms (between 20 and 99 employees), and (3) large firms (over 100 employees). We report the results of this analysis in the Table 1.11. Panels A, B, and C show the effect of remittances on the share of domestically owned firms, sales, and employment, respectively.

In panel A, we first find that remittances positively affect the share of capital held by nationals in all small firms (column 1). However, this effect is no longer significant when examining each sector (columns 2 and 3). In columns 4-6, where the impact of remittances on ownership in medium-sized firms is reported, we note a positive effect only in the manufacturing sector. The last three columns in Panel A suggest that remittances do not positively impact the share of capital held by nationals in large firms.

Regarding the effect of remittances on sales by firm size, Panel B highlights two key findings. First, we find that small firms drive the negative effect of remittances on manufacturing firm sales observed above (column 2). This result confirms the hypothesis that when remittances increase, recipients prefer higher quality imported goods to locally produced goods. In general, small manufacturing firms tend to have more constraints to improve the quality of their products, so they are the most affected by this preference for imported goods. Second, we find that remittances positively affect the sales of medium and large non-manufacturing firms.

Finally, the employment results presented in Panel C indicate a positive and statistically significant effect of remittances on employment in small and medium-sized non-manufacturing firms. We also find that remittances positively affect employment in medium-sized manufacturing firms.



## 1.7 Robustness Checks

This section tests the robustness of the results to the choice of the variable of interest. Specifically, we use per capita remittances to measure transfers instead of remittances relative to GDP. The main findings of this estimation are shown in Appendix [A.3](#).

Table [A.3.1](#) presents the results of the effect of remittances per capita on the share of firms owned by nationals. In the last three columns, where results using the instrumental variable fixed effects approach are reported, we find that remittances per capita positively affect domestic ownership in manufacturing firms. Specifically, we observe that a 1% increase in remittances per capita increases the share of manufacturing firms owned by nationals by 0.145 percentage points. Estimates of the effect of per capita remittances on business sales are shown in Table [A.3.2](#). As with remittances to GDP, we find that remittances per capita negatively affect the sales of manufacturing firms. However, the impact of remittances per capita on the sales of non-manufacturing firms is not statistically significant. Finally, Table [A.3.3](#) shows a positive and statistically significant effect of remittances per capita on full-time employees, regardless of sector.

Overall, the results for remittances per capita are consistent with those for remittances to GDP, confirming the robustness of the results to the choice of the variable of interest.

## 1.8 Concluding Remarks

This paper explores the effect of Sub-Saharan Africa's new main source of external finance, remittances, on firm performance. Specifically, we use a fixed-effect instrumental variable approach and a large sample of firms in 42 Sub-Saharan African countries between 2006 and 2020 to examine how remittances contribute to capital accumulation, firm sales, and job creation in this region. The results highlight three key findings.

First, the results show that international remittances increase the acquisition of capital by nationals in manufacturing firms. Specifically, we find that international remittances to GDP increase the share of firms owned by nationals in this sector by 1.40 percentage points. Second, analysis of the effect of international remittances on firm sales reveals a negative impact of remittances to GDP on the sales of manufacturing firms and a positive effect on non-manufacturing firms. A 1 percentage point increase in remittances to GDP increases sales of non-manufacturing firms by 0.125% and reduces sales of manufacturing firms by 0.129%. Finally, we observe a positive effect of remittances on job creation in manufacturing and non-manufacturing firms. Especially, a 1 percentage point increase in the share of remittances in GDP leads to a rise in employment of 0.08% in the non-manufacturing sector and 0.04% in the manufacturing sector.

We also conducted several heterogeneity tests that yielded interesting results. The first het-

erogeneity test shows that the impact of remittances on capital accumulation is higher in the less financially developed countries. Indeed, we find an increased effect of remittances on the share of firms owned by nationals when we exclude the most financially developed countries compared to the baseline model. Second, our results do not seem to be influenced by the main recipient countries of remittances since the results remain unchanged when we exclude these countries. Third, the results show that the effect size is very large in non-resource rich countries. Finally, we find that remittances mainly improve the performance of medium-sized firms.

The last section shows the robustness of the results to the choice of the variable of interest. Similar results are found when per capita remittances are used as an indicator instead of remittances relative to GDP.

These results have several policy implications. First, the positive effect of remittances on investment suggests a productive use of remittances. This demonstrates that remittances can be a source of finance for the manufacturing sector, which faces enormous difficulties in accessing finance. However, the lack of impact in the non-manufacturing sector suggests the persistence of other challenges to entrepreneurship, such as business profitability, poor infrastructure (roads, electricity, etc.), bureaucracy and corruption. If these barriers are removed, the investment effect of remittances in this region can be substantial. Second, the negative effect of remittances on manufacturing sales indicates a substitution of foreign industrial products for domestic manufactured goods. This phenomenon mainly affects small manufacturing firms. Therefore, to improve their sales and benefit from the spending effect of remittances, African manufacturing firms need to enhance the competitiveness of their products. Policymakers can also play a key role in improving the quality of local products by ensuring adequate transport and energy infrastructure. Policymakers can also help promote local products, especially those produced by small firms, by subsidizing them.

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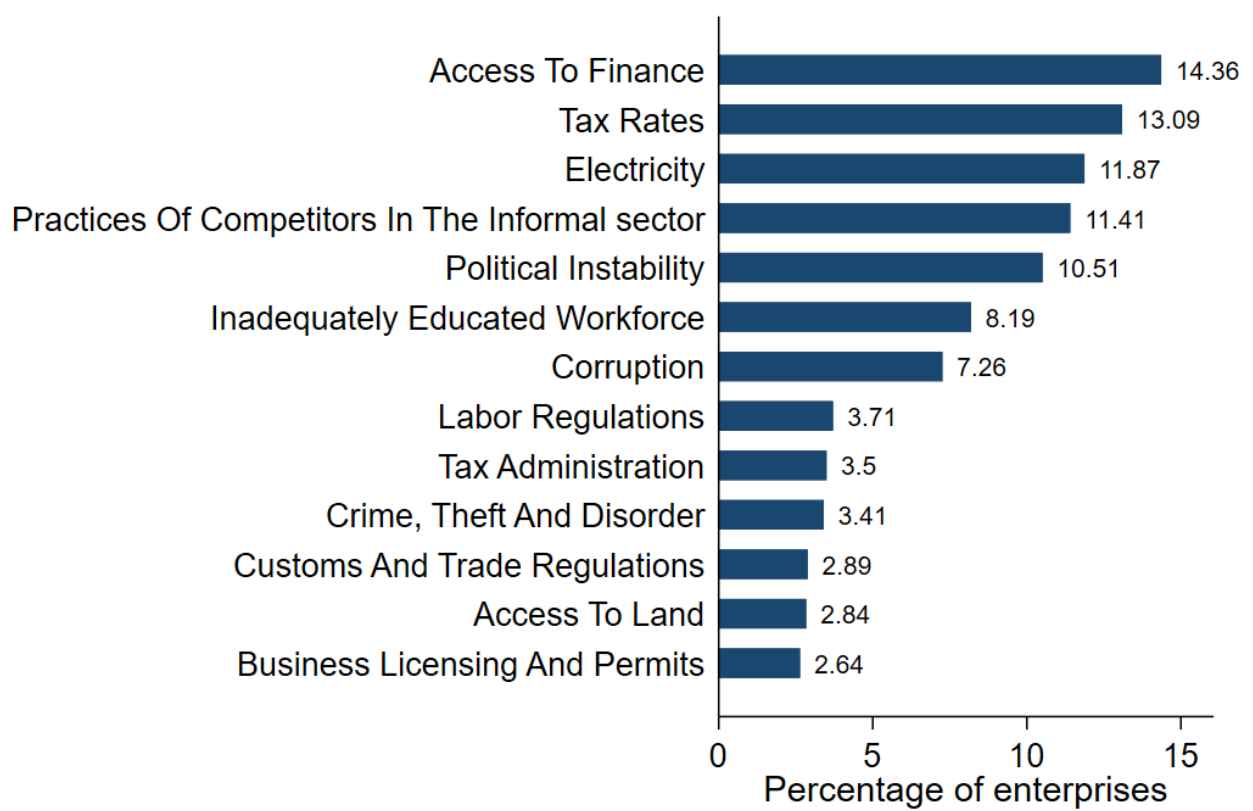
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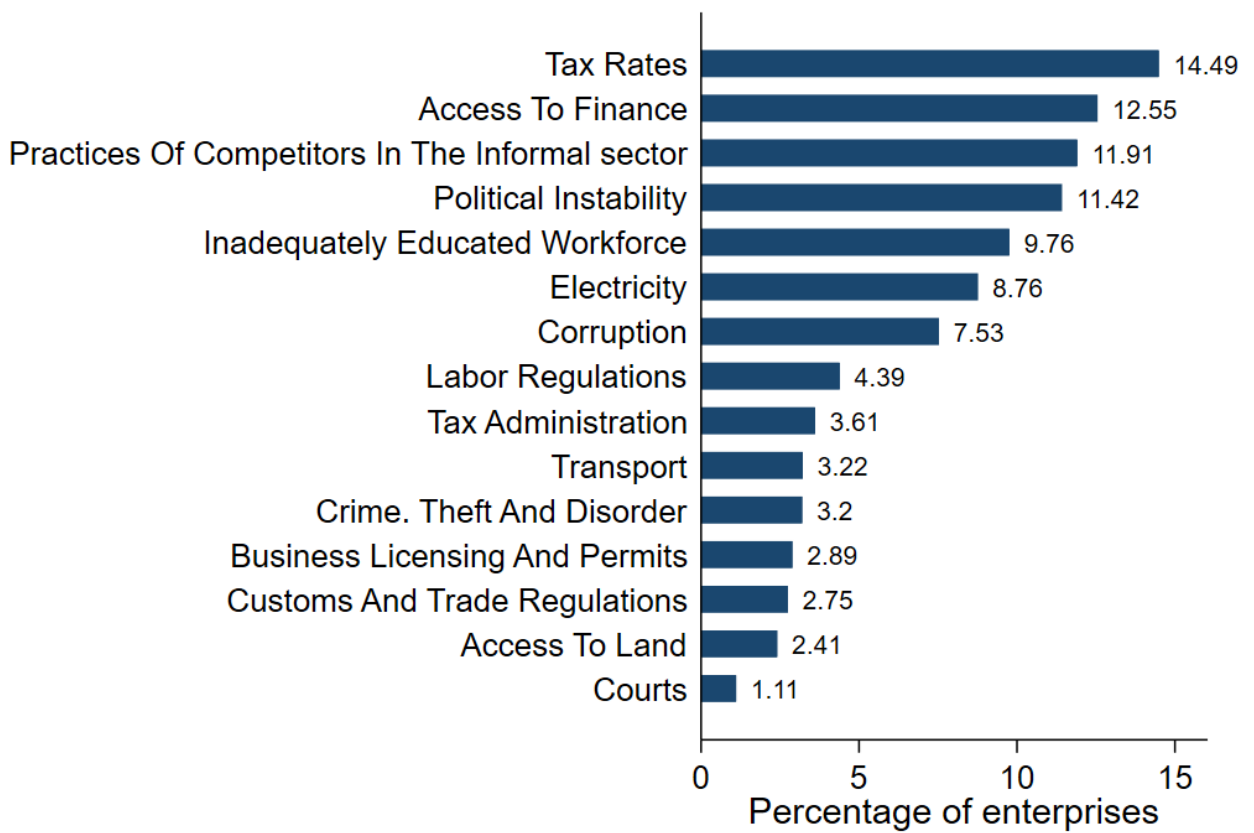
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Figure 1.1: Biggest obstacles affecting the operations of firms in all developing countries



Source: Authors using WBES data

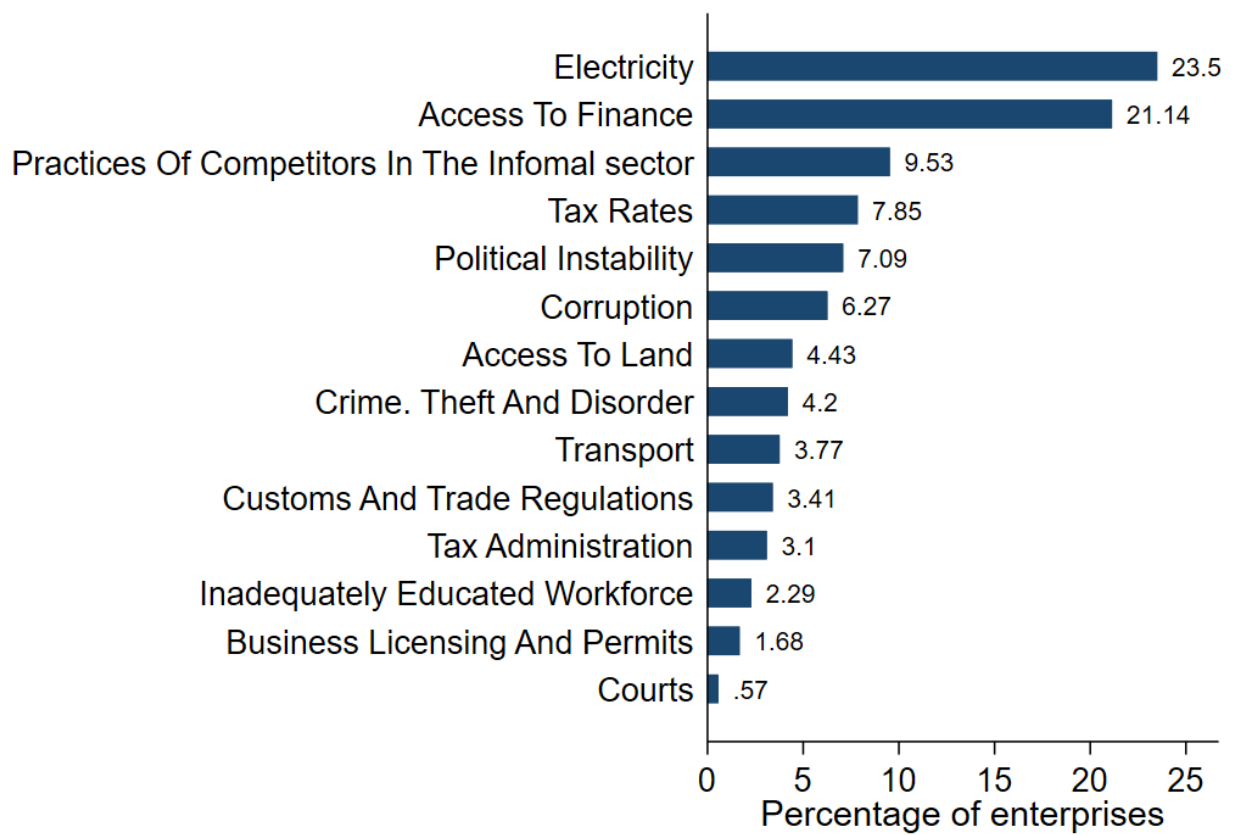
Figure 1.2: Biggest obstacles affecting the operations of firms in other developing countries



Source: Authors using WBES data

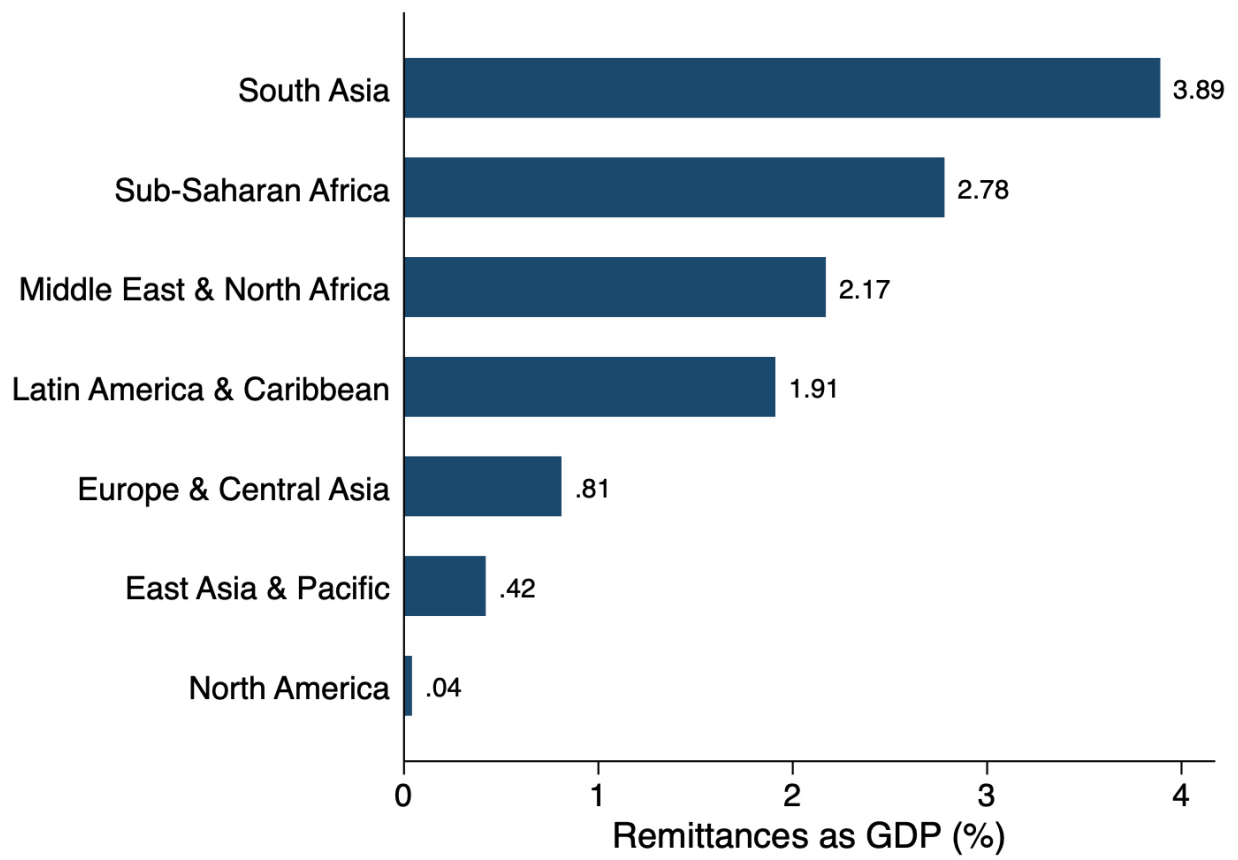


Figure 1.3: Biggest obstacles affecting the operations of firms in Sub-Saharan African countries



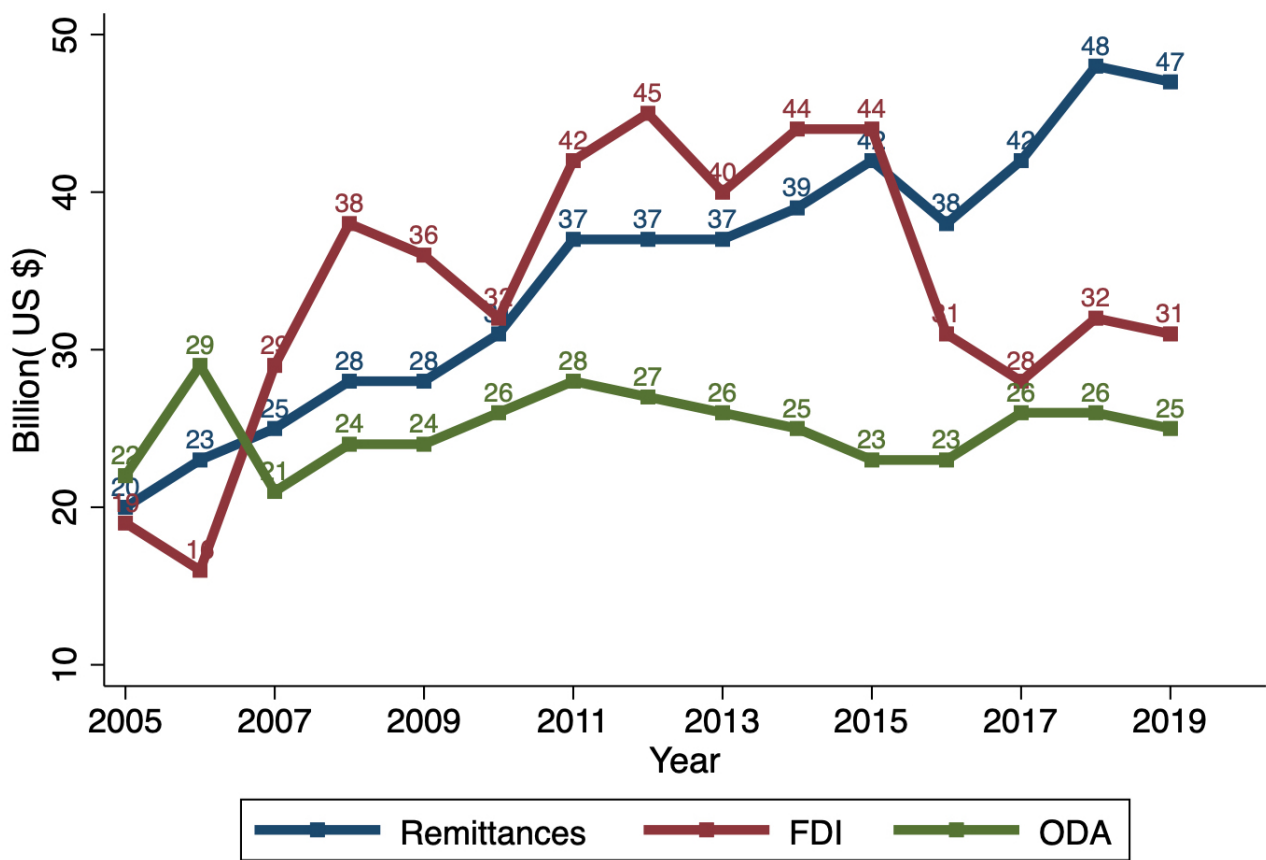
Source: Authors using WBES data

Figure 1.4: Remittances per GDP by world bank regions classification



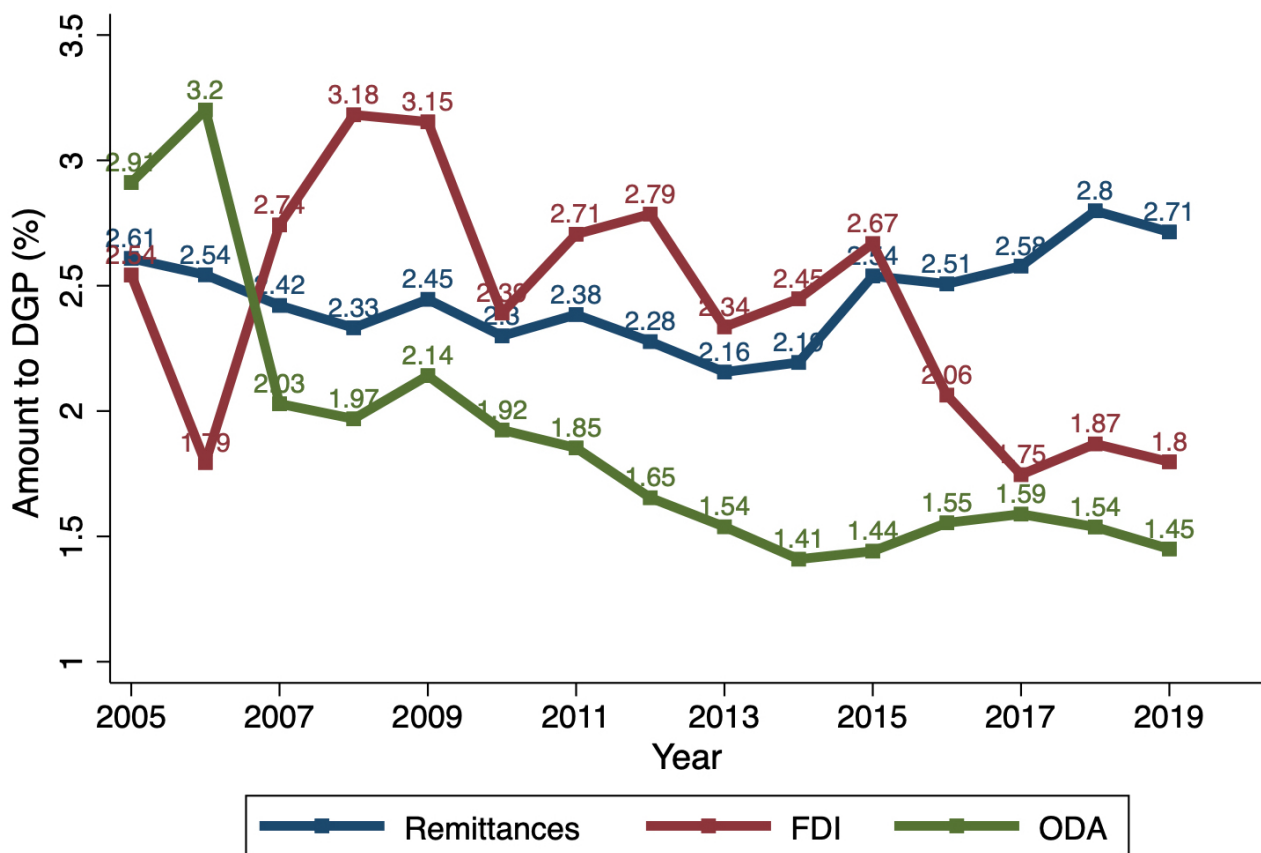
Source : Authors using WDI data

Figure 1.5: Remittances flows, Foreign Direct Investments and official development assistance to Sub-Saharan Africa



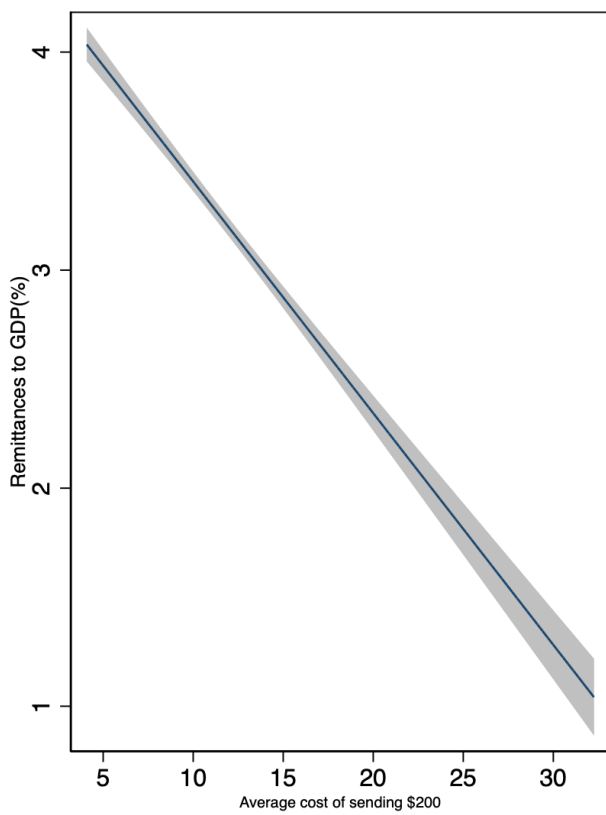
Source : Authors using WDI and OECD data

Figure 1.6: Remittances, Foreign Direct Investments and Official Development Assistance to GDP in Sub-Saharan Africa



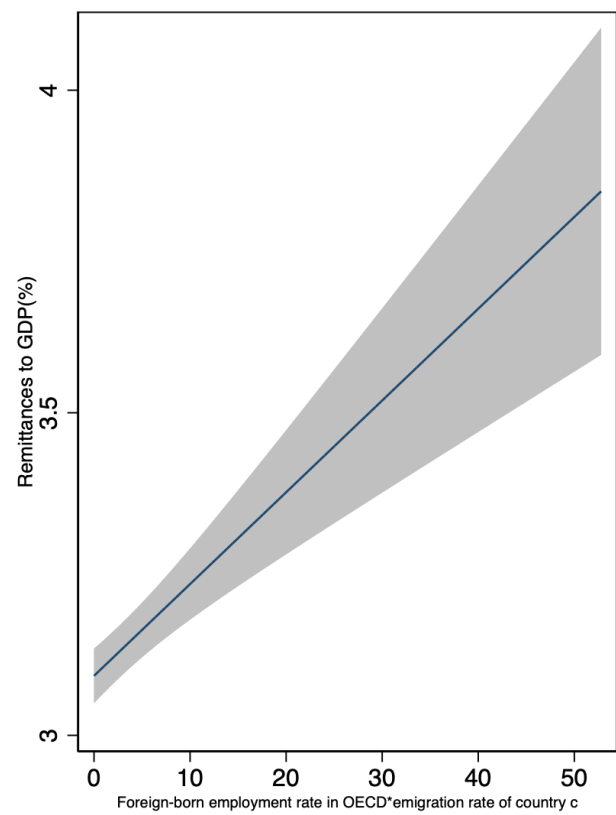
Source : Authors using WDI and OECD data

Figure 1.7: Remittances flows, remittances prices and Foreign-born employment rate in OECD countries



95% CI Fitted values

Source: Authors using World Development Indicators data.



95% CI Fitted values

Source: Authors using World Development Indicators data.

Table 1.1: Descriptive statistics of the main variables

	All				Manufacture				Non-manufacture			
	Mean.	Sd	Min	Max	Mean.	Sd	Min	Max	Mean.	Sd	Min	Max
<b>Firms variables</b>												
Share owned by nationals	81.84	36.16	0.00	100.00	82.91	34.96	0.00	100.00	81.00	37.04	0.00	100.00
Number of permanent full-time employees	54.85	438.71	0.00	64000	70.88	265.52	0.00	8000	42.22	536.82	0.00	64000
Firm sales(log)	6.42	3.93	0.00	23.72	6.74	4.11	0.00	23.72	6.16	3.76	0.00	21.87
Firm sales (log) <sub>t-3</sub>	5.20	4.30	0.00	26.27	5.62	4.48	0.00	26.27	4.88	4.11	0.00	22.45
Female Ownership	0.08	0.27	0.00	1.00	0.06	0.24	0.00	1.00	0.09	0.29	0.00	1.00
Location (= large city)	0.44	0.50	0.00	1.00	0.42	0.49	0.00	1.00	0.46	0.50	0.00	1.00
Transport obstacle	0.23	0.42	0.00	1.00	0.24	0.42	0.00	1.00	0.22	0.42	0.00	1.00
Small-sized firms	0.60	0.49	0.00	1.00	0.53	0.50	0.00	1.00	0.66	0.47	0.00	1.00
Medium-sized firm	0.28	0.45	0.00	1.00	0.32	0.46	0.00	1.00	0.26	0.44	0.00	1.00
Large size firm	0.11	0.32	0.00	1.00	0.16	0.36	0.00	1.00	0.08	0.27	0.00	1.00
<b>Macroeconomic variables</b>												
Remittances to GDP <sub>t-1</sub>	3.13	3.78	0.00	32.59	3.19	3.35	0.00	17.70	3.08	4.09	0.00	32.59
Remittances per capita <sub>t-1</sub>	42.73	52.86	0.01	322.42	44.92	52.01	0.01	322.42	41.01	53.46	0.01	322.42
Trade (% of GDP) <sub>t-1</sub>	61.31	25.89	27.74	179.12	59.51	22.51	27.74	129.72	62.72	28.18	27.74	179.12
Unemployment rate <sub>t-1</sub>	7.42	7.52	0.51	28.47	7.08	7.25	0.51	28.47	7.69	7.71	0.51	28.47
Time to start business <sub>t-1</sub>	40.13	32.66	4.00	259.50	40.42	30.73	4.00	259.50	39.91	34.09	4.00	259.50
Real exchange rate <sub>t-1</sub>	0.41	0.09	0.19	0.63	0.41	0.09	0.19	0.62	0.41	0.09	0.19	0.63
Domestic credit to private <sub>t-1</sub>	24.72	32.15	1.20	156.98	26.17	35.10	1.20	156.98	23.59	29.58	1.20	156.98
Political stability index <sub>t-1</sub>	-0.74	0.92	-2.19	1.06	-0.75	0.93	-2.19	1.06	-0.73	0.91	-2.19	1.06
Corruption index <sub>t-1</sub>	34.15	17.87	0.00	83.70	32.56	16.66	0.00	83.70	35.39	18.66	0.00	83.70
Number of power outages (log) <sub>t-1</sub>	2.29	0.64	0.71	3.49	2.30	0.67	0.71	3.49	2.29	0.63	0.71	3.49
Remittances prices <sub>t-1</sub>	11.81	4.93	4.09	32.26	11.82	4.49	4.09	32.26	11.81	5.25	4.09	32.26
Foreign-born employment rate*migration rate <sub>t-1</sub>	2.45	8.01	0.01	52.79	2.27	7.63	0.01	52.79	2.60	8.30	0.01	52.79
<i>N</i>	34645				15223				19422			

Table 1.2: First stage results

	Dependent variable : International remittances to GDP (%)								
	Instrumental variable approach with fixed effects								
	All			Manufacture			Non-manufacture		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	
Trade (% of GDP) <sub>t-1</sub>	-0.039*** (0.003)	-0.029*** (0.003)	-0.048*** (0.003)	0.045*** (0.004)	0.055*** (0.003)	0.043*** (0.003)	-0.052*** (0.003)	-0.041*** (0.004)	-0.064*** (0.004)
Unemployment rate <sub>t-1</sub>	0.677*** (0.027)	0.545*** (0.028)	0.607*** (0.027)	0.574*** (0.017)	0.405*** (0.017)	0.755*** (0.025)	0.716*** (0.039)	0.581*** (0.042)	0.651*** (0.039)
Time to start business <sub>t-1</sub>	-0.040*** (0.001)	-0.036*** (0.001)	-0.033*** (0.001)	-0.038*** (0.001)	-0.028*** (0.001)	-0.036*** (0.001)	-0.038*** (0.002)	-0.035*** (0.002)	-0.031*** (0.002)
Real exchange rate <sub>t-1</sub>	-19.810*** (1.088)	-16.415*** (1.104)	-18.587*** (1.026)	-14.586*** (0.874)	-10.179*** (0.641)	-16.041*** (0.563)	-18.860*** (1.546)	-15.665*** (1.591)	-18.370*** (1.440)
Domestic credit to private <sub>t-1</sub>	-0.058*** (0.008)	-0.157*** (0.011)	-0.153*** (0.011)	-0.146*** (0.011)	-0.295*** (0.010)	-0.301*** (0.010)	-0.039*** (0.010)	-0.123*** (0.013)	-0.114*** (0.013)
Political stability index <sub>t-1</sub>	0.114*** (0.035)	0.802*** (0.043)	0.383*** (0.056)	0.702*** (0.052)	1.327*** (0.057)	1.271*** (0.056)	-0.001 (0.051)	0.618*** (0.062)	0.079 (0.085)
Corruption index <sub>t-1</sub>	0.047*** (0.001)	0.049*** (0.001)	0.057*** (0.001)	0.035*** (0.002)	0.038*** (0.001)	0.048*** (0.001)	0.039*** (0.002)	0.040*** (0.002)	0.049*** (0.002)
Transport obstacle <sub>t-1</sub>	0.067*** (0.014)	0.062*** (0.013)	0.055*** (0.013)	0.045*** (0.009)	0.015* (0.008)	0.011 (0.007)	0.076*** (0.020)	0.085*** (0.020)	0.071*** (0.020)
Number of power outages (log) <sub>t-1</sub>	-0.714*** (0.060)	-0.855*** (0.062)	-0.853*** (0.062)	-1.000*** (0.093)	-1.430*** (0.089)	0.183 (0.161)	-0.673*** (0.075)	-0.782*** (0.075)	-0.814*** (0.074)
Female Ownership	-0.043** (0.022)	-0.026 (0.021)	-0.011 (0.022)	0.004 (0.016)	0.039*** (0.013)	0.055*** (0.014)	-0.023 (0.029)	-0.011 (0.029)	0.003 (0.029)
Location (= large city)	0.106*** (0.013)	0.110*** (0.013)	0.096*** (0.013)	0.033*** (0.010)	0.015* (0.008)	0.009 (0.007)	0.102*** (0.019)	0.109*** (0.018)	0.092*** (0.018)
Large size firm	-0.027 (0.017)	-0.019 (0.017)	-0.018 (0.017)	-0.038*** (0.010)	-0.022*** (0.008)	-0.026*** (0.008)	0.013 (0.031)	0.015 (0.030)	0.023 (0.030)
GDP per capita <sub>t-1</sub>		-0.002*** (0.000)	-0.002*** (0.000)		-0.003*** (0.000)	-0.003*** (0.000)		-0.002*** (0.000)	-0.002*** (0.000)
Domestic investment <sub>t-1</sub>			0.058*** (0.004)			0.132*** (0.005)			0.066*** (0.006)
<b>Instruments</b>									
Remittances prices <sub>t-1</sub>	-0.384*** (0.005)	-0.340*** (0.007)	-0.322*** (0.007)	-0.268*** (0.008)	-0.223*** (0.009)	-0.091*** (0.014)	-0.412*** (0.008)	-0.370*** (0.010)	-0.349*** (0.009)
Foreign-born employment rate* migration rate <sub>t-1</sub>	0.139*** (0.004)	0.138*** (0.004)	0.149*** (0.004)	0.193*** (0.005)	0.192*** (0.004)	0.269*** (0.007)	0.127*** (0.005)	0.124*** (0.005)	0.136*** (0.004)
Observation	31203	31203	31203	14128	14128	14128	17075	17075	17075
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 1.3: Effect of international remittances on the share of the business owned by nationals

	Dependent variable : Share of the business owned by nationals (%)								
	Instrumental variable approach with fixed effects								
	All			Manufacture			Non-manufacture		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	
<b>Remittances to GDP</b> <sub><i>t-1</i></sub>	1.103*** (0.377)	0.944** (0.394)	0.938** (0.396)	1.414** (0.569)	1.297** (0.592)	1.402** (0.586)	0.427 (0.527)	0.279 (0.557)	0.146 (0.567)
Trade (% of GDP) <sub><i>t-1</i></sub>	-0.101** (0.048)	-0.057 (0.049)	-0.047 (0.068)	-0.311*** (0.094)	-0.255** (0.099)	-0.314*** (0.119)	-0.047 (0.063)	-0.009 (0.064)	-0.054 (0.094)
Unemployment rate <sub><i>t-1</i></sub>	-0.955** (0.408)	-1.392*** (0.406)	-1.414*** (0.432)	-0.432 (0.631)	-0.852 (0.647)	-0.619 (0.718)	-1.028* (0.574)	-1.427** (0.574)	-1.290** (0.626)
Time to start business <sub><i>t-1</i></sub>	0.118*** (0.027)	0.137*** (0.027)	0.135*** (0.029)	-0.025 (0.042)	0.006 (0.043)	0.015 (0.044)	0.143*** (0.038)	0.155*** (0.038)	0.161*** (0.039)
Real exchange rate <sub><i>t-1</i></sub>	-34.006** (16.856)	-16.029 (17.114)	-14.702 (18.611)	-36.581 (26.423)	-15.570 (28.128)	-22.346 (29.579)	-33.275 (22.688)	-18.817 (23.020)	-25.624 (25.870)
Domestic credit to private <sub><i>t-1</i></sub>	0.607*** (0.158)	0.238 (0.181)	0.233 (0.181)	0.493* (0.283)	0.067 (0.335)	0.121 (0.333)	0.760*** (0.199)	0.477** (0.227)	0.482** (0.226)
Political stability index <sub><i>t-1</i></sub>	0.343 (1.286)	3.861*** (1.493)	4.069** (1.741)	4.607* (2.479)	7.859*** (2.771)	7.239** (2.878)	-2.666 (1.732)	0.257 (2.017)	-0.560 (2.440)
Corruption index <sub><i>t-1</i></sub>	-0.202*** (0.035)	-0.196*** (0.035)	-0.200*** (0.043)	-0.054 (0.058)	-0.054 (0.058)	-0.033 (0.066)	-0.251*** (0.045)	-0.248*** (0.045)	-0.227*** (0.058)
Transport obstacle <sub><i>t-1</i></sub>	-0.419 (0.479)	-0.432 (0.478)	-0.428 (0.479)	0.048 (0.689)	-0.051 (0.689)	-0.053 (0.689)	-0.739 (0.667)	-0.694 (0.667)	-0.716 (0.669)
Number of power outages (log) <sub><i>t-1</i></sub>	-0.595 (1.658)	-1.130 (1.629)	-1.027 (1.694)	0.573 (3.262)	-0.116 (3.262)	0.133 (3.262)	1.372 (2.235)	0.976 (2.196)	0.656 (2.290)
Female Ownership	7.638*** (0.698)	7.723*** (0.698)	7.718*** (0.698)	6.619*** (1.186)	6.732*** (1.183)	6.765*** (1.184)	7.804*** (0.861)	7.870*** (0.862)	7.875*** (0.863)
Location (= large city)	-2.193*** (0.517)	-2.200*** (0.516)	-2.199*** (0.516)	-0.772 (0.809)	-0.855 (0.810)	-0.841 (0.810)	-3.321*** (0.677)	-3.298*** (0.677)	-3.292*** (0.677)
Large size firm	-16.489*** (0.744)	-16.452*** (0.744)	-16.451*** (0.744)	-16.956*** (0.952)	-16.901*** (0.951)	-16.915*** (0.951)	-15.624*** (1.197)	-15.604*** (1.198)	-15.593*** (1.198)
GDP per capita <sub><i>t-1</i></sub>		-0.009*** (0.002)	-0.009*** (0.002)		-0.009*** (0.003)	-0.009** (0.003)		-0.007*** (0.002)	-0.007*** (0.002)
Domestic investment <sub><i>t-1</i></sub>			-0.027 (0.132)			0.182 (0.220)			0.116 (0.180)
Observation	31203	31203	31203	14128	14128	14128	17075	17075	17075
F-stats	62.352	62.390	58.381	33.492	33.841	31.989	30.847	29.523	28.012
R <sup>2</sup>	0.032	0.033	0.033	0.040	0.041	0.041	0.027	0.028	0.028
Kleibergen-Paap rk Wald F statistic	5026	2830	2559	6818	4516	7029	2021	1342	1194
Kleibergen-Paap rk LM statistic	6021	6021	5283	3223	3948	3876	2836	2549	2000
Chi-sq(2) P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.



Table 1.4: Effect of international remittances on firm sales

	Dependent variable : Total annual firm sales (log)								
	Instrumental variable approach with fixed effects								
	All			Manufacture			Non-manufacture		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	
<b>Remittances to GDP</b> $_{t-1}$	0.086*** (0.023)	0.081*** (0.024)	0.083*** (0.024)	-0.102*** (0.037)	-0.120*** (0.038)	-0.129*** (0.038)	0.121*** (0.032)	0.115*** (0.034)	0.125*** (0.035)
Trade (% of GDP) $_{t-1}$	0.016*** (0.003)	0.016*** (0.003)	-0.002 (0.004)	-0.006 (0.007)	0.000 (0.007)	-0.015* (0.008)	0.018*** (0.004)	0.018*** (0.004)	0.009 (0.006)
Unemployment rate $_{t-1}$	-0.448*** (0.028)	-0.456*** (0.029)	-0.416*** (0.029)	-0.627*** (0.050)	-0.673*** (0.052)	-0.613*** (0.054)	-0.455*** (0.039)	-0.458*** (0.039)	-0.440*** (0.041)
Time to start business $_{t-1}$	-0.001 (0.002)	-0.001 (0.002)	0.003** (0.002)	0.000 (0.002)	0.003 (0.003)	0.006** (0.003)	0.002 (0.002)	0.002 (0.002)	0.004* (0.002)
Real exchange rate $_{t-1}$	15.214*** (1.121)	15.546*** (1.132)	13.198*** (1.169)	15.662*** (2.095)	17.916*** (2.195)	16.373*** (2.193)	14.755*** (1.497)	14.888*** (1.495)	13.734*** (1.592)
Domestic credit to private $_{t-1}$	-0.007 (0.010)	-0.014 (0.011)	-0.007 (0.011)	-0.017 (0.018)	-0.062*** (0.020)	-0.053*** (0.020)	-0.012 (0.013)	-0.015 (0.014)	-0.010 (0.014)
Political stability index $_{t-1}$	-0.748*** (0.078)	-0.682*** (0.093)	-1.044*** (0.109)	-1.770*** (0.160)	-1.434*** (0.168)	-1.570*** (0.175)	-0.685*** (0.106)	-0.647*** (0.128)	-0.852*** (0.156)
Corruption index $_{t-1}$	-0.032*** (0.002)	-0.032*** (0.002)	-0.025*** (0.003)	-0.027*** (0.003)	-0.027*** (0.003)	-0.020*** (0.004)	-0.024*** (0.003)	-0.024*** (0.003)	-0.021*** (0.004)
Transport obstacle $_{t-1}$	-0.005 (0.032)	-0.005 (0.032)	-0.013 (0.032)	-0.002 (0.044)	-0.012 (0.044)	-0.014 (0.044)	0.005 (0.045)	0.005 (0.045)	-0.001 (0.045)
Number of power outages (log) $_{t-1}$	-0.886*** (0.105)	-0.895*** (0.104)	-1.070*** (0.107)	-1.970*** (0.196)	-2.047*** (0.197)	-2.001*** (0.196)	-0.928*** (0.136)	-0.928*** (0.134)	-1.032*** (0.142)
Female Ownership	-0.178*** (0.049)	-0.177*** (0.049)	-0.170*** (0.049)	-0.154* (0.083)	-0.144* (0.083)	-0.134 (0.083)	-0.178*** (0.062)	-0.177*** (0.061)	-0.175*** (0.061)
Location (= large city)	0.160*** (0.034)	0.160*** (0.034)	0.159*** (0.034)	0.073 (0.052)	0.065 (0.052)	0.065 (0.052)	0.204*** (0.046)	0.205*** (0.046)	0.204*** (0.046)
Large size firm	1.244*** (0.052)	1.246*** (0.052)	1.248*** (0.052)	1.272*** (0.068)	1.282*** (0.068)	1.280*** (0.068)	1.235*** (0.083)	1.236*** (0.083)	1.239*** (0.084)
Firm sales $_{t-3}$	0.506*** (0.006)	0.506*** (0.006)	0.505*** (0.006)	0.486*** (0.009)	0.485*** (0.009)	0.484*** (0.009)	0.515*** (0.007)	0.514*** (0.008)	0.514*** (0.008)
GDP per capita $_{t-1}$		-0.000 (0.000)	-0.000 (0.000)		-0.001*** (0.000)	-0.001*** (0.000)		-0.000 (0.000)	-0.000 (0.000)
Domestic investment $_{t-1}$			0.049*** (0.008)			0.054*** (0.013)			0.023** (0.012)
Observation	31804	31804	31804	14422	14422	14422	17382	17382	17382
F-stats	1320.605	1249.179	1200.001	678.130	636.748	609.873	688.693	652.252	617.881
R <sup>2</sup>	0.463	0.463	0.464	0.491	0.492	0.493	0.440	0.440	0.440
Kleibergen-Paap rk Wald F statistic	5030	2854	2563	6967	4555	7115	2105	1452	1338
Kleibergen-Paap rk LM statistic	5962	5968	5246	3153	3909	3832	2876	2547	2112
Chi-sq(2) P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 1.5: Effect of international remittances on the number of permanent and full-time employees

	Dependent variable : Number of full-time employees(log)								
	Instrumental variable approach with fixed effects								
	All			Manufacture			Non-manufacture		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	
<b>Remittances to GDP</b> $_{t-1}$	0.051*** (0.008)	0.055*** (0.009)	0.053*** (0.009)	0.040*** (0.013)	0.041*** (0.013)	0.037*** (0.013)	0.079*** (0.011)	0.083*** (0.012)	0.084*** (0.012)
Trade (% of GDP) $_{t-1}$	0.001 (0.001)	0.000 (0.001)	0.001 (0.001)	0.002 (0.002)	0.001 (0.002)	0.002 (0.002)	0.003** (0.001)	0.001 (0.001)	0.002 (0.002)
Unemployment rate $_{t-1}$	-0.038*** (0.008)	-0.030*** (0.008)	-0.031*** (0.009)	0.004 (0.013)	0.012 (0.014)	0.010 (0.015)	-0.056*** (0.012)	-0.046*** (0.012)	-0.048*** (0.013)
Time to start business $_{t-1}$	-0.001 (0.001)	-0.001** (0.001)	-0.001** (0.001)	-0.002*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Real exchange rate $_{t-1}$	1.048*** (0.345)	0.701** (0.350)	0.788** (0.375)	-0.042 (0.554)	-0.415 (0.585)	-0.348 (0.599)	1.848*** (0.465)	1.480*** (0.472)	1.610*** (0.518)
Domestic credit to private $_{t-1}$	0.007** (0.003)	0.014*** (0.004)	0.014*** (0.004)	0.007 (0.006)	0.015** (0.007)	0.014** (0.007)	0.010** (0.004)	0.018*** (0.005)	0.017*** (0.005)
Political stability index $_{t-1}$	0.101*** (0.026)	0.031 (0.031)	0.046 (0.036)	0.140** (0.056)	0.082 (0.062)	0.089 (0.063)	0.194*** (0.034)	0.115*** (0.041)	0.133*** (0.049)
Corruption index $_{t-1}$	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)
Transport obstacle $_{t-1}$	0.006 (0.010)	0.006 (0.010)	0.006 (0.010)	0.003 (0.016)	0.005 (0.016)	0.005 (0.016)	0.005 (0.014)	0.004 (0.014)	0.004 (0.014)
Number of power outages (log) $_{t-1}$	-0.001 (0.035)	0.009 (0.034)	0.017 (0.035)	0.143** (0.072)	0.155** (0.073)	0.151** (0.073)	-0.002 (0.046)	0.008 (0.045)	0.017 (0.047)
Female Ownership	-0.221*** (0.016)	-0.223*** (0.016)	-0.223*** (0.016)	-0.215*** (0.027)	-0.217*** (0.027)	-0.217*** (0.027)	-0.230*** (0.020)	-0.232*** (0.020)	-0.232*** (0.020)
Location (= large city)	0.130*** (0.011)	0.130*** (0.011)	0.131*** (0.011)	0.178*** (0.018)	0.179*** (0.018)	0.179*** (0.018)	0.105*** (0.015)	0.104*** (0.015)	0.104*** (0.015)
Large size firm	2.454*** (0.016)	2.454*** (0.016)	2.454*** (0.016)	2.417*** (0.020)	2.416*** (0.020)	2.416*** (0.020)	2.471*** (0.025)	2.471*** (0.025)	2.471*** (0.025)
GDP per capita $_{t-1}$		0.000*** (0.000)	0.000*** (0.000)		0.000** (0.000)	0.000** (0.000)		0.000*** (0.000)	0.000*** (0.000)
Domestic investment $_{t-1}$			-0.002 (0.003)			-0.000 (0.005)			-0.002 (0.004)
Observation	31404	31404	31404	14279	14279	14279	17125	17125	17125
F-stats	2020.902	1876.447	1751.489	1157.237	1074.934	1003.384	838.806	778.919	726.810
R <sup>2</sup>	0.511	0.511	0.511	0.562	0.563	0.563	0.443	0.443	0.443
Kleibergen-Paap rk Wald F statistic	4930	2781	2485	6827	4490	6971	2060	1410	1280
Kleibergen-Paap rk LM statistic	5969	5906	5213	3235	3922	3856	2888	2535	2101
Chi-sq(2) P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 1.6: Effect of international remittances on the share of the firm owned by nationals, excluding the most financially developed countries

	Dependent variable : Share of the business owned by nationals (%)		
	Instrumental variable approach with fixed effects		
	(1) All	(2) Manufacture	(3) Non-Manufacture
<b>Remittances to GDP<sub>t-1</sub></b>	0.571 (0.350)	1.891** (0.888)	-0.012 (0.467)
Controls	Yes	Yes	Yes
Observation	23281	10580	12701
F-stats	49.760	27.574	23.006
R <sup>2</sup>	0.034	0.044	0.028
Kleibergen-Paap rk Wald F statistic	18449	41935	9216
Kleibergen-Paap rk LM statistic	4554	1550	2729
Chi-sq(2) P-value	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. The 25% of countries with the highest domestic credit to the private sector relative to GDP are excluded. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 1.7: Effect of international remittances on the share of the firm owned by nationals, excluding the least financially developed countries

	Dependent variable : Share of the business owned by nationals (%)		
	Instrumental variable approach with fixed effects		
	(1) All	(2) Manufacture	(3) Non-Manufacture
<b>Remittances to GDP<sub>t-1</sub></b>	-0.280 (0.521)	0.800 (1.420)	-0.795 (0.658)
Controls	Yes	Yes	Yes
Observation	23634	10714	12920
F-stats	48.951	28.619	20.259
R <sup>2</sup>	0.032	0.043	0.023
Kleibergen-Paap rk Wald F statistic	3153	17892	1824
Kleibergen-Paap rk LM statistic	1794	1646	1077
Chi-sq(2) P-value	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. The 25% of countries with the lowest domestic credit to the private sector relative to GDP are excluded. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 1.8: Effect of international remittances on the share of the firm owned by nationals, sales and employment, excluding the most financially developed countries

Instrumental variable approach with fixed effects									
	Share			Sales			Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Manufacture	Non-manufacture	All	Manufacture	Non-manufacture	All	Manufacture	Non-manufacture
<b>Remittances to GDP<sub>t-1</sub></b>	0.209	0.185	-0.096	0.075***	-0.012	0.086***	0.066***	0.071***	0.088***
	(0.354)	(0.729)	(0.474)	(0.021)	(0.044)	(0.029)	(0.008)	(0.016)	(0.010)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	25124	11303	13821	25654	11578	14076	25286	11447	13839
F-stats	55.862	30.018	25.840	1005.565	462.750	539.640	1329.577	733.605	593.068
R <sup>2</sup>	0.040	0.050	0.033	0.459	0.478	0.441	0.501	0.551	0.444
Kleibergen-Paap rk Wald F statistic	6483	11117	2918	6235	11152	2774	6254	10973	2807
Kleibergen-Paap rk LM statistic	5210	2783	2415	5121	2773	2319	5121	2778	2355
Chi-sq(2) P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. Financially developed countries are countries whose domestic credit to the private sector is greater than or equal to 30% of GDP. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 1.9: Effect of international remittances on the share of the firm owned by nationals, sales and employment, excluding top receivers

Instrumental variable approach with fixed effects									
	Share			Sales			Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Manufacture	Non-manufacture	All	Manufacture	Non-manufacture	All	Manufacture	Non-manufacture
<b>Remittances to GDP<sub>t-1</sub></b>	0.925**	1.396**	0.036	0.068**	0.005	0.098**	0.061***	0.068***	0.095***
	(0.438)	(0.674)	(0.639)	(0.027)	(0.041)	(0.040)	(0.010)	(0.015)	(0.014)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	29492	13402	16090	30075	13695	16380	29686	13555	16131
F-stats	51.657	27.579	25.468	1211.573	585.554	622.992	1682.556	963.204	695.981
R <sup>2</sup>	0.032	0.038	0.027	0.471	0.494	0.449	0.511	0.562	0.448
Kleibergen-Paap rk Wald F statistic	15088	7214	5714	15299	7333	5769	15048	7248	5716
Kleibergen-Paap rk LM statistic	7865	2224	2817	7835	2225	2806	7859	2228	2823
Chi-sq(2) P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. We consider as top receivers those countries for which remittances represent at least 10% of GDP.

Table 1.10: Effect of international remittances on the share of the firm owned by nationals, sales and employment, excluding natural resource-rich countries

	Instrumental variable approach with fixed effects								
	Share			Sales			Employment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Manufacture	Non-manufacture	All	Manufacture	Non-manufacture	All	Manufacture	Non-manufacture
<b>Remittances to <math>GDP_{t-1}</math></b>	1.124	2.913***	-0.724	0.647***	0.256***	0.752***	0.152***	0.098***	0.190***
	(0.831)	(1.122)	(1.167)	(0.050)	(0.065)	(0.072)	(0.018)	(0.025)	(0.025)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	28836	13061	15775	29422	13351	16071	29041	13208	15833
F-stats	47.465	27.126	23.953	1163.689	593.475	597.790	1580.192	928.333	635.632
R <sup>2</sup>	0.031	0.038	0.025	0.452	0.490	0.427	0.507	0.564	0.434
Kleibergen-Paap rk Wald F statistic	1809	1979	754	2131	2149	925	2103	2080	920
Kleibergen-Paap rk LM statistic	1925	1724	843	2182	1809	990	2166	1763	987
Chi-sq(2) P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level Natural resource-rich countries are : Mozambique, Liberia, Mauritania, Sierra Leone, Gabon, Chad, Angola, Equatorial Guinea, Congo \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.



# Appendix

## A.1 Descriptive statistics

Table A.1.1: Total firms, manufacturing firms and non-manufacturing firms by country and year

Country	Year	Firms		
		Total	Manufacture	Non-manufacture
Angola	2006	425	213	212
Angola	2010	360	78	282
Benin	2009	150	72	78
Benin	2016	150	70	80
Botswana	2006	342	114	228
Botswana	2010	268	85	183
Burkina Faso	2009	394	95	299
Burundi	2006	270	102	168
Burundi	2014	157	60	97
Cameroon	2009	363	106	257
Cameroon	2016	361	192	169
Cape Verde	2009	156	68	88
Central african republic	2011	150	37	113
Chad	2009	150	60	90
Chad	2018	153	74	79
Congo	2009	151	0	151
Democratic Republic of the Congo	2006	340	149	191
Democratic Republic of the Congo	2010	359	124	235
Democratic Republic of the Congo	2013	529	241	288
Eritrea	2009	179	93	86
Eswatini	2006	307	70	237
Eswatini	2016	150	75	75
Ethiopia	2011	644	321	323
Ethiopia	2015	848	383	465
Gabon	2009	179	0	179
Gambia	2006	174	33	141
Gambia	2018	151	76	75
Ghana	2007	494	292	202
Ghana	2013	720	377	343
Guinea	2006	223	135	88
Guinea	2016	150	27	123
Guinea-Bissau	2006	159	50	109
Ivory Coast	2009	526	204	322
Ivory Coast	2016	361	106	255
Kenya	2007	657	396	261
Kenya	2013	1781	414	367
Kenya	2018	1001	455	546
Lesotho	2009	151	0	151
Lesotho	2016	150	76	74
Liberia	2009	150	0	150
Liberia	2017	151	75	76
Madagascar	2009	445	204	241
Madagascar	2013	532	0	532
Malawi	2009	150	71	79
Malawi	2014	523	197	326
Mali	2007	490	301	189
Mali	2010	360	160	200
Mali	2016	185	99	86
Mauritania	2006	237	80	157
Mauritania	2014	150	52	98
Mauritius	2009	398	216	182
Mozambique	2007	479	341	138
Mozambique	2018	601	287	314
Namibia	2006	329	106	223
Namibia	2014	580	181	399
Niger	2009	150	62	88
Niger	2017	151	41	110
Nigeria	2007	1891	948	943
Nigeria	2014	2676	1427	1249
Rwanda	2006	212	59	153
Rwanda	2011	241	81	160
Rwanda	2019	360	120	240
Senegal	2007	506	259	247
Senegal	2014	601	249	352
Sierra Leone	2009	150	0	150
Sierra Leone	2017	152	77	75
South Africa	2007	937	680	257
South Africa	2020	1097	680	417
Sudan	2014	662	82	580
Tanzania	2006	419	273	146
Tanzania	2013	813	440	373
Togo	2009	155	35	120
Togo	2016	150	45	105
Uganda	2006	563	307	256
Uganda	2013	762	378	384
Zambia	2007	484	304	180
Zambia	2013	720	364	356
Zambia	2019	601	180	421
Zimbabwe	2011	599	378	221
Zimbabwe	2016	600	289	311

Table A.1.2: Number of firms and share of each industry in the total sample by sector

Industries	Code	Number of firms	Percent
<b>Manufacturing sector</b>		15,223	100.00
Manufacture of food products and beverages	15	4,017	26.39
Manufacture of tobacco products	16	33	0.22
Manufacture of textiles	17	543	3.57
Manufacture of wearing apparel; dressing and dyeing of fur	18	2,029	13.33
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	19	292	1.92
Manufacture of wood and of products of wood and cork, except furniture	20	694	4.56
Manufacture of paper and paper products	21	187	1.23
Publishing, printing and reproduction of recorded media	22	1,030	6.77
Manufacture of coke, refined petroleum products and nuclear fuel	23	58	0.38
Manufacture of chemicals and chemical products	24	858	5.64
Manufacture of rubber and plastics products	25	543	3.57
Manufacture of basic metals	26	774	5.08
Manufacture of other non-metallic mineral products	27	318	2.09
Manufacture of fabricated metal products, except machinery and equipment	28	1,335	8.77
Manufacture of machinery and equipment n.e.c.	29	322	2.12
Manufacture of office, accounting and computing machinery	30	5	0.03
Manufacture of electrical machinery and apparatus n.e.c.	31	199	1.31
Manufacture of radio, television and communication equipment and apparatus	32	30	0.20
Manufacture of medical, precision and optical instruments, watches and clocks	33	24	0.16
Manufacture of motor vehicles, trailers and semi-trailers	34	111	0.73
Manufacture of other transport equipment	35	44	0.29
Manufacture of furniture; manufacturing n.e.c	36	1,750	11.50
Recycling	37	27	0.18
<b>Non-manufacturing sector</b>		18,787	100.00
Other Industries	4	3	0.02
Mining and quarrying	10	2	0.01
Collection, purification and distribution of water	40	2	0.01
Construction	45	1,252	6.66
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	50	13,641	72.61
Hotels and restaurants	55	2,274	12.10
Transport, storage and communications	60	1,197	6.37
Financial intermediation	65	2	0.01
Real estate, renting and business activities	70	410	2.18
Other community, social and personal service activities	90	4	0.02



## A.2 OLS and fixed effects model results

Table A.2.1: Effect of international remittances on the share of the business owned by nationals

	Dependent variable : Share of the business owned by nationals (%)					
	Ordinary least squares model			Fixed-effects model		
	(1) All	(2) Manufacture	(3) Non-Manufacture	(4) All	(5) Manufacture	(6) Non-Manufacture
<b>Remittances to GDP</b> $_{t-1}$	0.556*** (0.060)	0.680*** (0.094)	0.538*** (0.076)	-0.012 (0.196)	0.885* (0.456)	0.146 (0.249)
Trade (% of GDP) $_{t-1}$	0.015 (0.011)	-0.027 (0.019)	0.031** (0.013)	-0.115** (0.054)	-0.310*** (0.093)	-0.098 (0.073)
Unemployment rate $_{t-1}$	-0.841*** (0.051)	-0.437*** (0.085)	-0.979*** (0.064)	-0.934** (0.387)	-0.475 (0.662)	-1.000* (0.541)
Time to start business $_{t-1}$	0.050*** (0.006)	0.030*** (0.011)	0.063*** (0.008)	0.116*** (0.028)	0.012 (0.044)	0.154*** (0.037)
Real exchange rate $_{t-1}$	-5.661* (3.190)	-21.150*** (4.973)	-1.430 (4.262)	-34.571** (15.701)	-26.336 (25.359)	-37.627* (21.061)
Domestic credit to private $_{t-1}$	0.335*** (0.011)	0.211*** (0.021)	0.388*** (0.014)	0.066 (0.170)	-0.052 (0.321)	0.439** (0.214)
Political stability index $_{t-1}$	2.285*** (0.318)	1.721*** (0.521)	2.082*** (0.407)	3.091** (1.455)	7.254*** (2.533)	-1.205 (1.973)
Corruption index $_{t-1}$	-0.266*** (0.014)	-0.189*** (0.023)	-0.290*** (0.018)	-0.140*** (0.033)	-0.009 (0.057)	-0.195*** (0.043)
Transport obstacle $_{t-1}$	0.532 (0.473)	0.492 (0.687)	0.508 (0.651)	-0.340 (0.470)	-0.053 (0.678)	-0.576 (0.652)
Number of power outages (log) $_{t-1}$	8.474*** (0.483)	6.255*** (0.809)	8.912*** (0.617)	-0.220 (1.649)	-0.023 (3.260)	0.344 (2.200)
Female Ownership	6.518*** (0.670)	4.764*** (1.158)	7.192*** (0.823)	7.429*** (0.696)	6.393*** (1.178)	7.742*** (0.861)
Location (= large city)	-0.972** (0.424)	-0.728 (0.658)	-0.889 (0.560)	-1.890*** (0.507)	-0.755 (0.794)	-2.919*** (0.667)
Large size firm	-18.540*** (0.727)	-18.494*** (0.946)	-19.009*** (1.149)	-16.427*** (0.732)	-16.839*** (0.941)	-15.609*** (1.172)
GDP per capita $_{t-1}$	-0.002*** (0.000)	-0.001** (0.000)	-0.002*** (0.000)	-0.011*** (0.002)	-0.010*** (0.003)	-0.007*** (0.002)
Domestic investment $_{t-1}$	-0.118*** (0.026)	0.015 (0.041)	-0.194*** (0.034)	0.129 (0.110)	0.252 (0.193)	0.189 (0.144)
Observation	32998	14524	18474	32375	14524	17851
F-stats	192.952	60.868	151.509	58.036	31.597	27.971
R <sup>2</sup>	0.098	0.070	0.122	0.148	0.134	0.167
Industry fixed effect				Yes	Yes	Yes
Country fixed effect				Yes	Yes	Yes
Year fixed effect				Yes	Yes	Yes

Notes : Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table A.2.2: Effect of international remittances on firm sales

	Dependent variable : Total annual firm sales (log)					
	Ordinary least squares model			Fixed-effects model		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture
<b>Remittances to GDP</b> $_{t-1}$	-0.140*** (0.005)	-0.210*** (0.007)	-0.104*** (0.005)	-0.092*** (0.013)	-0.338*** (0.032)	-0.078*** (0.015)
Trade (% of GDP) $_{t-1}$	0.013*** (0.001)	0.007*** (0.001)	0.015*** (0.001)	0.002 (0.004)	-0.007 (0.006)	0.013*** (0.005)
Unemployment rate $_{t-1}$	0.027*** (0.003)	0.040*** (0.005)	0.012*** (0.004)	-0.414*** (0.027)	-0.662*** (0.050)	-0.426*** (0.037)
Time to start business $_{t-1}$	-0.003*** (0.000)	-0.010*** (0.001)	-0.000 (0.001)	-0.000 (0.002)	0.006** (0.003)	-0.000 (0.002)
Real exchange rate $_{t-1}$	1.706*** (0.232)	3.367*** (0.355)	0.836*** (0.303)	13.910*** (1.046)	18.045*** (1.827)	13.910*** (1.364)
Domestic credit to private $_{t-1}$	-0.005*** (0.001)	-0.004*** (0.001)	-0.007*** (0.001)	-0.004 (0.010)	-0.079*** (0.019)	-0.006 (0.013)
Political stability index $_{t-1}$	0.199*** (0.022)	0.145*** (0.034)	0.239*** (0.028)	-0.597*** (0.094)	-1.469*** (0.154)	-0.284** (0.130)
Corruption index $_{t-1}$	-0.015*** (0.001)	-0.021*** (0.002)	-0.011*** (0.001)	-0.015*** (0.002)	-0.011*** (0.003)	-0.011*** (0.003)
Transport obstacle $_{t-1}$	0.115*** (0.033)	0.160*** (0.047)	0.062 (0.047)	0.009 (0.031)	-0.019 (0.043)	0.044 (0.044)
Number of power outages (log) $_{t-1}$	0.190*** (0.031)	-0.032 (0.051)	0.310*** (0.039)	-0.882*** (0.104)	-2.153*** (0.195)	-0.788*** (0.138)
Female Ownership	-0.469*** (0.051)	-0.467*** (0.088)	-0.453*** (0.063)	-0.187*** (0.049)	-0.133 (0.082)	-0.192*** (0.062)
Location (= large city)	-0.326*** (0.031)	-0.601*** (0.047)	-0.178*** (0.041)	0.133*** (0.034)	0.028 (0.051)	0.192*** (0.046)
Large size firm	0.967*** (0.052)	0.996*** (0.068)	0.894*** (0.082)	1.267*** (0.051)	1.315*** (0.067)	1.263*** (0.082)
Firm sales $_{t-3}$	0.627*** (0.005)	0.613*** (0.008)	0.623*** (0.006)	0.502*** (0.006)	0.475*** (0.009)	0.513*** (0.007)
Domestic investment $_{t-1}$	0.021*** (0.002)	0.019*** (0.003)	0.019*** (0.003)	0.046*** (0.007)	0.058*** (0.012)	0.018* (0.010)
GDP per capita $_{t-1}$	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Observation	33626	14827	18799	33000	14827	18173
F-stats	3444.505	2485.274	1425.421	1275.050	657.237	684.665
R <sup>2</sup>	0.607	0.667	0.558	0.691	0.742	0.645
Industry fixed effect				Yes	Yes	Yes
Country fixed effect				Yes	Yes	Yes
Year fixed effect				Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table A.2.3: Effect of international remittances on the number of permanent and full-time employees

	Dependent variable : Number of full-time employees(log)					
	Ordinary least squares model			Fixed-effects model		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture
<b>Remittances to GDP</b> $_{t-1}$	0.007*** (0.001)	0.004* (0.002)	0.007*** (0.002)	0.006 (0.004)	-0.001 (0.010)	0.011** (0.005)
Trade (% of GDP) $_{t-1}$	-0.001*** (0.000)	-0.001* (0.000)	-0.001*** (0.000)	-0.000 (0.001)	0.002 (0.002)	-0.001 (0.002)
Unemployment rate $_{t-1}$	-0.000 (0.001)	0.006*** (0.002)	0.001 (0.001)	-0.016** (0.008)	0.013 (0.014)	-0.015 (0.010)
Time to start business $_{t-1}$	-0.000 (0.000)	0.000 (0.000)	-0.001*** (0.000)	-0.002*** (0.001)	-0.003*** (0.001)	-0.001 (0.001)
Real exchange rate $_{t-1}$	-0.374*** (0.064)	-0.710*** (0.102)	-0.333*** (0.084)	0.257 (0.320)	-0.408 (0.533)	0.445 (0.421)
Domestic credit to private $_{t-1}$	0.002*** (0.000)	0.001** (0.000)	0.002*** (0.000)	0.007** (0.003)	0.006 (0.007)	0.008* (0.004)
Political stability index $_{t-1}$	-0.038*** (0.007)	-0.081*** (0.011)	-0.019** (0.008)	0.039 (0.030)	0.098* (0.057)	0.104*** (0.039)
Corruption index $_{t-1}$	-0.001* (0.000)	-0.001 (0.001)	0.001 (0.000)	0.002*** (0.001)	0.001 (0.001)	0.003*** (0.001)
Transport obstacle $_{t-1}$	0.010 (0.010)	0.011 (0.016)	-0.006 (0.014)	0.010 (0.010)	0.004 (0.015)	0.012 (0.014)
Number of power outages (log) $_{t-1}$	-0.077*** (0.010)	-0.124*** (0.017)	-0.048*** (0.012)	0.059* (0.034)	0.134* (0.072)	0.085* (0.045)
Female Ownership	-0.219*** (0.016)	-0.208*** (0.027)	-0.201*** (0.019)	-0.225*** (0.016)	-0.210*** (0.027)	-0.237*** (0.019)
Location (= large city)	0.143*** (0.010)	0.150*** (0.015)	0.150*** (0.012)	0.134*** (0.011)	0.176*** (0.017)	0.110*** (0.015)
Large size firm	2.629*** (0.015)	2.557*** (0.019)	2.625*** (0.023)	2.457*** (0.015)	2.417*** (0.020)	2.483*** (0.024)
GDP per capita $_{t-1}$	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000* (0.000)	0.000 (0.000)	0.000 (0.000)
Domestic investment $_{t-1}$	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.003 (0.002)	0.003 (0.004)	0.006** (0.003)
Observation	33206	14683	18523	32593	14683	17910
F-stats	2403.944	1365.958	964.030	1829.838	1028.942	774.076
R <sup>2</sup>	0.556	0.600	0.496	0.588	0.636	0.507
Industry fixed effect				Yes	Yes	Yes
Country fixed effect				Yes	Yes	Yes
Year fixed effect				Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

### A.3 Remittances per capita results

Table A.3.1: Effect of international remittances per capita on the share of the business owned by nationals

	Dependent variable : Share of the business owned by nationals (%)								
	Ordinary least squares model			Fixed-effects model			Instrumental variable approach with fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture
<b>Remittances per capita</b> <sub><i>t-1</i></sub>	0.047*** (0.005)	0.048*** (0.007)	0.047*** (0.006)	0.031 (0.021)	0.059 (0.041)	0.057** (0.028)	0.114** (0.047)	0.145** (0.060)	0.080 (0.070)
Trade (% of GDP) <sub><i>t-1</i></sub>	0.029*** (0.011)	-0.004 (0.019)	0.043*** (0.013)	-0.114** (0.054)	-0.291*** (0.091)	-0.088 (0.073)	-0.038 (0.068)	-0.315*** (0.120)	-0.033 (0.094)
Unemployment rate <sub><i>t-1</i></sub>	-0.838*** (0.050)	-0.439*** (0.085)	-0.978*** (0.064)	-1.086*** (0.398)	-0.857 (0.690)	-1.256** (0.555)	-1.825*** (0.480)	-1.484** (0.752)	-1.703** (0.709)
Time to start business <sub><i>t-1</i></sub>	0.052*** (0.006)	0.031*** (0.011)	0.065*** (0.008)	0.116*** (0.027)	0.004 (0.044)	0.149*** (0.036)	0.115*** (0.028)	-0.004 (0.045)	0.156*** (0.037)
Real exchange rate <sub><i>t-1</i></sub>	-12.922*** (3.359)	-26.495*** (5.194)	-9.316** (4.484)	-32.316** (15.756)	-19.501 (25.079)	-33.010 (21.193)	-8.735 (18.742)	-12.024 (28.862)	-17.029 (26.438)
Domestic credit to private <sub><i>t-1</i></sub>	0.352*** (0.012)	0.234*** (0.022)	0.405*** (0.015)	0.103 (0.170)	-0.125 (0.313)	0.475** (0.215)	0.264 (0.184)	0.116 (0.332)	0.552** (0.230)
Political stability index <sub><i>t-1</i></sub>	2.530*** (0.321)	1.877*** (0.525)	2.363*** (0.411)	2.517* (1.506)	6.613** (2.749)	-1.914 (2.025)	3.091 (1.898)	4.808 (3.338)	-1.355 (2.573)
Corruption index <sub><i>t-1</i></sub>	-0.253*** (0.014)	-0.184*** (0.023)	-0.273*** (0.018)	-0.153*** (0.033)	-0.001 (0.057)	-0.214*** (0.044)	-0.212*** (0.044)	-0.035 (0.066)	-0.257*** (0.060)
Transport obstacle <sub><i>t-1</i></sub>	0.564 (0.473)	0.487 (0.687)	0.557 (0.651)	-0.353 (0.470)	-0.074 (0.678)	-0.608 (0.652)	-0.470 (0.480)	-0.082 (0.689)	-0.762 (0.670)
Number of power outages (log) <sub><i>t-1</i></sub>	8.501*** (0.483)	6.415*** (0.806)	8.985*** (0.617)	-0.013 (1.636)	-0.087 (3.266)	0.892 (2.177)	0.565 (1.644)	0.466 (3.280)	1.405 (2.173)
Female Ownership	6.479*** (0.670)	4.715*** (1.157)	7.167*** (0.824)	7.426*** (0.696)	6.389*** (1.178)	7.725*** (0.861)	7.654*** (0.698)	6.735*** (1.184)	7.858*** (0.863)
Location (= large city)	-0.715* (0.425)	-0.554 (0.657)	-0.612 (0.561)	-1.881*** (0.507)	-0.773 (0.794)	-2.897*** (0.667)	-2.135*** (0.516)	-0.848 (0.810)	-3.279*** (0.677)
Large size firm	-18.557*** (0.727)	-18.494*** (0.947)	-19.020*** (1.150)	-16.417*** (0.732)	-16.835*** (0.941)	-15.608*** (1.173)	-16.433*** (0.744)	-16.890*** (0.952)	-15.592*** (1.198)
GDP per capita <sub><i>t-1</i></sub>	-0.003*** (0.000)	-0.002*** (0.000)	-0.003*** (0.000)	-0.010*** (0.002)	-0.011*** (0.003)	-0.007*** (0.002)	-0.009*** (0.002)	-0.009*** (0.003)	-0.006*** (0.002)
Domestic investment <sub><i>t-1</i></sub>	-0.114*** (0.026)	0.010 (0.041)	-0.187*** (0.034)	0.114 (0.110)	0.239 (0.194)	0.158 (0.144)	-0.047 (0.132)	0.128 (0.220)	0.056 (0.183)
Observation	32998	14524	18474	32375	14524	17851	31203	14128	17075
F-stats	192.820	59.901	151.300	58.476	31.582	28.390	58.507	31.970	28.376
R <sup>2</sup>	0.098	0.070	0.122	0.148	0.134	0.167	0.033	0.041	0.028
Kleibergen-Paap rk Wald F statistic							1432	2593	597
Kleibergen-Paap rk LM statistic							4102	2907	1462
Chi-sq(2) P-value							0.000	0.000	0.000
Industry fixed effect				Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect				Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect				Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table A.3.2: Effect of international remittances per capita on on firm sales

	Dependent variable : Total annual firm sales (log)								
	Ordinary least squares model			Fixed-effects model			Instrumental variable approach with fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture
<b>Remittances per capita</b> <sub><i>t-1</i></sub>	-0.009*** (0.000)	-0.013*** (0.001)	-0.007*** (0.000)	-0.021*** (0.001)	-0.035*** (0.003)	-0.020*** (0.002)	0.004 (0.003)	-0.013*** (0.004)	0.004 (0.005)
Trade (% of GDP) <sub><i>t-1</i></sub>	0.008*** (0.001)	-0.001 (0.001)	0.012*** (0.001)	-0.000 (0.004)	-0.010 (0.006)	0.009* (0.005)	-0.002 (0.004)	-0.014* (0.008)	0.007 (0.006)
Unemployment rate <sub><i>t-1</i></sub>	0.022*** (0.003)	0.038*** (0.005)	0.008** (0.004)	-0.329*** (0.027)	-0.458*** (0.046)	-0.342*** (0.037)	-0.421*** (0.031)	-0.533*** (0.050)	-0.424*** (0.046)
Time to start business <sub><i>t-1</i></sub>	-0.003*** (0.000)	-0.010*** (0.001)	-0.000 (0.001)	0.002 (0.002)	0.011*** (0.003)	0.002 (0.002)	0.002 (0.002)	0.008*** (0.003)	0.001 (0.002)
Real exchange rate <sub><i>t-1</i></sub>	3.060*** (0.246)	4.605*** (0.385)	2.020*** (0.317)	12.561*** (1.034)	15.295*** (1.769)	12.398*** (1.349)	13.176*** (1.170)	15.450*** (2.092)	13.041*** (1.639)
Domestic credit to private <sub><i>t-1</i></sub>	-0.008*** (0.001)	-0.010*** (0.001)	-0.009*** (0.001)	-0.017 (0.010)	-0.071*** (0.019)	-0.016 (0.013)	-0.013 (0.011)	-0.053*** (0.020)	-0.019 (0.014)
Political stability index <sub><i>t-1</i></sub>	0.162*** (0.022)	0.112*** (0.035)	0.201*** (0.028)	-0.352*** (0.096)	-0.938*** (0.168)	-0.073 (0.133)	-1.037*** (0.117)	-1.344*** (0.202)	-0.826*** (0.162)
Corruption index <sub><i>t-1</i></sub>	-0.017*** (0.001)	-0.021*** (0.002)	-0.014*** (0.001)	-0.010*** (0.002)	-0.009*** (0.003)	-0.006* (0.003)	-0.024*** (0.003)	-0.020*** (0.004)	-0.018*** (0.004)
Transport obstacle <sub><i>t-1</i></sub>	0.108*** (0.033)	0.155*** (0.047)	0.056 (0.047)	0.018 (0.031)	-0.011 (0.043)	0.054 (0.044)	-0.014 (0.031)	-0.011 (0.044)	0.001 (0.045)
Number of power outages (log) <sub><i>t-1</i></sub>	0.134*** (0.031)	-0.115** (0.051)	0.258*** (0.038)	-1.094*** (0.104)	-2.232*** (0.194)	-0.994*** (0.138)	-0.972*** (0.105)	-2.030*** (0.196)	-0.885*** (0.140)
Female Ownership	-0.460*** (0.051)	-0.446*** (0.088)	-0.450*** (0.063)	-0.181*** (0.049)	-0.125 (0.082)	-0.187*** (0.062)	-0.174*** (0.049)	-0.132 (0.083)	-0.180*** (0.061)
Location (= large city)	-0.374*** (0.031)	-0.635*** (0.048)	-0.220*** (0.041)	0.123*** (0.034)	0.022 (0.051)	0.184*** (0.046)	0.165*** (0.034)	0.066 (0.052)	0.214*** (0.046)
Large size firm	0.956*** (0.052)	0.966*** (0.069)	0.886*** (0.082)	1.271*** (0.051)	1.314*** (0.067)	1.268*** (0.082)	1.247*** (0.052)	1.280*** (0.068)	1.243*** (0.083)
Firm sales <sub><i>t-3</i></sub>	0.630*** (0.005)	0.622*** (0.008)	0.624*** (0.006)	0.499*** (0.006)	0.473*** (0.009)	0.510*** (0.007)	0.505*** (0.006)	0.483*** (0.009)	0.514*** (0.008)
GDP per capita <sub><i>t-1</i></sub>	0.000 (0.000)	-0.000 (0.000)	0.000** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.000** (0.000)	-0.001*** (0.000)	-0.000* (0.000)
Domestic investment <sub><i>t-1</i></sub>	0.021*** (0.002)	0.021*** (0.003)	0.018*** (0.003)	0.054*** (0.007)	0.072*** (0.012)	0.028*** (0.010)	0.050*** (0.008)	0.059*** (0.013)	0.028** (0.012)
Observation	33626	14827	18799	33000	14827	18173	31804	14422	17382
F-stats	3307.523	2068.271	1400.387	1291.059	665.072	693.594	1197.051	611.067	615.337
R <sup>2</sup>	0.604	0.661	0.556	0.692	0.743	0.647	0.465	0.494	0.443
Kleibergen-Paap rk Wald F statistic							1462	2579	672
Kleibergen-Paap rk LM statistic							4197	2946	1544
Chi-sq(2) P-value							0.000	0.000	0.000
Industry fixed effect				Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect				Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect				Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table A.3.3: Effect of international remittances per capita on the number of permanent and full-time employees

	Dependent variable : Number of full-time employees(log)								
	Ordinary least squares model			Fixed-effects model			Instrumental variable approach with fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture	All	Manufacture	Non-Manufacture
<b>Remittances per capita</b> <sub><i>t-1</i></sub>	0.000*** (0.000)	0.000 (0.000)	0.000*** (0.000)	0.000 (0.000)	-0.002* (0.001)	0.001 (0.001)	0.007*** (0.001)	0.004*** (0.001)	0.010*** (0.002)
Trade (% of GDP) <sub><i>t-1</i></sub>	-0.001*** (0.000)	-0.001 (0.000)	-0.000* (0.000)	-0.000 (0.001)	0.003 (0.002)	-0.001 (0.002)	0.002 (0.001)	0.002 (0.002)	0.004* (0.002)
Unemployment rate <sub><i>t-1</i></sub>	-0.000 (0.001)	0.006*** (0.002)	0.001 (0.001)	-0.016** (0.008)	0.021 (0.015)	-0.016 (0.011)	-0.059*** (0.010)	-0.012 (0.016)	-0.082*** (0.015)
Time to start business <sub><i>t-1</i></sub>	-0.000 (0.000)	0.000 (0.000)	-0.001*** (0.000)	-0.002*** (0.001)	-0.003*** (0.001)	-0.001 (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.001* (0.001)
Real exchange rate <sub><i>t-1</i></sub>	-0.434*** (0.068)	-0.700*** (0.108)	-0.404*** (0.088)	0.263 (0.322)	-0.440 (0.529)	0.457 (0.425)	1.210*** (0.384)	-0.077 (0.587)	2.137*** (0.540)
Domestic credit to private <sub><i>t-1</i></sub>	0.002*** (0.000)	0.001** (0.000)	0.002*** (0.000)	0.006* (0.003)	0.003 (0.006)	0.007 (0.004)	0.017*** (0.004)	0.014* (0.007)	0.019*** (0.005)
Political stability index <sub><i>t-1</i></sub>	-0.037*** (0.007)	-0.083*** (0.011)	-0.016** (0.008)	0.044 (0.030)	0.136** (0.060)	0.109*** (0.040)	-0.024 (0.039)	0.027 (0.072)	0.068 (0.052)
Corruption index <sub><i>t-1</i></sub>	-0.000 (0.000)	-0.001 (0.001)	0.001* (0.000)	0.003*** (0.001)	0.002* (0.001)	0.003*** (0.001)	-0.001 (0.001)	-0.000 (0.001)	-0.001 (0.001)
Transport obstacle <sub><i>t-1</i></sub>	0.010 (0.010)	0.011 (0.016)	-0.006 (0.014)	0.010 (0.010)	0.004 (0.015)	0.012 (0.014)	0.003 (0.011)	0.004 (0.016)	0.001 (0.014)
Number of power outages (log) <sub><i>t-1</i></sub>	-0.073*** (0.010)	-0.119*** (0.017)	-0.044*** (0.012)	0.066* (0.034)	0.120* (0.072)	0.099** (0.045)	0.114*** (0.035)	0.159** (0.074)	0.169*** (0.047)
Female Ownership	-0.220*** (0.016)	-0.208*** (0.027)	-0.202*** (0.019)	-0.225*** (0.016)	-0.209*** (0.027)	-0.237*** (0.019)	-0.226*** (0.016)	-0.217*** (0.027)	-0.236*** (0.020)
Location (= large city)	0.145*** (0.010)	0.151*** (0.015)	0.152*** (0.012)	0.134*** (0.011)	0.174*** (0.017)	0.111*** (0.015)	0.134*** (0.011)	0.178*** (0.018)	0.111*** (0.015)
Large size firm	2.630*** (0.015)	2.557*** (0.019)	2.625*** (0.023)	2.457*** (0.015)	2.416*** (0.020)	2.484*** (0.024)	2.455*** (0.016)	2.417*** (0.020)	2.473*** (0.025)
GDP per capita <sub><i>t-1</i></sub>	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000*** (0.000)	0.000* (0.000)	0.000*** (0.000)
Domestic investment <sub><i>t-1</i></sub>	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.003 (0.002)	0.004 (0.004)	0.006** (0.003)	-0.003 (0.003)	-0.002 (0.005)	-0.005 (0.004)
Observation	33206	14683	18523	32593	14683	17910	31404	14279	17125
F-stats	2402.462	1366.332	961.341	1827.833	1029.396	773.112	1751.925	1002.710	729.457
R <sup>2</sup>	0.556	0.600	0.496	0.588	0.636	0.507	0.509	0.562	0.441
Kleibergen-Paap rk Wald F statistic							1407	2572	630
Kleibergen-Paap rk LM statistic							4051	2869	1503
Chi-sq(2) P-value							0.000	0.000	0.000
Industry fixed effect				Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect				Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect				Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses are clustered at the country level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.



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## DO INTERNATIONAL REMITTANCES INCREASE INTERNAL CASH TRANSFERS? EVIDENCE FROM SENEGAL

### 2.1 Introduction

International remittances now play a crucial role in improving the standard of living of recipients, especially in developing countries. Numerous articles have shown that international remittances reduce poverty (Maitra & Ray (2003), Adams Jr & Page (2005), Giannetti et al. (2009), Anyanwu & Erhijakpor (2010)). However, the effects of these remittances on inequality remain ambiguous. While some studies find a positive effect of international remittances on inequality (Barham & Boucher (1998), Adams et al. (2008), Bouoiyour & Miftah (2014), Möllers & Meyer (2014)), others find a negative or no effect (Acosta et al. (2008), Gubert et al. (2010) Beyene (2014)).

Although the findings are quite different, the papers that analyze the effect of remittances on inequality use the same methodological approach. They compare income distribution with and without international remittances using the Gini index. Even though this approach theoretically considers the direct and indirect effects of international remittances as defined by Taylor (1992) and Taylor & Wyatt (1996), there is one aspect of international remittances in developing countries that this method does not address. This aspect refers to the possibility that the international remittances received are not entirely destined for the primary recipient. They may benefit others inside or outside the household due to social norms of benevolence or an implicit indication from the senders. The above is particularly true in Senegal, known for the legendary generosity of its citizens and the close ties that characterize family members and religious communities (Boltz-Laemmel & Villar (2013)). Omitting this possibility tends to overestimate the income of recipients and underestimate that of non-recipients. Therefore, this article aims to contribute to the sparse and ambiguous literature on remittances and inequality by consider-



ing the possible distribution of international remittances domestically. Specifically, I investigate whether recipients of international remittances share them within the country, on the one hand, and how this possible redistribution affects inequality, on the other. The second point on which this paper differs from existing studies is the level of analysis. Unlike the existing literature, which analyzes the effect of remittances on inequality at the country or household level, this paper analyzes the effect at the individual level since remittances are received individually. To my knowledge, this paper is the first to analyze the effects of international remittances on internal cash transfers and inequality, considering the distributional aspect of these remittances within the country.

Using the instrumental variable approach and a large sample of individuals over the age of 13 in Senegal, I study the effect of international remittances on the sending of internal cash transfers. First, the results show that individuals who receive international remittances are more likely to send internal cash transfers. Specifically, I find that receiving international remittances increases the likelihood of sending internal cash transfers by about 26%. Second, I show, on the one hand, that the rich who receive international remittances are more likely to send internal cash transfers, and on the other hand, that it is the poorest who benefit from these internal cash transfers. Furthermore, when people receive international remittances and send internal cash transfers, the Gini index is 4.50 percentage points and 9.2 percentage points lower, respectively than a situation without international transfers and with international transfers but no internal sharing. All these results demonstrate the redistributive role of international remittances in Senegal. The findings are robust to the variables used since using extensive margins instead of intensive margins leads to similar results. Moreover, the positive impact of receiving international remittances on sending internal transfers remains, regardless of the recipients' location. Finally, I find similar results using several alternative specifications and econometric approaches.

The remainder of the article is structured as follows: section 2.2 presents a brief review of the literature on remittances and inequalities. Data description and identification strategies are presented in sections 2.3 and 2.4, respectively. In Sections 2.5 and 2.6, I show the main results and the test for heterogeneity, respectively. Section 2.7 presents some robustness checks, and Section 2.8 concludes.

## 2.2 Literature review

There is little evidence and consensus in the literature on the impact of international remittances on inequalities in recipient countries. Theoretically, Taylor (1992) and Taylor & Wyatt (1996) distinguished two effects of remittances on recipients' income: a direct effect and an indi-

rect effect. The direct impact refers to the immediate increase in household resources resulting from the remittance received, while the indirect impact refers to the expected change in recipients' behavior. Thus, the indirect effect of remittances on income can be positive if recipients use remittances productively (investment) and negative if they reduce their participation in the labour market. In addition to these two expected effects of remittances on recipients' income, the overall impact of remittances on inequalities will also depend on which income quintile receives the most.

Empirically, although many papers have analyzed the effect of migrants' remittances on income distribution (Akim & Robilliard (2019), Bouoiyour & Miftah (2014), Beyene (2014), Margolis et al. (2013), Mughal & Anwar (2012), Gubert et al. (2010), Adams et al. (2008), Acosta et al. (2008), Barham & Boucher (1998)), there is still no consensus on the nature of this effect. While some papers have shown that remittances reduce inequality, others have found positive or no impact.

In the first set, Acosta et al. (2008) showed, using a large panel of cross-national data, that remittances to countries in Latin America and the Caribbean (LAC) reduce inequalities. Similarly, using a household survey in Mali, Gubert et al. (2010) found that remittances reduce the Gini coefficient by about 5%. Likewise, Mughal & Anwar (2012) argued that foreign remittances have a beneficial effect on economic inequalities in Pakistan. They show that the contribution of these remittances to reducing inequalities is far more significant than that of domestic remittances. Finally, Margolis et al. (2013) found that remittances decrease the Gini index by nearly 4% for both regions by analyzing the distributive impact of remittances in two Algerian emigration regions (Nedroma and Idjeur).

Conversely, Barham & Boucher (1998) argued that remittances exacerbate income inequalities in examining the net effects of migration and remittances on income distribution in Nicaragua. Likewise, Adams et al. (2008) found that international remittances positively affect income inequality in Ghana. They showed that international remittances increase the Gini coefficient by about 17.4%. Bouoiyour & Miftah (2014) obtained similar results in rural areas of southern Morocco using survey data. Möllers & Meyer (2014) also found a positive effect of remittances on income inequality in rural areas of Kosovo, where Gini coefficients showed a tendency to increase due to migration.

Finally, other authors have found no effect of remittances on inequality. For example, Yang & Martinez (2006) shows that in the Philippines, there is no substantial evidence that remittances affect inequality, at least at the regional level. Similarly, using a survey of urban households, Beyene (2014) showed that international remittances do not change inequality levels in Ethiopia.

However, all of these papers used the same methodological basis to estimate the effect of remittances on inequality. The authors constructed the counterfactual income of recipients - that

is, their income in the absence of transfers - from estimating an income equation on the sample of non-recipients. Although this approach is interesting from a theoretical point of view, there is a risk of overestimating the income of the primary recipients and underestimating the income of non-recipients if part of these international transfers is shared with others internally. [Akim & Robilliard \(2019\)](#) also mentioned this possibility in a recently published article. The others highlighted, in particular, the possible role of international transfers in the equalizing effect of internal transfers that they have observed. Therefore, in this article, I examine this possibility by analyzing, on the one hand, whether the recipients of international remittances share part of the transfers received domestically and, on the other hand, whether these transfers have a redistributive character.

## 2.3 Data

The data used for this study come from the Poverty and Family Structure survey conducted in Senegal in 2006 and 2010 ([De Vreyer et al. \(2008\)](#)). It is a nationally representative household survey that provides detailed information on various topics, including remittances and cash transfers. This survey consists of two waves, but I used only the second wave for this study because the first wave does not report information on the origin of transfers. The second wave includes 3,020 households and 28,348 individuals. However, transfer information is only available for individuals over 13, limiting the database to 16,615 individuals. Furthermore, in this article, I consider remittances to and from abroad as international and transfers within Senegal as internal transfers. Using this definition, I identified 840 people (5 %) receiving regular remittances and 5471 people (33 %) sending internal cash transfers in 2010.<sup>1</sup>

Table 2.1 presents the main variables used in this paper. These variables refer to the socio-economic characteristics of individuals, households, and communities. We distinguish four categories of individuals: those who receive international remittances without sending internal cash transfers, those who receive international remittances and send internal cash transfers, those who send internal cash transfers without receiving international remittances, and those who neither receive nor send. Several interesting contrasts emerge when comparing these four groups. In particular, those who send internal cash transfers, whether or not they receive international remittances, appear to be wealthier and older than the other categories. In terms of amount, international remittances received per capita account for an average of 35% of recipients' total expenditures. In comparison, internal cash transfers sent represent 5% of the senders' total spending.

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<sup>1</sup>I did not report descriptive statistics for individuals receiving internal remittances, but they numbered 2468, or 14% of the sample.

## 2.4 Empirical specification

### 2.4.1 Ordinary least squares model

To estimate the effect of receiving international remittances on sending internal cash transfers, the basic econometric model is :

$$S_i = \alpha + \beta R_i + \gamma X_i + \epsilon_i \quad (2.1)$$

$S_i$  is a dummy variable equal to 1 if the individual sends an internal transfer and 0 otherwise.  $R_i$  is also a dummy variable that takes the value 1 if the individual receives international remittances and 0 otherwise.  $X_i$  includes a vector of socio-economic characteristics of the individual, household, and community.

However, estimating this specification using a Probit model could lead to biased coefficients. The primary source of this bias would be the endogeneity of remittances. Indeed, remittances can be endogenous for at least three reasons. Firstly, there may be unobservable omitted factors that can explain both the receipt of international remittances and the sending of internal cash transfers. Second, there may be a memory bias that could lead to measurement errors in the explanatory variable of interest. Finally, reverse causality could be a concern, especially if people receive transfers from abroad because they make internal cash transfers. These factors may make it impossible to establish a causal link between the receipt of international remittances and the sending of internal cash transfers.

### 2.4.2 Instrumental variables approach

To address the endogeneity issue raised above, I use the instrumental variable approach. Concretely, I use the following two instruments : (1) The magnitude of the great drought of 1983, measured as a deviation of 1983 rainfall from historical averages (for 22 years) at the district level<sup>2</sup> and (2) GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district  $i$  living in that country five years ago.

Regarding the first instrument, many papers have already used changes in precipitation as instruments for migration and remittances (Munshi (2003); Yang & Choi (2007); Adams Jr & Cuecuecha (2010); Barrios Puente et al. (2016)). In this paper, I use the 1983 rainfall shock, which is the largest negative rainfall shock ever recorded in Senegal, as shown in Figure 2.1.

<sup>2</sup>I measure the magnitude of the great drought of 1983 as a deviation from the historical average as follows:

$$Shock_{i1983} = \frac{\bar{R}_i - R_{i1983}}{R_i^{SD}}$$

Where  $\bar{R}_i$  is the historical annual average rainfall (for 22 years) at the district of residence  $i$ .  $R_{i1983}$  indicates the 1983 annual rainfall in district  $i$  and  $R_i^{SD}$  is the standard deviation of annual rainfall (calculated over the 22-year period)

Specifically, I used variation in the magnitude of the 1983 drought by locality of residence as a predictor of current migration and remittances. The idea behind this is that international migration, unlike internal migration, has a very high economic cost that only relatively wealthy families can bear. Thus, in a country like Senegal, where many families live directly or indirectly from agriculture, animal husbandry, and fishing that depend heavily on the rains, severe droughts can lead to significant economic losses and consequently affect their ability to migrate internationally. However, as the extent of this 1983 drought is not the same in different localities, its effect on early migration may also vary. Therefore, we expect lower early international migration in localities with the most extensive drought. These early migrations can, in turn, create migration networks that can affect current migration and remittances by reducing migration costs (McKenzie & Rapoport (2007); Hanson & Woodruff (2003)). As a result, one can expect a negative relationship between the magnitude of the great drought of 1983 and current international migration and remittances received.

Figures 2.2 and 2.3 show the extent of the 1983 drought and international migration rates in 1993 and 2010 by district, respectively. As expected, in graph 2.2, we can observe that the early international migration rate is lower in the districts with the highest drought shock. A negative relationship between the extent of drought and the international migration rate is also observed when considering recent years, as shown in Figure 2.3.

In addition to strongly explaining the endogenous variable, this instrument must meet the exclusion restriction conditions. Although it is intuitively plausible that the rainfall instruments are exogenous, the exclusionary restriction conditions could be violated if, for instance, following the 1983 drought, there were large internal migration flows into Senegal. Suppose that the households or individuals most likely to migrate abroad have moved from the most drought-affected locations to less affected ones. Then, those who were most successful have members who have in turn migrated, but this time abroad, and these members send remittances back to their families of origin. This could explain the negative relationship between international remittances and the magnitude of the 1983 drought shock and invalidate the instrumentation strategy, especially if the factors that led these households or individuals to migrate internally also affect their propensity to send remittances.

To test this potential violation of the exclusion restriction conditions, I first examine internal migration patterns in 1993, ten years after the 1983 drought. We focus on data from 1993 because this is the first nationally representative survey on migration in Senegal. The Agence Nationale de la Statistique et de la Démographie (ANSD) conducted the survey. The objective is to see if significant internal migration flows from the most affected localities are observed following the great drought. Figure 2.4 shows the correlation between the emigration rate and the 1983 rainfall deviation from the historical average in the different localities. It can be seen from

this graph that the great drought of 1983 did not cause massive emigration to less affected localities since no positive relationship was observed between the 1993 internal emigration rate and this great drought. Next, I investigated whether individuals born before 1983 and old enough to have migrated at that time and who receive international remittances are more likely to have been born elsewhere than in their current place of residence. Table 2.2 presents the results of this analysis. This Table shows that living in the same residence as at birth has no significant effect on the probability of receiving remittances for individuals born before 1983, whether or not we control for a set of socioeconomic characteristics. These results indicate that remittance recipients born before 1983 are not more likely to have been born outside their current place of residence. Taken together, the findings of the previous analyses suggest that the violation of the exclusion restriction conditions associated with large internal migration flows after the 1983 drought, discussed above, is less likely to occur.

My second instrument is the GDP growth rate of the major remittance-sending countries, weighted by the emigration rate five years ago from each district in Senegal to those countries. The use of these countries' economic conditions as an instrument for remittances is not new either (Acosta et al. (2008), Amuedo-Dorantes & Pozo (2011)). The argument behind this instrument is that if the GDP in the remittance-sending country increases, migrants' incomes have increased, which means that they have more money to send. One can therefore expect remittances to increase in response to this increase in GDP. However, the actual effect of economic conditions in destination countries on remittances received will depend on the size of the population immigrating to those countries from different areas of Senegal. For this reason, I weight the growth rate by the rate of emigration from each district to these countries five years ago.

My claim is that conditional on the set of individual, household, and district characteristics included in my specification, the unobserved components of my dependent variable are not correlated with these two instruments. Based on the above, I use a linear probability model (LPM) with an instrumental variable (IV) approach where, as a first step, I estimate the probability of receiving international remittances as follows :

$$R_i = \alpha_1 + \alpha_2 X_i + \alpha_3 Z_i + \epsilon_i \quad (2.2)$$

Where  $R_i$  represents the suspected endogenous variable. It takes the value 1 if the individual receives international remittances and 0 otherwise.  $X_i$  includes a vector of socio-economic characteristics of individuals, households, and districts based both on standard literature on migration and remittances and on the Senegalese context. Although Figure 2.5 shows no apparent correlation between the current poverty rate and the shock variable used as an instrument, other variables related to the location of individuals could be predictors of both receiving international

remittances and sending domestic transfers. That is why I use regional fixed effects, and I control local development (Nighttime Lights) in all regressions.  $Z_i$  is a vector of the instrumental variables described above.  $\alpha_i$  are the reduced form coefficients.

The second step equation of the effect of receiving international remittances on sending internal cash transfers can be estimated as follows:

$$S_i = \alpha + \beta \hat{R}_i + \gamma X_i + \epsilon_i \quad (2.3)$$

$S_i$  is a dummy variable equal to 1 if the individual sends internal cash transfers and 0 otherwise.  $\hat{R}_i$  is the fitted value of international remittances and  $X_i$  is the same variable described in equation 3.2. Our coefficient of interest is  $\beta$ , and  $\epsilon_i$  represents the error term.

Since ? have shown that the marginal effects of a dummy variable estimated by the linear probability model (LPM) and probit techniques are "indistinguishable," we follow this literature and estimate the LPM with instruments.

## 2.5 Results

### 2.5.1 Determinants of receiving international remittances and sending internal cash transfers

I first begin by examining the determinants of receiving international remittances and sending internal cash transfers, as well as the interdependence of these two decisions. To do this, I use a bivariate Probit regression. Table 2.3 shows the results of this estimation. Overall, I find that older people, women, people with more formal education, and Koranic education are more likely to receive international remittances.

Although the coefficients associated with each of the explanatory variables of the bivariate Probit model are interesting, the key statistic of this estimate is the covariance of the error terms of these two equations ( $\rho$ ) shown at the bottom of Table 2.3. The estimated coefficient associated with this  $\rho$  is 0.286 and significant at any conventional level ( $p = 0.000$ ). This positive covariance implies that people who are more likely to receive remittances than the model predicts are also (on average) more likely to send internal cash transfers than the model predicts. Hence, the decision to send internal cash transfers is not entirely independent of the receipt of international remittances.



## **2.5.2 Effect of international remittances on sending internal cash transfers**

### **2.5.2.1 Effect of receiving international remittances on sending internal cash transfers**

Table 2.4 displays the main results of the analysis. I report the results estimated using the Probit model in the first two columns. This estimate shows that, on average, receiving international remittances increases the probability of sending domestic transfers by 18% (column 2).

I consider the potential endogeneity of international remittances and use a 2SLS linear probability model to correct this potential bias in the following columns. The first and second stages are presented in columns 3 and 4, respectively. As expected, column 3 shows that the instruments used predict the probability of receiving international remittances very well. Indeed, the GDP growth rate in the major remittance-sending countries weighted by the Senegalese migration rate in each of these countries is positively and significantly associated with the likelihood of receiving international remittances. In contrast, as mentioned above, the magnitude of the great drought of 1983 is negatively associated with international remittances. Specifically, if the magnitude of the great drought of 1983 increases by 1 standard deviation of regular precipitation levels, the probability of receiving international remittances decreases by 0.07.

We also note at the bottom of column 4 that the instruments used are also relevant. They pass the tests for weak identification, under-identification, and overidentification. Indeed, the Kleibergen-Paap Wald F rk statistic for weak identification is well above the critical values of Stock-Yogo. Moreover, the p-value associated with the Kleibergen-Paap LM rk statistic is below 5% which allows to reject the null hypothesis of no correlation between the instruments and the endogenous variable. In addition, the p-value of the Hansen test is equal to 0.149, so the null hypothesis of no correlation between the instruments and the error term is not rejected. Thus, the exclusion restriction conditions are met.

The results of the second stage estimate are shown in the last column of Table 2.4. The positive effect of receiving international remittances on sending internal cash transfers found in the first and second columns remains unchanged. However, the effect size is larger using the instrumental variable method. I find that receiving international remittances increases the probability of sending internal cash transfers by about 25%, compared to 18% using the Probit model. In other words, the Probit model tends to underestimate the effect.

### **2.5.2.2 Effect of the amount of international remittances received on the amount of internal cash transfers sent**

In the previous subsection, I examined intensive margins using dummy variables indicating whether or not individuals received international remittances and sent internal transfers. This



subsection discusses the extensive margins of international remittances by focusing on the amount of international remittances received and internal transfers sent. Specifically, I use the logarithm of these amounts.

Table 2.5 reports the results of this analysis. The results using ordinary least squares reported in the first column show that the amount of international remittances received is positively associated with the amount of internal cash transfers sent. Specifically, I find that a 1% increase in international remittances leads to a 0.17% increase in internal transfers. I then used the instrumental variable approach with the same instruments as above to address the endogeneity of international remittances. The results of the first and second stages are presented in columns 2 and 3 of Table 2.5, respectively. The first step results and the statistics reported at the bottom of column 4 confirm the relevance and validity of the instruments used. Finally, the estimation of the instrumental variables shows that a 1% increase in the amount of international remittances leads to a 0.20% increase in the amount of transfers sent within the country. This analysis indicates that the dependent variable and the variable of interest selected do not drive the results observed above since replacing dummy variables with amounts does not change the results.

### **2.5.3 Is there a redistributive effect of international remittances ?**

I showed that people who have received international remittances are more likely to send internal cash transfers in the previous subsection. However, to assert a redistributive effect of international remittances, it is necessary to examine, on the one hand, the main characteristics of the senders and receivers of these internal cash transfers, and on the other hand, how this sharing affects income inequality.

#### **2.5.3.1 Who sends Internal cash transfers?**

This section investigates whether wealthier recipients of international remittances are more likely to send domestic transfers than less wealthy recipients. I used both monetary and multidimensional measures of wealth. The monetary wealth criterion refers to per capita expenditures and the international poverty line of \$1.25 (2005 PPP). Specifically, I consider an individual to be poor if he or she spends less than \$1.25 per day and non-poor otherwise. For multidimensional measures of wealth, I use the Grimm vulnerability score<sup>3</sup> (Grimm et al. (2002)). I then consider

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<sup>3</sup>The Grimm vulnerability score is an indicator of objective and structural elements, which refers to the conception of poverty as a lack of capacity or vulnerability. The different components of the calculation of this score are : (1) an indicator of material living conditions (housing, water, electricity, toilets, type of fuel); (2) an indicator of the level of human capital calculated as the ratio between the number of years of education completed by household members and the maximum possible number of years of education, taking into account the age of each member; (3) a vulnerability indicator that takes into account the number of durable goods (bicycles, radios, televisions, etc.) available in each household. For each component, the maximum score corresponds to a high level of deprivation, while a score of zero means the absence of any impairment.

all individuals with a vulnerability score above eight to be multidimensionally poor.

Table 2.6 presents the results of the second stage of the instrumental variables approach. In column 1, I report the results using the monetary measure, while column 2 shows the multidimensional measure results. Overall, we observe that, regardless of the measure of wealth used, the effect of international remittances on domestic transfers is larger for wealthier individuals. Indeed, we notice that the coefficient associated with the interaction term is huge. I get similar results when I interact the receipt of international remittances with the logarithm of total per capita spending (Figure 2.6). It is clear from this figure that the probability of sending internal cash transfers increases with the total expenditure per capita. However, this increase is greater for recipients of international transfers than for non-recipients. Moreover, the gap between the two groups is enormous among the richest. Taken together, the results in Table 2.6 and Figure 2.6 provide evidence that wealthier individuals are more likely to share the international remittances they receive domestically.

### **2.5.3.2 Who receives internal cash transfers?**

Ideally, each internal transfer sent by international remittance recipients should be linked to its destination to identify whether the internal transfer recipients are, on average poor or not. But, unfortunately, the data does not allow for this analysis. For this reason, I analyzed all internal transfer recipients and examined whether they are poor or not on average. Specifically, I explored the determinants of internal transfer receipt. Besides the standard of living variable, these determinants are age, education level, gender, marital status, religion, location, and socio-professional category.

Regarding the standard of living variable, I use the same two measures of wealth as before: the monetary index and the multidimensional index. The point is to investigate whether the probability of receiving internal cash transfers decreases or increases with individuals' level of wealth. The results of this analysis are shown in Table 2.7. We note that both monetary and multidimensional wealth indices are negatively associated with the probability of receiving internal cash transfers. This implies that the poor are most likely to receive these internal cash transfers. Figure 2.7, which shows the relationship between the probability of receiving internal cash transfers and total expenditure per capita, leads to similar conclusions.

### **2.5.3.3 How do receiving international remittances and sending internal cash transfers affect income inequalities?**

In this subsection, I examine how sharing a portion of international remittances affects income inequality relative to the counterfactuals. Specifically, I use the two-step [Dubin & McFadden](#)

(1984) method to predict selection-adjusted income in the following three scenarios: (1) without international remittances, (2) with international remittances but no internal sharing, and (3) with international remittances and internal sharing (See Appendix A.1 for details). This approach draws on existing research on remittances and inequality, in particular Adams et al. (2008), Gubert et al. (2010) and Akim & Robilliard (2019).

The first stage of the model predicts the probability of being in one of the three scenarios described above. Then, in the second step, I estimate the income equation. Next, I use the parameters from the second step to predict the income of individuals in each of the three situations. Finally, I calculate the different inequality indices: the Gini index, the Palma ratio, the interquartile ratio, from these incomes.

I use income rather than consumption inequality because I focus on an individual-level analysis, and consumption is not observed individually. The income variable includes wage income, compensation, unemployment insurance, rental income, own-account farm income, individual entrepreneurs' income, retirement insurance, pensions, and government transfers.

Table 2.8 presents the first stage equation results. We note in the last part of this table that the two instruments used to predict very well the probability of being in scenario 2 (receiving international remittances only) and scenario 3 (receiving international remittances and sending internal remittances) compared to scenario 1 (non-international remittances). Specifically, as expected, the magnitude of the 1983 drought shock is negatively correlated with Scenario 2 and Scenario 3 relative to Scenario 1. In contrast, the GDP growth rate in the main remittance-sending countries, weighted by the Senegalese migration rate in each of these countries, is positively correlated with scenarios 2 and 3, compared with scenario 1. This table also shows that our instruments are relevant. The joint test of our instruments is significant at 1% level. The second-stage equation results are shown in Table 2.9. Each column corresponds to one of the three scenarios mentioned above. The coefficients presented in this table are the "selectivity adjusted" coefficients used to simulate total individual income in each of the scenarios. The  $_m_k$  terms at the bottom of Table 2.9 represent the selection term. They reflect the correlation between the unobservable determinants of each scenario (1,2,3) and total annual individual income.

Table 2.10 reports several inequality indices (Gini index, Palma ratio, and interquartile ratio) based on each of the above scenarios. Overall, income distribution appears to be more egalitarian with scenario 3, where those who receive international transfers share a portion of those transfers internally. Specifically, the Gini index of income in scenario 3 is 4.50 percentage points lower than in the scenario without international remittances. Compared to the situation with international remittances but without internal sharing, the Gini index is 9.2 percentage points lower in scenario 3. The equalization effect of Scenario 3 is also supported by the Palma ratio

and the interquartile ratios reported in the same table. The analysis of the concentration curves of the different scenarios with the Lorenz curve shown in Figure 2.8 also confirms the equalization effect of scenario 3 highlighted in Table 2.10. Indeed, we notice that the concentration curve of scenario 3 is situated above those of scenarios 1 and 2.

Overall, the results in subsection 2.5.3 suggest a redistributive effect of international remittances. They show that international remittances are shared internally and that it is the richest who share these funds for the benefit of the poorest. Moreover, compared to the situation without international remittances and the situation with international remittances but without internal sharing, the scenario with international remittances and internal sharing tends to reduce income inequality.

There is, however, one point to be made about this analysis. As you may have noticed, the three scenarios analyzed above focus on the status of individuals with respect to international remittances, regardless of internal migrants' transfers. One might therefore expect the exclusion of internal remittances to affect the income estimates of individuals. Nonetheless, there are three reasons for this choice. First, given the endogeneity of internal transfers, including them as controls without correcting for this concern may lead to biased coefficients and predicted incomes, making the analysis even more problematic. Second, the value of internal transfers is likely to be partially determined by the control variables I use to predict income. Hence, the remaining effect of these transfers on income may be small. Finally, since the poor seem to be the most likely to receive these internal transfers<sup>4</sup>, not including them directly in the analysis may, at worst, underestimate the sharing effect of the international remittances I observe.

## **2.6 Does the observed effect persist regardless of the location of the recipients of international remittances?**

To answer this question, I first re-estimate the model by excluding from the database all those who reside in the capital Dakar. The decision to exclude Dakar stems from the fact that it occupies a particular position in Senegalese migration. It is the primary destination for internal migrants and a hub for the international migration of Senegalese (?). Table 2.11 shows the results of this first analysis. In particular, in column 4, which is my preferred specification, we can see that the positive and statistically significant impact of receiving international remittances on sending internal cash transfers remains unchanged, even excluding Dakar. Moreover, the effect size (31%) is even larger than the specification, including Dakar (25%). In other words, outside the capital, Dakar, receiving international remittances increases the probability of sending internal remittances by about 31%. Secondly, I did the same as before, but this time focusing

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<sup>4</sup>See subsection 2.5.3.2

on the recipients of international remittances residing in rural areas. The results of this second analysis presented in Table 2.12 show similar findings. We can see in the last column that receiving international remittances increases the likelihood of sending internal cash transfers by 29%.

## 2.7 Robustness checks

### 2.7.1 Effect of international remittances on internal cash transfers controlling for personal income and household expenditures

Since international remittances also affect individuals' non-transfer income and household expenditures and thus their value is partly determined by the treatment (receiving international remittances), I decided not to include these variables in the base model to avoid what I call "bad controls". In this subsection, I test whether receiving international remittances affects the probability of transferring internal cash, even controlling for individual income level and household wealth. The results of this analysis, using both dummy variables and amounts as dependent and interest variables, are shown in Table 2.13. Overall, the results are consistent with those of the baseline model, although the coefficients vary slightly. Overall, the results are consistent with the baseline model's, although the coefficients vary slightly. Indeed, receiving international remittances increases the probability of sending domestic cash transfers by 25.6% when we control for personal income and household expenditure per capita, compared to 25.5% in Table 2.4. As for the effect of the amount of international transfers received on the amount of domestic cash transfers sent, the coefficient decreases slightly: 0.14 when personal income and household expenditure per capita are added as control variables, compared to 0.20 with the baseline specification (Table 2.5).

### 2.7.2 Including non-regular international remittances

So far, I have only considered those who regularly receive international remittances as these transfer recipients. In this subsection, I expand the beneficiary definition to include all those who received international remittances in the past 12 months, even irregularly, to test whether the results are robust to the inclusion of non-regular recipients. The results of this analysis, using both dummy variables and amounts as dependent and interest variables, are shown in Table 2.15. Overall, my results remain unchanged. International remittances still have a positive and significant effect on internal cash transfers. However, the magnitude of this effect is somewhat smaller than before. This suggests that the regular nature of remittances plays a crucial role in sharing international remittances.

### 2.7.3 Alternative econometric models

#### 2.7.3.1 Effect of receiving international remittances on sending internal cash transfers using the bivariate, control function, and IV-PROBIT approaches

In this part, I test the robustness of the results using alternative instrumental variable approaches. First, as suggested by ?, I use a bivariate "Biprobit" model, where the receipt of international remittances and the sending of internal cash transfers are modeled as probits. This is a joint maximum likelihood procedure. The results of the equation estimating the effect of receiving international remittances on the probability of transferring internal cash are shown in the first column of Table 2.14. As previously, I find a positive and statistically significant effect of international remittances on internal cash transfers. Specifically, the likelihood of sending internal transfers is 18% higher when individuals receive international transfers.

Second, I follow ? and ? and apply a control function approach. This approach first uses probit to regress the receipt of international remittances on the instruments and exogenous variables. Then, I use the fitted probit regression probabilities and the instruments as instrumental variables to estimate the effect of receiving international remittances on sending domestic money. The second column presents the results of this estimation. We note that the results are similar to those of the linear probability model.

Third, I estimate the effect of international remittances on transfers using an IV-PROBIT model. Since this model requires continuous endogenous variables, I use the amount of international remittances received as the variables of interest. The results of this analysis, presented in the last column of Table 2.14, show that an increase in the amount of international remittances received leads to higher internal cash transfers sent.

#### 2.7.3.2 Effect of receiving international remittances on sending internal cash transfers using Propensity score matching

Even if the instruments used pass all instrument validation tests and the analyses in Subsection 2.4.2 argue against a violation of the exclusion restriction assumption, I nonetheless recognize that I cannot definitively rule out the possibility that our instruments have some independent impact on the sending of internal cash transfers. Therefore, I use propensity score matching (PSM) as an alternative approach to check the robustness of the results. This method estimates the average treatment (international remittances) impact on treated individuals by comparing recipients and non-recipients based on their observable characteristics. The idea is to find non-recipient individuals similar to recipient individuals in terms of observable variables described by the propensity score. I then use the results from these untreated units to estimate the counterfactual outcome for the treated units in the absence of treatment. We can obtain the average

treatment effect on the treated by differentiating between the beneficiary and non-beneficiary units with similar propensity scores. I employed various matching methods to construct the counterfactual situation: Kernel, Radius caliper(0.01), Nearest-neighbor, Five Nearest-neighbor, Ten Nearest-neighbor, and Mahalanobis.

Before presenting the analysis results, I first performed a matching diagnosis by examining the performance of the variables used in the model before and after matching and the common support hypothesis. The results of these diagnostics are presented in Table 2.16 and Figures 2.9 and 2.10. More precisely, Table 2.16 presents the percentages of bias before and after matching for each variable, the percentage reduction in bias after matching, and the significance level of the t-test. Overall, this table shows that the significant differences between treated and untreated observable characteristics before matching became statistically insignificant after matching. The existence of a substantial overlap between the treated and non-treated characteristics illustrated in Figures 2.9 and 2.10 confirms the validity of the common support hypothesis.

The effect of receiving international remittances on sending internal cash transfers using the propensity score matching method is shown in Table 2.17. Overall, I find that people who receive international remittances are 19-25% more likely to send internal cash transfers than if they do not receive any, depending on the matching method used (column 1). These findings are within the range of results obtained with the instrumental variable approach. This positive effect remains unchanged when I use the logarithm of the amount sent instead of the dummy for sending (column 2). This confirms the robustness of the results to the chosen method or variable.

Finally, given that the propensity score matching method is based on observable characteristics, one would expect that unobservable characteristics could bias the results. To address this concern, I perform the Rosenbaum (2002) sensitivity test, which assumes the existence of influential unobserved variables and estimates the size that these unobserved variables would need to be for the results to change. The larger the magnitude required to affect the analysis, the less likely the unobserved variables affect the results. More concretely, this analysis consists of choosing Gamma values (hidden bias due to unobserved factors) greater than one and recalculating the associated p-values. We then look for the smallest Gamma value that will modify the result. The higher this value is, the less sensitive the result is to the presence of unobserved variables. The results of this sensitivity analysis, presented in Table 2.18, show that the critical Gamma values are greater than 4 for both outcomes used. This demonstrates that the results are not sensitive to unobserved factors because these Gamma values are above the generally accepted critical Gamma value in this literature, which is 2 (Thapa & Acharya (2017), Bertoli & Marchetta (2014), Clément (2011)).



## 2.8 Concluding Remarks

In this paper, I examine how international remittances affect internal cash transfers in Senegal, one of the largest recipients of international remittances in Sub-Saharan Africa. First, using the instrumental variables approach, I find that international remittances are internally shared. Indeed, the results show that people who receive international remittances are more likely to send internal cash transfers. I then investigate whether international remittances have redistributive effects by analyzing the profile of senders and recipients of domestic remittances, on the one hand, and how receiving international remittances and sending domestic remittances affect income inequality, on the other. Regarding senders, the results show that wealthier individuals who receive international remittances are more likely to send domestic transfers. When it comes to who receives internal cash transfers, I find that it is the poorest and most vulnerable people who benefit.

Regarding income inequality, the results show that compared to a situation without international remittances or international remittances but without internal sharing, inequality is lower when people receive international remittances and send internal cash transfers. This suggests that international remittances have a redistributive effect in Senegal. The results are robust to the variable of interest used and the location of the beneficiaries. I also find similar results using several alternative specifications and econometric approaches.

These results have several implications. Firstly, the results are in line with articles that find a negative effect of remittances on inequalities ([Acosta et al. \(2008\)](#), [Gubert et al. \(2010\)](#)) as the redistributive nature of the international remittances can help reduce income inequalities between individuals. Secondly, my results consider the literature on inequalities in international remittances. Indeed, until now, the literature has omitted this redistributive character of international remittances by focusing only on the main recipient of remittances. This overestimates the income of primary recipients and underestimates secondary recipients, mainly if they are not observed in the survey. For this reason, analysts should not limit their studies to those receiving directly remittances from abroad in order to identify their impacts (not just on inequality). Finally, the results underline, on the one hand, the strong solidarity between individuals in developing countries such as Senegal, and on the one hand, that international remittances benefit not only the original households but also the extended family.



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Table 2.1: Descriptive statistics of the main variables

	All individuals		Individuals receiving international remittances only		Individuals receiving international remittances and sending internal transfers		Individuals sending internal transfers only		No remittances neither sending internal transfers	
	(1)		(2)		(3)		(4)		(5)	
	Mean.	sd	Mean.	sd	Mean.	sd	Mean.	sd	Mean.	sd
Age of individual(years)	34.67	(16.68)	44.02	(20.52)	43.55	(16.12)	38.67	(14.31)	32.12	(16.98)
Gender of individual(=1 if male)	0.45	(0.50)	0.32	(0.47)	0.27	(0.45)	0.43	(0.49)	0.47	(0.50)
Education : Non-Education	0.28	(0.45)	0.27	(0.44)	0.35	(0.48)	0.31	(0.46)	0.26	(0.44)
Education : Primary	0.14	(0.34)	0.10	(0.30)	0.12	(0.33)	0.14	(0.35)	0.14	(0.34)
Education : Secondary	0.12	(0.32)	0.09	(0.28)	0.07	(0.25)	0.07	(0.26)	0.14	(0.35)
Education : University	0.02	(0.13)	0.03	(0.16)	0.02	(0.13)	0.02	(0.13)	0.02	(0.13)
Education : Coranic School	0.41	(0.49)	0.50	(0.50)	0.41	(0.49)	0.44	(0.50)	0.39	(0.49)
Education : Missing	0.04	(0.20)	0.02	(0.14)	0.03	(0.18)	0.02	(0.14)	0.05	(0.22)
Ethnicity : Wolof/Lebou	0.45	(0.50)	0.40	(0.49)	0.43	(0.50)	0.46	(0.50)	0.45	(0.50)
Religion : Muslim-mouride	0.32	(0.47)	0.23	(0.42)	0.31	(0.46)	0.35	(0.48)	0.31	(0.46)
Socio-professional category : Unemployed	0.47	(0.50)	0.46	(0.50)	0.38	(0.49)	0.31	(0.46)	0.54	(0.50)
Socio-professional category : Farmer	0.05	(0.21)	0.05	(0.23)	0.03	(0.18)	0.04	(0.20)	0.05	(0.21)
Socio-professional category : Employer	0.23	(0.42)	0.23	(0.42)	0.36	(0.48)	0.33	(0.47)	0.17	(0.38)
Socio-professional category : Employee	0.26	(0.44)	0.26	(0.44)	0.23	(0.42)	0.32	(0.47)	0.24	(0.42)
Personal annual income(log)	6.89	(6.71)	5.74	(6.72)	7.65	(6.90)	9.96	(6.09)	5.48	(6.49)
Household has a mobile phone	0.92	(0.27)	0.94	(0.23)	0.95	(0.22)	0.93	(0.26)	0.91	(0.28)
Household head	0.36	(0.48)	0.52	(0.50)	0.63	(0.48)	0.56	(0.50)	0.26	(0.44)
Household size(log)	2.51	(0.57)	2.45	(0.54)	2.37	(0.61)	2.38	(0.62)	2.58	(0.54)
Total consumption per capita(log)	12.32	(1.53)	12.58	(1.72)	12.66	(1.52)	12.50	(1.03)	12.21	(1.69)
Remittances received as % of total expenditure pc	1.62	(15.36)	27.39	(45.96)	35.38	(69.32)	0.00	(0.00)	0.00	(0.00)
Internal cash transfers as % of total expenditure pc	1.83	(8.97)	0.00	(0.00)	5.59	(27.38)	5.50	(13.06)	0.00	(0.00)
Nighttime lights(district development level proxy)	1.42	(1.44)	1.89	(1.54)	1.42	(1.42)	1.41	(1.42)	1.40	(1.44)
Rural area location(=1 if yes)	0.45	(0.50)	0.34	(0.47)	0.41	(0.49)	0.47	(0.50)	0.45	(0.50)
Dakar	0.30	(0.46)	0.46	(0.50)	0.28	(0.45)	0.28	(0.45)	0.30	(0.46)
Ziguinchor	0.08	(0.28)	0.07	(0.25)	0.10	(0.30)	0.12	(0.32)	0.07	(0.25)
Diourbel	0.05	(0.22)	0.02	(0.15)	0.03	(0.18)	0.05	(0.21)	0.05	(0.23)
Saint Louis	0.05	(0.22)	0.01	(0.09)	0.02	(0.13)	0.05	(0.22)	0.06	(0.23)
Tambacounda	0.06	(0.24)	0.02	(0.14)	0.03	(0.17)	0.07	(0.25)	0.06	(0.24)
Kaolack	0.01	(0.07)	0.00	(0.00)	0.00	(0.00)	0.00	(0.05)	0.01	(0.08)
Thies	0.03	(0.18)	0.01	(0.09)	0.01	(0.10)	0.03	(0.18)	0.03	(0.18)
Louga	0.06	(0.23)	0.04	(0.20)	0.08	(0.27)	0.06	(0.24)	0.06	(0.23)
Fatick	0.03	(0.18)	0.07	(0.26)	0.15	(0.36)	0.03	(0.16)	0.03	(0.17)
Kolda	0.08	(0.27)	0.09	(0.28)	0.10	(0.29)	0.07	(0.26)	0.08	(0.27)
Matam	0.03	(0.16)	0.02	(0.13)	0.01	(0.10)	0.03	(0.16)	0.03	(0.17)
Kaffrine	0.03	(0.17)	0.08	(0.27)	0.03	(0.18)	0.02	(0.14)	0.03	(0.18)
Kedougou	0.14	(0.34)	0.09	(0.29)	0.13	(0.34)	0.13	(0.33)	0.14	(0.35)
Sedhiou	0.05	(0.21)	0.02	(0.14)	0.03	(0.16)	0.06	(0.25)	0.04	(0.20)
<i>N</i>	16615		349		491		4980		10795	

Table 2.2: Correlation between receiving international remittances and being in the same birth-place for individuals born before 1983

	Dependent variable : Receiving international remittances (Dummy)			
	Model 1		Model 2	
	(1)		(2)	
	Coef.	se	Coef.	se
Same place as birth	-0.005	(0.008)	0.002	(0.006)
Controls variable	No		Yes	
Observation	9681		9635	

Notes : Control variables include: Age, gender, education, ethnicity, religion, socio-professional categories, having a cell phone, household head, household size, nighttime lights(district development level proxy), rural location (=1 if yes), and regional dummy variables. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 2.3: Bivariate probit model : effects of listed variables on receiving international remittances and sending internal cash transfers (marginal effects)

	Receiving international remittances		Sending internal cash transfers	
	(1)		(2)	
	Coef.	se	Coef.	se
Age of individual(years)	0.001***	(0.000)	-0.000	(0.000)
Gender of individual(=1 if male)	-0.030***	(0.003)	-0.063***	(0.011)
Education : No education	ref		ref	
Education : Primary	0.010*	(0.005)	0.032*	(0.017)
Education : Secondary	0.012**	(0.006)	-0.062***	(0.021)
Education : University	0.039**	(0.019)	-0.008	(0.031)
Education : Coranic School	0.017***	(0.004)	0.033**	(0.015)
Education : Missing	-0.001	(0.008)	-0.086***	(0.026)
Ethnicity : No Wolof/Lebou	ref		ref	
Ethnicity : Wolof/Lebou (=1 if yes)	-0.002	(0.004)	0.004	(0.017)
Religion : Non-mouride	ref		ref	
Religion : Muslim-mouride (=1 if yes)	-0.003	(0.004)	0.010	(0.019)
Socio-professional category : Unemployment	ref		ref	
Socio-professional category : Farmer	0.009	(0.006)	0.039**	(0.019)
Socio-professional category : Employer	0.004	(0.004)	0.228***	(0.016)
Socio-professional category : Employee	-0.011***	(0.004)	0.274***	(0.016)
Household has a mobile phone(=1 if yes)	0.012**	(0.006)	0.067***	(0.018)
Household head (=1 if yes)	0.014***	(0.004)	0.227***	(0.012)
Household size(log)	-0.007**	(0.003)	-0.070***	(0.013)
Nighttime lights(district development level proxy)	0.009*	(0.005)	0.025	(0.022)
Rural area location(=1 if yes)	-0.004	(0.005)	0.038*	(0.020)
Regional controls	Yes		Yes	
Observation	16615		16615	
Dependant variable mean	0.329		0.050	
Rho	Coeff.		(se)	
	0.286		(0.028)	
Wald test of rho=0:	$\chi^2$		Prob > $\chi^2$	
	92.800		0.000	

Notes : Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 2.4: Effect of receiving international remittances on sending internal cash transfers

	Dependent variable : Sending internal cash transfers (dummy)							
	Probit regression				Instrumental-variables regression			
	Probit		Marginal effects		First Stage		Second stage	
	(1)	(2)	(3)	(4)				
Coef.	se	Coef.	se	Coef.	se	Coef.	se	
<b>Receiving international remittances</b>	0.579***	(0.064)	0.179***	(0.020)			0.255***	(0.044)
Age of individual(years)	-0.001	(0.001)	-0.000	(0.000)	0.001***	(0.000)	-0.001*	(0.000)
Gender of individual(=1 if male)	-0.160***	(0.032)	-0.050***	(0.010)	-0.026***	(0.003)	-0.043***	(0.010)
Education : No education	ref		ref		ref			
Education : primary	0.082*	(0.047)	0.025*	(0.015)	0.013**	(0.005)	0.025	(0.015)
Education : Secondary	-0.193***	(0.065)	-0.060***	(0.020)	0.014***	(0.005)	-0.047**	(0.018)
Education : University	-0.047	(0.087)	-0.015	(0.027)	0.032**	(0.014)	-0.007	(0.026)
Education : Coranic School	0.083*	(0.042)	0.026*	(0.013)	0.015***	(0.004)	0.025*	(0.014)
Education : Missing	-0.263***	(0.087)	-0.081***	(0.027)	0.005	(0.008)	-0.052**	(0.021)
Ethnicity : No Wolof/Lebou	ref		ref		ref			
Ethnicity : Wolof/Lebou (=1 if yes)	0.013	(0.047)	0.004	(0.015)	0.004	(0.004)	0.005	(0.015)
Religion : Non-mouride	ref		ref		ref			
Religion : Muslim-mouride (=1 if yes)	0.031	(0.054)	0.010	(0.017)	-0.001	(0.004)	0.010	(0.017)
Socio-professional category : Unemployment	ref		ref		ref			
Socio-professional category : Farmer	0.107**	(0.053)	0.033**	(0.016)	0.007	(0.005)	0.027*	(0.016)
Socio-professional category : Employer	0.616***	(0.042)	0.191***	(0.013)	0.001	(0.005)	0.202***	(0.014)
Socio-professional category : Employee	0.744***	(0.042)	0.230***	(0.013)	-0.015***	(0.005)	0.240***	(0.015)
Household has a mobile phone (=1 if yes)	0.188***	(0.055)	0.058***	(0.017)	0.014**	(0.006)	0.057***	(0.017)
Household head (=1 if yes)	0.628***	(0.033)	0.194***	(0.010)	0.013***	(0.004)	0.224***	(0.011)
Household size(log)	-0.194***	(0.036)	-0.060***	(0.011)	-0.004	(0.004)	-0.062***	(0.011)
Nighttime lights(district development level proxy)	0.066	(0.062)	0.020	(0.019)	0.007	(0.006)	0.023	(0.020)
Rural area location (=1 if yes)	0.111**	(0.056)	0.034**	(0.017)	0.001	(0.006)	0.033*	(0.018)
Regional controls	Yes		Yes		Yes		Yes	
<b>Instrument</b>								
The magnitude of the 1983 drought shock					-0.068***	(0.019)		
Weighted GDP growth rate in destination					0.009***	(0.001)		
Observation	16615		16615		16615		16615	
F-stats					13.663		99.983	
R <sup>2</sup>					0.255		0.162	
Kleibergen-Paap rk Wald F statistic							92.797	
Kleibergen-Paap rk LM statistic							57.311	
Chi-sq(2) P-value							0.000	
Hansen J statistic							2.078	
Hansen J (p-value)							0.149	
Dependent Variable mean	0.329						0.329	

Notes : The magnitude of the great drought of 1983 : deviation of 1983 rainfall from historical averages (for 22 years) at the district level. Weighted GDP growth rate : GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district i living in that country five years ago. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Kleibergen–Paap rk Wald F statistics to be compared with the Stock-Yogo critical values for weak instrumentation.

Table 2.5: Effect of the amount of international remittances received on the amount of internal cash transfers sent

	Dependent variable : Amount of internal cash transfers sent (log+1)					
	Ordinary Least Squares		Instrumental-variables regression			
	OLS		First Stage		Second stage	
	(1)		(2)		(3)	
	Coef.	se	Coef.	se	Coef.	se
<b>Amount of international remittances received(log+1)</b>	0.168***	(0.020)			0.201***	(0.035)
Age of individual(years)	-0.006*	(0.003)	0.011***	(0.002)	-0.006*	(0.003)
Gender of individual(=1 if male)	-0.222***	(0.084)	-0.268***	(0.036)	-0.211**	(0.084)
Education : No education	ref		ref		ref	
Education : primary	0.290**	(0.127)	0.156***	(0.057)	0.285**	(0.127)
Education : Secondary	-0.217	(0.155)	0.158***	(0.056)	-0.223	(0.154)
Education : University	0.363	(0.255)	0.390**	(0.182)	0.349	(0.253)
Education : Coranic School	0.332***	(0.120)	0.174***	(0.048)	0.325***	(0.119)
Education : Missing	-0.298*	(0.180)	0.065	(0.084)	-0.299*	(0.179)
Ethnicity : No Wolof/Lebou	ref		ref		ref	
Ethnicity : Wolof/Lebou (=1 if yes)	0.028	(0.131)	0.042	(0.048)	0.029	(0.131)
Religion : Non-mouride	ref		ref		ref	
Religion : Muslim-mouride (=1 if yes)	0.114	(0.145)	-0.015	(0.046)	0.115	(0.145)
Socio-professional category : Unemployment	ref		ref		ref	
Socio-professional category : Farmer	0.202	(0.135)	0.070	(0.057)	0.200	(0.136)
Socio-professional category : Employer	1.905***	(0.122)	0.027	(0.056)	1.904***	(0.122)
Socio-professional category : Employee	2.363***	(0.135)	-0.162***	(0.053)	2.370***	(0.135)
Household has a mobile phone (=1 if yes)	0.594***	(0.144)	0.163**	(0.068)	0.587***	(0.143)
Household head (=1 if yes)	2.081***	(0.096)	0.164***	(0.048)	2.075***	(0.095)
Household size(log)	-0.666***	(0.107)	-0.039	(0.040)	-0.663***	(0.107)
Nighttime lights(district development level proxy)	0.194	(0.165)	0.074	(0.065)	0.190	(0.165)
Rural area location (=1 if yes)	0.172	(0.155)	0.017	(0.061)	0.173	(0.154)
Regional controls	Yes		Yes		Yes	
<b>Instrument</b>						
The magnitude of the 1983 drought shock			-0.726***	(0.201)		
Weighted GDP growth rate in destination			0.092***	(0.007)		
Observation	16615		16615		16615	
F-stats	116.010		12.921		109.545	
R <sup>2</sup>	0.178		0.240		0.178	
Kleibergen-Paap rk Wald F statistic					86.129	
Kleibergen-Paap rk LM statistic					58.490	
Chi-sq(2) P-value					0.000	
Hansen J statistic			0.000		2.182	
Hansen J (p-value)					0.140	
Dependent Variable mean	2.874				2.874	

Notes : The magnitude of the great drought of 1983 : deviation of 1983 rainfall from historical averages (for 22 years) at the district level. Weighted GDP growth rate : GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district i living in that country five years ago. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Kleibergen–Paap rk Wald F statistics to be compared with the Stock-Yogo critical values for weak instrumentation.



Table 2.6: Effect of receiving international remittances on sending internal cash transfers (Poverty status)

	Dependent variable : Sending internal cash transfers(dummy)			
	Monetary measurement		Multidimensional measurement	
	(1)		(2)	
	Coef.	se	Coef.	se
Non-Poor	0.047***	(0.013)	0.007	(0.019)
Receiving international remittances	0.239***	(0.061)	0.212**	(0.065)
Receiving international remittances*Non-Poor	0.321***	(0.056)	0.295***	(0.051)
Regional controls	Yes		Yes	
Observation	16615		16615	
F-stats	101.013		95.993	
R <sup>2</sup>	0.163		0.161	
Kleibergen-Paap rk Wald F statistic	15.636		21.954	
Kleibergen-Paap rk LM statistic	46.899		40.757	
Chi-sq(2) P-value	0.000		0.000	
Hansen J statistic	2.204		1.973	
Hansen J (p-value)	0.138		0.160	
Dependent Variable mean	0.329		0.329	

Notes: All regressions also include the control variables used above. The monetary wealth criterion refers to per capita expenditures and the international poverty line of \$1.25 (2005 PPP). Specifically, I consider an individual to be poor if he or she spends less than \$1.25 per day and non-poor otherwise. For multidimensional measures of wealth, I use the Grimm vulnerability score. The Grimm vulnerability score is an indicator of objective and structural elements, which refers to the conception of poverty as a lack of capacity or vulnerability. The different components of the calculation of this score are : (1) an indicator of material living conditions (housing, water, electricity, toilets, type of fuel); (2) an indicator of the level of human capital calculated as the ratio between the number of years of education completed by household members and the maximum possible number of years of education, taking into account the age of each member; (3) a vulnerability indicator that takes into account the number of durable goods (bicycles, radios, televisions, etc.) available in each household. For each component, the maximum score corresponds to a high level of deprivation, while a score of zero means the absence of any impairment. I then consider all individuals with a vulnerability score above eight to be multidimensionally poor. Weighted GDP growth rate: GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district *i* living in that country five years ago. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Kleibergen–Paap rk Wald F statistics to be compared with the Stock-Yogo critical values for weak instrumentation.

Table 2.7: Determinants of Receipt of Internal Cash Transfers

	Dependent variable : receiving internal cash transfers(dummy)			
	Monetary measurement		Multidimensional measurement	
	(1)		(2)	
	Probit	Marginal effect	Probit	Marginal effect
Non-Poor	-0.116** (0.059)	-0.013** (0.007)	-0.155*** (0.059)	-0.018*** (0.007)
Regional controls	Yes	Yes	Yes	Yes
Observation	16615	16615	16615	16615
<i>Pseudo – R</i> <sup>2</sup>	0.105		0.105	
Dependent variable mean	0.149		0.149	

Notes: All regressions also include the control variables used above. Standard errors are in parentheses. The monetary wealth criterion refers to per capita expenditures and the international poverty line of \$1.25 (2005 PPP). Specifically, I consider an individual to be poor if he or she spends less than \$1.25 per day and non-poor otherwise. For multidimensional measures of wealth, I use the Grimm vulnerability score. The Grimm vulnerability score is an indicator of objective and structural elements, which refers to the conception of poverty as a lack of capacity or vulnerability. The different components of the calculation of this score are : (1) an indicator of material living conditions (housing, water, electricity, toilets, type of fuel); (2) an indicator of the level of human capital calculated as the ratio between the number of years of education completed by household members and the maximum possible number of years of education, taking into account the age of each member; (3) a vulnerability indicator that takes into account the number of durable goods (bicycles, radios, televisions, etc.) available in each household. For each component, the maximum score corresponds to a high level of deprivation, while a score of zero means the absence of any impairment. I then consider all individuals with a vulnerability score above eight to be multidimensionally poor. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 2.8: Multinomial logit model first stage results, using Dubin and McFadden's method(marginal effect)

	Scenario 2		Scenario 3	
	(1)		(2)	
	Coef.	se	Coef.	se
Age of individual(years)	0.000***	(0.000)	0.000***	(0.000)
Gender of individual(=1 if male)	-0.010***	(0.003)	-0.020***	(0.004)
Education : No education	ref		ref	
Education : Primary	0.004	(0.004)	0.006	(0.005)
Education : Secondary	0.008*	(0.004)	0.002	(0.007)
Education : University	0.013**	(0.005)	0.009	(0.011)
Education : Coranic School	0.008***	(0.003)	0.004	(0.003)
Education : Missing	-0.005	(0.008)	0.010	(0.007)
Ethnicity : No Wolof/Lebou	ref		ref	
Ethnicity : Wolof/Lebou (=1 if yes)	0.001	(0.003)	0.006**	(0.003)
Marital status : Married	0.004	(0.003)	0.026***	(0.004)
Religion : Non-mouride	ref		ref	
Religion : Muslim-mouride (=1 if yes)	-0.004	(0.003)	0.005	(0.004)
Socio-professional category : Unemployment	ref		ref	
Socio-professional category : Farmer	0.004	(0.004)	-0.001	(0.003)
Socio-professional category : Employer	-0.009***	(0.003)	0.007*	(0.004)
Socio-professional category : Employee	-0.013***	(0.005)	-0.000	(0.004)
Household has a mobile phone (=1 if yes)	0.004	(0.006)	0.012	(0.008)
Household head (=1 if yes)	-0.003	(0.002)	0.004	(0.003)
Household size(log)	0.002	(0.003)	-0.007***	(0.002)
Nighttime lights(district development level proxy)	0.004***	(0.001)	-0.004**	(0.002)
Rural area location(=1 if yes)	0.001	(0.004)	-0.002	(0.006)
<b>Instrument</b>				
The magnitude of the 1983 drought shock	-0.017***	(0.004)	-0.028***	(0.007)
Weighted GDP growth rate in destination	0.002***	(0.000)	0.002***	(0.000)
<i>N</i>	16615		16615	
Test of joint significance for all IV's	60.72			

Notes : The magnitude of the great drought of 1983 : deviation of 1983 rainfall from historical averages (for 22 years) at the district level. Weighted GDP growth rate : GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district *i* living in that country five years ago. Scenario 1: Situation without international remittances. Scenario 2: Situation with international remittances without internal cash transfers. Scenario 3: Situation with both international remittances and internal cash transfers. Reference outcome : Scenario 1. Standard errors in parentheses are obtained clustering observations at the district level and via bootstrapping (50 repetitions). \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 2.9: Individual income estimates adjusted for selectivity, using Dubin and McFadden's method

	Dependent variable : Individual annual total income(log+1)					
	Scenario 1		Scenario 2		Scenario 3	
	(1)		(2)		(3)	
	Coef.	se	Coef.	se	Coef.	se
Age of individual (years)	0.011**	(0.005)	-0.041*	(0.023)	-0.024	(0.024)
Gender of individual (=1 if male)	2.852***	(0.091)	2.384***	(0.780)	4.065***	(0.495)
Education : No education	ref		ref		ref	
Education : Primary	0.051	(0.124)	1.334	(1.121)	-0.158	(0.681)
Education : Secondary	-0.759***	(0.132)	2.007	(1.287)	-0.217	(1.122)
Education : University	1.074***	(0.412)	0.919	(1.769)	4.238***	(1.071)
Education : Coranic School	0.346***	(0.098)	0.926	(0.768)	0.789	(0.560)
Education : Missing	-1.070***	(0.222)	1.371	(1.358)	0.021	(1.789)
Ethnicity : No Wolof/Lebou	ref		ref		ref	
Ethnicity : Wolof/Lebou (=1 if yes)	0.037	(0.098)	0.530	(0.768)	0.026	(0.779)
Marital status : Married	1.738***	(0.146)	1.281**	(0.582)	-0.746	(0.897)
Religion : Non-mouride	ref		ref		ref	
Religion : Muslim-mouride (=1 if yes)	0.195*	(0.113)	0.475	(0.820)	0.573	(0.860)
Socio-professional category : Unemployment	ref		ref		ref	
Socio-professional category : Farmer	2.517***	(0.186)	3.821***	(0.835)	3.522***	(0.903)
Socio-professional category : Employer	8.111***	(0.163)	7.630***	(0.831)	8.469***	(0.536)
Socio-professional category : Employee	7.667***	(0.150)	6.956***	(1.166)	6.294***	(0.831)
Household has a mobile phone (=1 if yes)	-0.128	(0.137)	0.567	(2.040)	0.457	(1.177)
Household head (=1 if yes)	0.914***	(0.141)	2.527***	(0.768)	1.813***	(0.650)
Household size(log)	-0.209**	(0.082)	0.968	(0.687)	0.213	(0.445)
Nighttime lights(district development level proxy)	-0.243**	(0.101)	-0.906	(0.775)	-0.923	(0.592)
Rural area location(=1 if yes)	0.549***	(0.097)	1.025	(0.922)	-0.185	(0.553)
Regional controls	Yes		Yes		Yes	
_m1			-0.507	(1.139)	0.187	(0.887)
_m2	-4.519**	(2.212)			-0.411	(1.364)
_m3	4.485**	(2.194)	0.862	(1.688)		

Notes : Scenario 1 : Situation without international remittances, Scenario 2: Situation with international remittances without internal cash transfers and Scenario 3: Situation with both international remittances and internal cash transfers. Income variable includes wage income, compensation, unemployment insurance, rental income, own-account farm income, individual entrepreneurs' income, retirement insurance, pensions, and government transfers. Standard errors in parentheses are obtained clustering observations at the commune level and via bootstrapping (50 repetitions). \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 2.10: Comparison of inequality indices under different scenarios

	(1)	(2)	(3)	(4)	(5)
	Scenario 1	Scenario 2	Scenario 3	(3)-(1)	(3)-(2)
Gini index	0.357	0.404	0.312	-0.045	-0.092
<b>Palma Inequality Measure</b>					
Income share of richest 10% (a)	0.203	0.215	0.192	-0.011	-0.023
Income share of the poorest 40% (b)	0.147	0.114	0.179	0.032	0.065
Ratio de Palma (a)/(b)	1.377	1.895	1.077	-0.300	-0.818
<b>Interquantile ratio</b>					
Ratio C99/C10	10.05	32.17	7.771	-2.279	-24.399
Ratio C99/C25	4.556	5.666	3.739	-0.817	-1.927
Ratio C99/C50	2.363	2.465	2.052	-0.311	-0.413
Ratio C99/C90	1.13	1.25	1.182	0.052	-0.068
Observations	16615	16615	16615	16615	16615

Notes : Scenario 1: Situation without international remittances. Scenario 2: Situation with international remittances without internal cash transfers. Scenario 3: Situation with both international remittances and internal cash transfers.

Table 2.11: Effect of receiving international transfers on sending internal cash transfers(Without Dakar)

	Dependent variable : Sending internal cash transfers (dummy)							
	Probit regression				Instrumental-variables regression			
	Probit		Marginal effects		First Stage		Second stage	
	(1)		(2)		(3)		(4)	
	Coef.	se	Coef.	se	Coef.	se	Coef.	se
<b>Receiving international remittances</b>	0.718***	(0.077)	0.226***	(0.024)			0.308***	(0.051)
Regional controls	Yes		Yes		Yes		Yes	
<b>Instrument</b>								
The magnitude of the 1983 drought shock					-0.070***	(0.019)		
Weighted GDP growth rate in destination					0.008***	(0.001)		
Observation	11648		11648		11648		11648	
F-stats					15.686		66.084	
R <sup>2</sup>					0.270		0.156	
Kleibergen-Paap rk Wald F statistic							95.990	
Kleibergen-Paap rk LM statistic							39.115	
Chi-sq(2) P-value							0.000	
Hansen J statistic							1.729	
Hansen J (p-value)							0.188	
Dependent Variable mean	0.338						0.338	

Notes : All regressions also include the control variables used above. The magnitude of the great drought of 1983 : deviation of 1983 rainfall from historical averages (for 22 years) at the district level. Weighted GDP growth rate : GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district i living in that country five years ago. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Kleibergen–Paap rk Wald F statistics to be compared with the Stock-Yogo critical values for weak instrumentation.

Table 2.12: Effect of receiving international transfers on sending internal cash transfers(Rural Senegal)

	Dependent variable : Sending internal cash transfers (dummy)							
	Probit regression				Instrumental-variables regression			
	Probit		Marginal effects		First Stage		Second stage	
	(1)		(2)		(3)		(4)	
	Coef.	se	Coef.	se	Coef.	se	Coef.	se
<b>Receiving international remittances</b>	0.670***	(0.099)	0.213***	(0.031)			0.289***	(0.060)
Regional controls	Yes		Yes		Yes		Yes	
<b>Instrument</b>								
The magnitude of the 1983 drought shock					-0.078***	(0.023)		
Weighted GDP growth rate in destination					0.008***	(0.001)		
Observation	7517		7517		7517		7517	
F-stats					13.200		80.450	
R <sup>2</sup>					0.281		0.148	
Kleibergen-Paap rk Wald F statistic							65.262	
Kleibergen-Paap rk LM statistic							27.845	
Chi-sq(2) P-value							0.000	
Hansen J statistic							1.140	
Hansen J (p-value)							0.286	
Dependent Variable mean	0.340						0.340	

Notes : All regressions also include the control variables used above. The magnitude of the great drought of 1983 : deviation of 1983 rainfall from historical averages (for 22 years) at the district level. Weighted GDP growth rate : GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district i living in that country five years ago. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Kleibergen–Paap rk Wald F statistics to be compared with the Stock-Yogo critical values for weak instrumentation.

Table 2.13: Effect of receiving international transfers on sending internal cash transfers controlling for personal income and household expenditures

	Sending internal cash transfers (dummy)			Amount of internal cash transfers sent (log+1)		
	Probit	Instrumental-variables		OLS	Instrumental-variables	
	(1)	(2)	(3)	(4)	(5)	(6)
	Marginal Effects	First Stage	Second Stage		First Stage	Second Stage
<b>Receiving international remittances</b>	0.179*** (0.014)		0.256*** (0.043)			
<b>Amount of international remittances received(log+1)</b>				0.164*** (0.017)		0.140*** (0.024)
Personal annual income(log+1)	0.015*** (0.001)	-0.000 (0.000)	0.015*** (0.001)	0.139*** (0.008)	0.002 (0.004)	0.139*** (0.008)
Total consumption per capita(log+1)	0.025*** (0.003)	0.003 (0.003)	0.015*** (0.003)	0.163*** (0.031)	0.063** (0.029)	0.165*** (0.032)
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes
<b>Instrument</b>						
The magnitude of the 1983 drought shock		-0.067*** (0.019)			-0.792*** (0.205)	
Weighted GDP growth rate in destination		0.009*** (0.001)			0.134*** (0.009)	
Observation	16615	16615	16615	16615	16615	16615
F-stats		13.480	109.591	120.515	23.155	117.424
R <sup>2</sup>		0.255	0.191	0.212	0.341	0.212
Kleibergen-Paap rk Wald F statistic			92.431			127.883
Kleibergen-Paap rk LM statistic			57.445			62.193
Chi-sq(2) P-value			0.000			0.000
Hansen J statistic			1.666			1.497
Hansen J (p-value)			0.197			0.221
Dependent Variable mean			0.329	2.874		2.874

Notes : All regressions also include the control variables used above. The magnitude of the great drought of 1983 : deviation of 1983 rainfall from historical averages (for 22 years) at the district level. Weighted GDP growth rate : GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district i living in that country five years ago. Income variable includes wage income, compensation, unemployment insurance, rental income, own-account farm income, individual entrepreneurs' income, retirement insurance, pensions, and government transfers. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Kleibergen-Paap rk Wald F statistics to be compared with the Stock-Yogo critical values for weak instrumentation.



Table 2.14: Effect of receiving international remittances on sending internal cash transfers using alternative models.

	Dependent variable : Sending internal cash transfers (dummy)					
	Biprobit		Control function approach		IV-probit	
	(1)		(2)		(3)	
	Coef.	se	Coef.	se	Coef.	se
<b>Receiving international remittances</b>	0.180***	(0.032)	0.245***	(0.044)		
<b>Amount of international remittances received(log+1)</b>					0.048***	(0.007)
Regional controls	Yes		Yes		Yes	
Observation	16615		16530		16615	
Dependent Variable mean	0.329		0.329		0.329	

Notes : All regressions also include the control variables used above. The results presented in this table are the second stage results. The first stage of these estimates includes the same two instruments used above: The magnitude of the 1983 drought shock and Weighted GDP growth rate in destination. Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

Table 2.15: Effect of receiving international remittances on sending internal cash transfers (include individuals who receive non-regular international remittances)

	Sending internal cash transfers (dummy)			Amount of internal cash transfers sent (log+1)		
	Probit	Instrumental-variables		OLS	Instrumental-variables	
	(1)	(2)	(3)	(4)	(5)	(6)
	Marginal Effects	First Stage	Second Stage		First Stage	Second Stage
<b>Receiving international remittances</b>	0.174*** (0.012)		0.177*** (0.029)			
<b>Amount of international remittances received(log+1)</b>				0.168*** (0.016)		0.140*** (0.024)
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes
<b>Instrument</b>						
The magnitude of the 1983 drought shock		-0.075*** (0.019)			-0.804*** (0.205)	
Weighted GDP growth rate in destination		0.013*** (0.001)			0.134*** (0.009)	
Observation	16615	16615	16615	16615	16615	16615
F-stats		23.419	98.272	115.609	22.308	107.127
R <sup>2</sup>		0.359	0.166	0.181	0.340	0.181
Kleibergen-Paap rk Wald F statistic			144.014			128.879
Kleibergen-Paap rk LM statistic			61.502			61.939
Chi-sq(2) P-value			0.000			0.000
Hansen J statistic			1.746			1.823
Hansen J (p-value)			0.186			0.177
Dependent Variable mean			0.329	2.874		2.874

Notes : All regressions also include the control variables used above. The magnitude of the great drought of 1983 : deviation of 1983 rainfall from historical averages (for 22 years) at the district level. Weighted GDP growth rate : GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district i living in that country five years ago. . Standard errors in parentheses are obtained clustering observations at the district level. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. Kleibergen–Paap rk Wald F statistics to be compared with the Stock-Yogo critical values for weak instrumentation.

Table 2.16: Balancing Tests for the propensity score matching-Gaussian Kernel Estimator

	Sample	Mean		% Bias	%Reduction in Bias	T-test		R V(T)/V(C)
		Treated	Control			t	p>  t )	
Age of individual (years)	U	43.744	34.191	55.3		16.30	0.000	1.20*
	M	43.744	41.558	12.6	77.1	2.40	0.016	0.89
Gender of individual(=1 if male)	U	.29167	.45338	-33.9		-9.21	0.000	.
	M	.29167	.32957	-7.9	76.6	-1.68	0.093	.
Education : Primary	U	.11429	.13788	-7.1		-1.94	0.052	.
	M	.11429	.1168	-0.8	89.3	-0.16	0.872	.
Education : Secondary	U	.075	.12044	-15.3		-3.98	0.000	.
	M	.075	.08747	-4.2	72.2	-0.94	0.350	.
Education : University	U	.02143	.01642	3.7		1.11	0.269	.
	M	.02143	.01856	2.1	42.6	0.42	0.674	.
Education : Coranic School	U	.44762	.40628	8.4		2.38	0.018	.
	M	.44762	.4383	1.9	77.5	0.38	0.701	.
Education : Missing	U	.02738	.04089	-7.4		-1.94	0.052	.
	M	.02738	.03085	-1.9	74.3	-0.42	0.672	.
Ethnicity : Wolof/Lebou (=1 if yes)	U	.41667	.45287	-7.3		-2.05	0.040	.
	M	.41667	.42668	-2.0	72.3	-0.42	0.678	.
Religion : Muslim-mouride (=1 if yes)	U	.27619	.32431	-10.5		-2.91	0.004	.
	M	.27619	.28582	-2.1	80.0	-0.44	0.661	.
Socio-professional category : Farmer	U	.15833	.14586	3.5		1.00	0.319	.
	M	.15833	.15794	0.1	96.9	0.02	0.982	.
Socio-professional category : Employer	U	.30714	.22269	19.2		5.70	0.000	.
	M	.30714	.27808	6.6	65.6	1.31	0.191	.
Socio-professional category : Employee	U	.12619	.16532	-11.1		-2.99	0.003	.
	M	.12619	.13578	-2.7	75.5	-0.58	0.561	.
Household has a mobile phone(=1 if yes)	U	.94524	.91746	11.0		2.87	0.004	.
	M	.94524	.93504	4.0	63.3	0.88	0.379	.
Household head (=1 if yes)	U	.58452	.35277	47.7		13.67	0.000	.
	M	.58452	.5267	11.9	75.1	2.39	0.017	.
Household size(log)	U	2.4048	2.5158	-19.2		-5.46	0.000	1.03
	M	2.4048	2.441	-6.3	67.4	-1.28	0.202	1.00
Nighttime lights(district development level proxy)	U	1.6159	1.4047	14.5		4.15	0.000	1.08
	M	1.6159	1.5372	5.4	62.7	1.09	0.276	1.02
Rural area location(=1 if yes)	U	.37619	.45648	-16.3		-4.56	0.000	.
	M	.37619	.39538	-3.9	76.1	-0.81	0.420	.
Region==Diourbel	U	.08452	.08456	-0.0		-0.00	0.997	.
	M	.08452	.08262	0.7	-4615,9	0.14	0.888	.
Region==Fatick	U	.02857	.05192	-11.9		-3.00	0.003	.
	M	.02857	.03466	-3.1	73.9	-0.71	0.476	.
Region==Kaffrine	U	.0131	.05477	-23.2		-5.27	0.000	.
	M	.0131	.02557	-6.9	70.1	-1.86	0.063	.
Region==Kaolack	U	.02619	.06529	-18.8		-4.54	0.000	.
	M	.02619	.03742	-5.4	71.3	-1.31	0.190	.
Region==Kedougou	U	0	.00539	-10.4		-2.13	0.033	.
	M	0	0	0.0	100.0	.	.	.
Region==Kolda	U	.00952	.03455	-17.1		-3.94	0.000	.
	M	.00952	.01688	-5.0	70.6	-1.32	0.187	.
Region==Louga	U	.0631	.05731	2.4		0.70	0.483	.
	M	.0631	.05995	1.3	45.6	0.27	0.788	.
Region==Matam	U	.12143	.02865	35.8		14.69	0.000	.
	M	.12143	.1003	8.1	77.2	1.38	0.168	.
Region==Saint-louis	U	.09167	.07886	4.6		1.34	0.181	.
	M	.09167	.08847	1.1 0	75.0	0.23	0.819	.
Region==Sedhiou	U	.0131	.02777	-10.4		-2.56	0.011	.
	M	.0131	.01794	-3.4	67.0	-0.80	0.422	.
Region==Tambacounda	U	.05357	.02941	12.1		3.96	0.000	.
	M	.05357	.04773	2.9	75.8	0.55	0.585	.
Region==Thies	U	.11667	.13629	-5.9		-1.62	0.105	.
	M	.11667	.12332	-2.0	66.1	-0.42	0.675	.
Region==Ziguinchor	U	.02381	.04926	-13.6		-3.36	0.001	.
	M	.02381	.03123	-4.0	70.8	-0.93	0.353	.

Notes : U : Unmatched and M : Matched. \* if variance ratio outside [0.87; 1.15] for U and [0.87; 1.15] for M

Table 2.17: Average Treatment Effects of receiving international remittances

Matching methods	Sending internal cash		Amount send(log+1)	
	ATT	t-Statistics	ATT	t-Statistics
Panel A : Baseline (N = 16615)				
Kernel	0.195***	(0.020)	1.777***	(0.184)
Radius caliber (0.01)	0.209***	(0.018)	1.893***	(0.166)
Nearest-neighbor	0.207***	(0.025)	1.876***	(0.228)
Five Nearest-neighbor	0.212***	(0.020)	1.932***	(0.179)
Ten Nearest-neighbor	0.217***	(0.019)	1.958***	(0.172)
Mahalanobis	0.241***	(0.019)	2.197***	(0.170)

Note : \*, \*\* and \*\*\* are significant at 10%, 5% and 1%, respectively. ATT : Average treatment effect among treated.

Table 2.18: Rosenbaum Sensitivity analysis for average treatment effects (International remittances)

Rosenbaum bounds for delta (N = 840 matched pairs)							
	Gamma	Bound		Bound		Bound	
		significance level		Hodges-Lehmann point estimate		Confidence interval	
		Sig+	Sig-	T-hat+	T-hat-	CI+	CI-
Sending internal cash transfers (dummy)	1	0	0	.160369	.160369	.153178	.168499
	1.5	0	0	.140747	.189154	.134767	.202802
	2	0	0	.127239	.574951	.119421	.596486
	2.5	1.8e-10	0	.115278	.604511	.106494	.616739
	3	3.9e-06	0	.104387	.618783	.093984	.628746
	3.5	.00145	0	.094214	.628541	.080744	.636714
	4	.044524	0	.083585	.635349	.050913	.642117
	<b>4.5</b>	.280978	0	.073364	.640044	-.305798	.646521
5	.662962	0	-.292733	.643882	-.319688	.650424	
Amount of transfers sent (log+1)	1	0	0	1.66791	1.66791	1.52295	1.81392
	1.5	0	0	1.25019	2.19769	1.12755	2.48729
	2	6.6e-15	0	.982849	3.90918	.845304	4.6084
	2.5	3.5e-08	0	.771098	4.82409	.62031	5.12384
	3	.000189	0	.586742	5.17776	.395759	5.41092
	3.5	.021403	0	.400787	5.4062	.118063	5.61442
	<b>4</b>	.238711	0	.187982	5.57692	-2.39166	5.76799
	4.5	.672476	0	-.192826	5.70938	-2.66475	5.89635
5	.930979	0	-2.5412	5.8209	-2.79803	6.00193	

Notes : Gamma - log odds of differential assignment due to unobserved factors. Sig+ : upper bound significance level. Sig- : lower bound significance level. T-hat+ : upper bound Hodges-Lehmann point estimate. T-hat- : lower bound Hodges-Lehmann point estimate. CI+ : upper bound confidence interval ( $\alpha = .9$ ). CI- : lower bound confidence interval ( $\alpha = .9$ ). Bold values are critical gamma values that make our results sensitive to hidden biases.

Figure 2.1: Average monthly precipitation per year in millimeters in Senegal

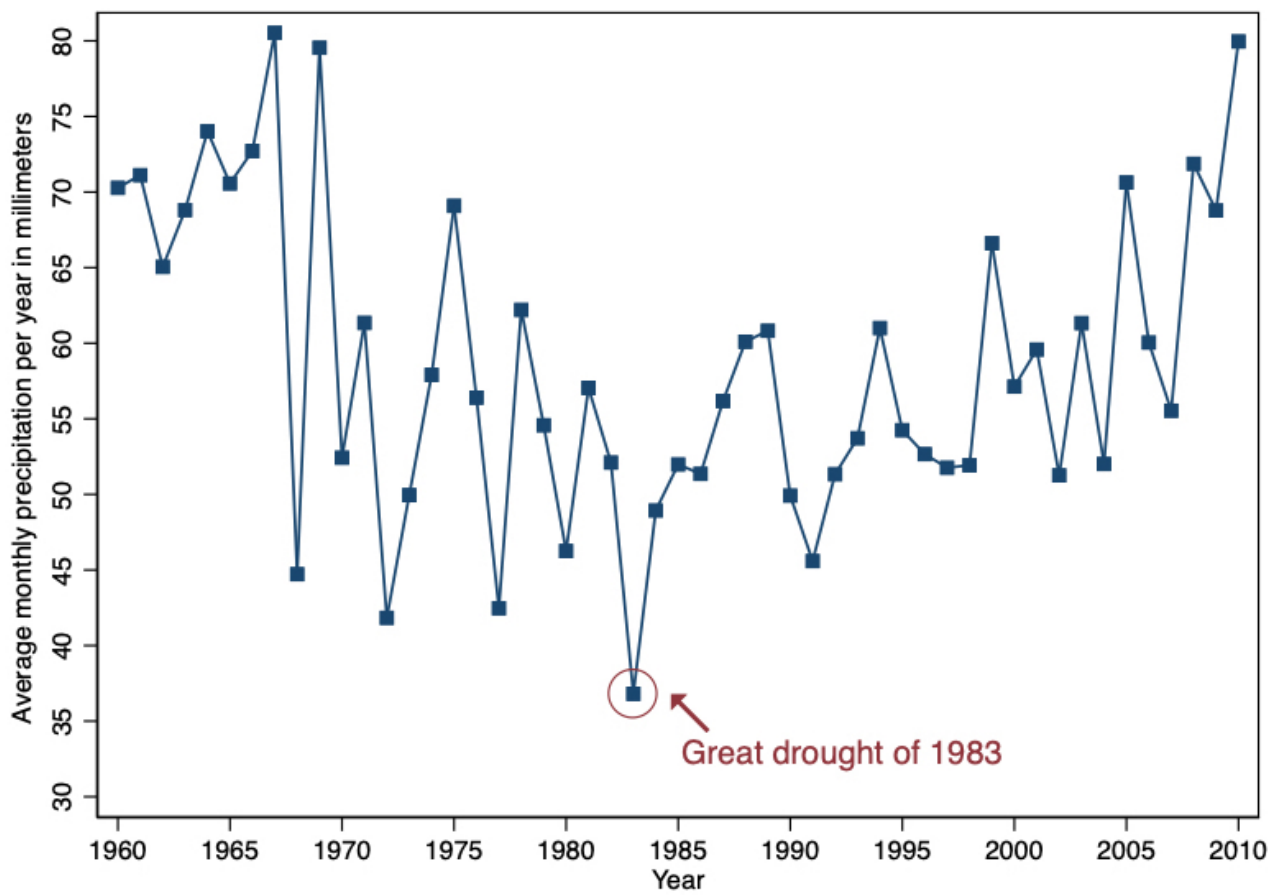


Figure 2.2: External migration rate in 1993 by 1983 Rainfall Shock

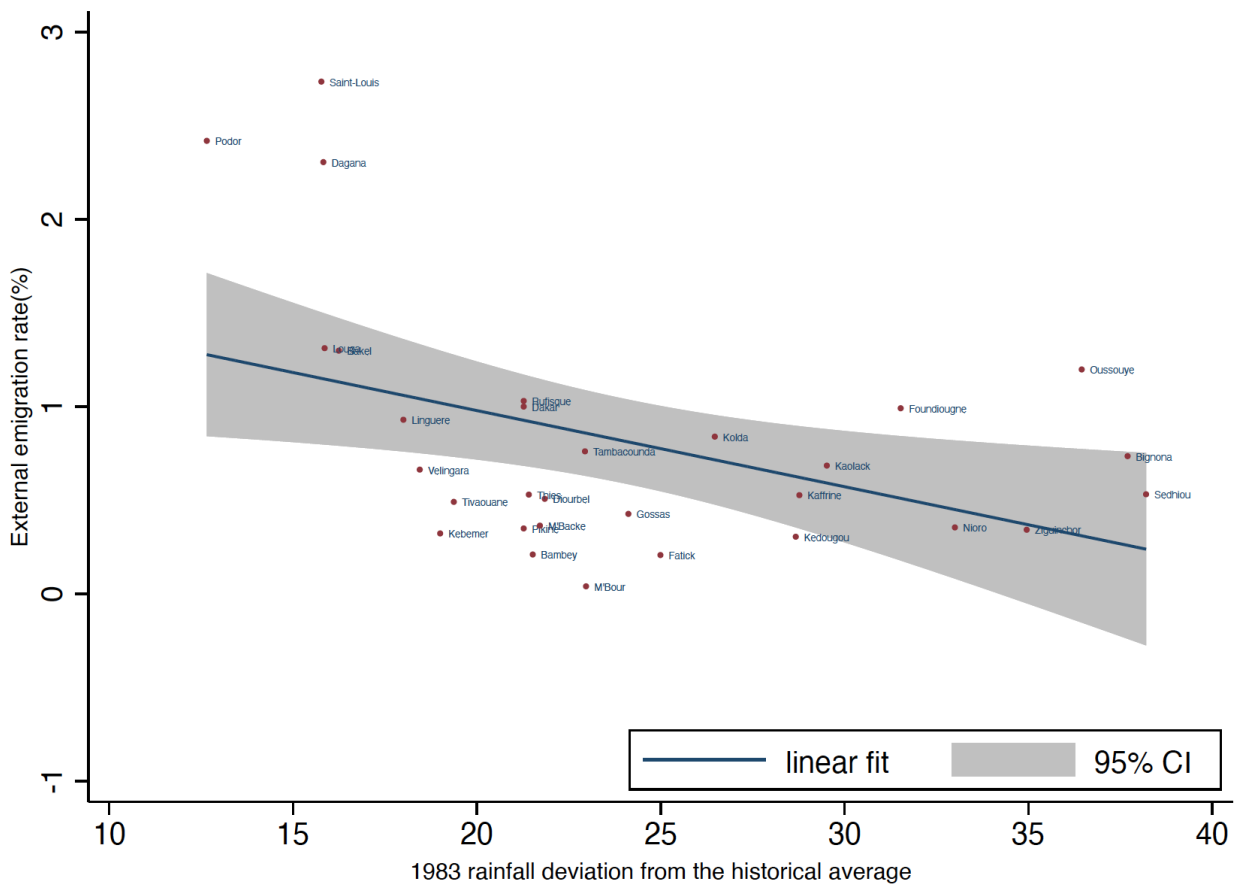


Figure 2.3: Correlation between the magnitude of the 1983 drought shock and the proportion of households with a migrant in 2006-2010

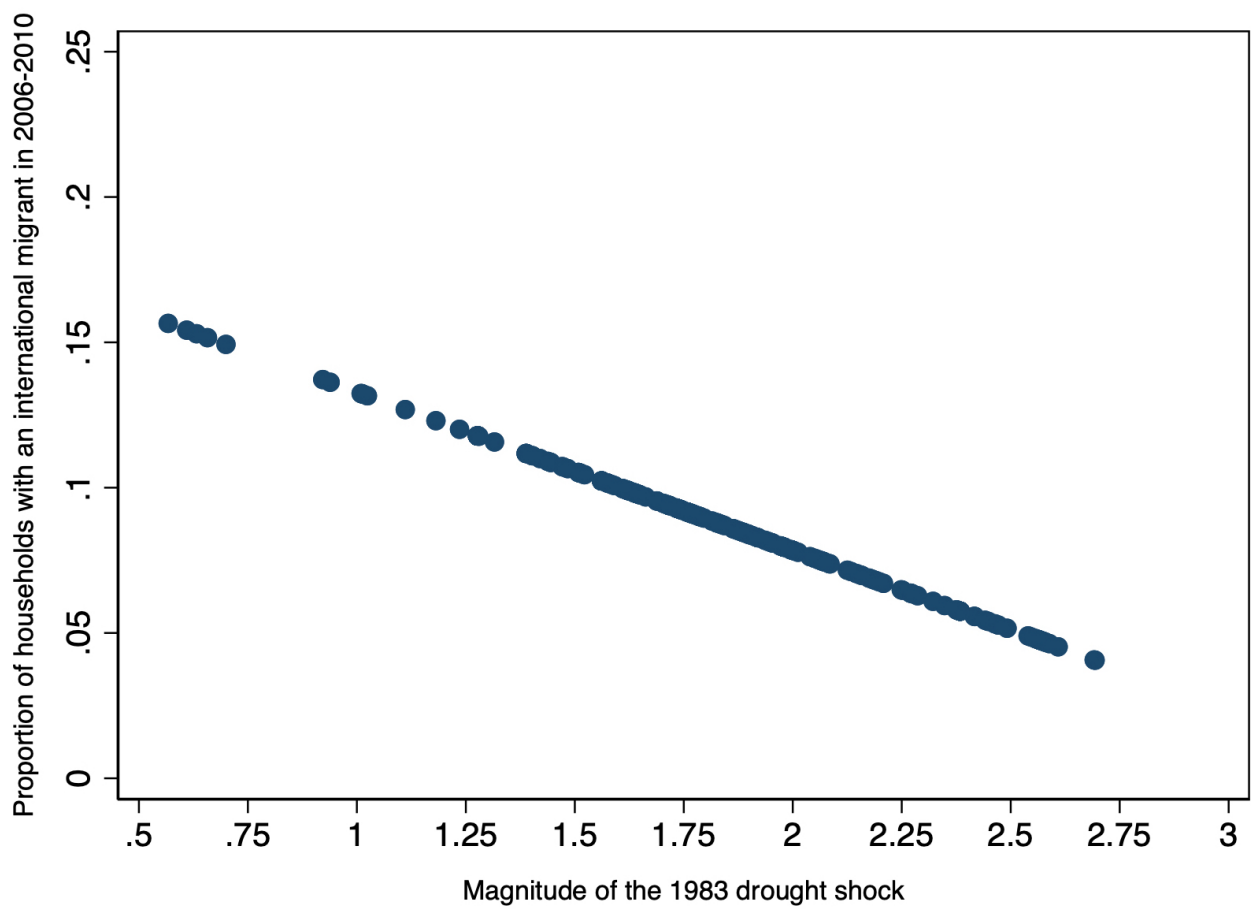




Figure 2.4: Internal migration rate in 1993 by 1983 Rainfall Shock

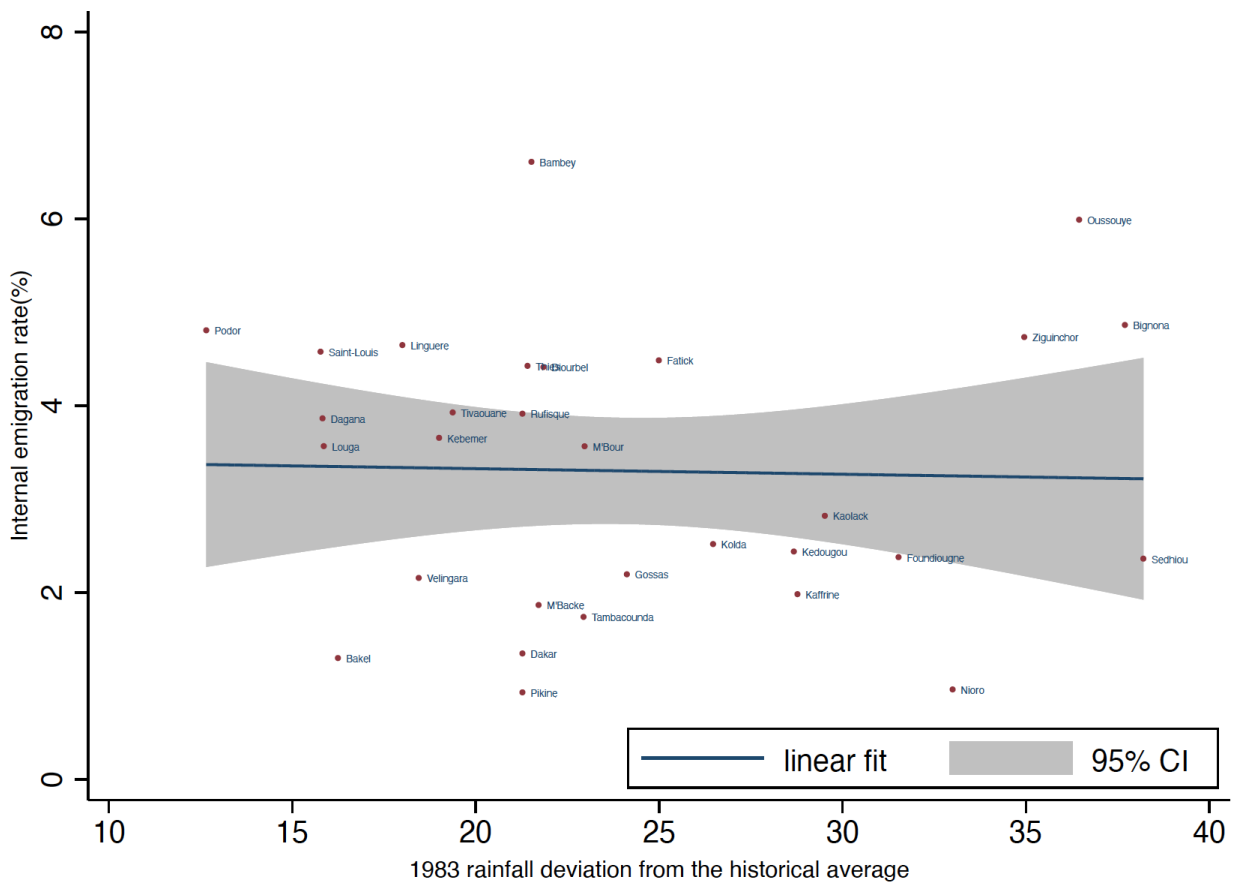
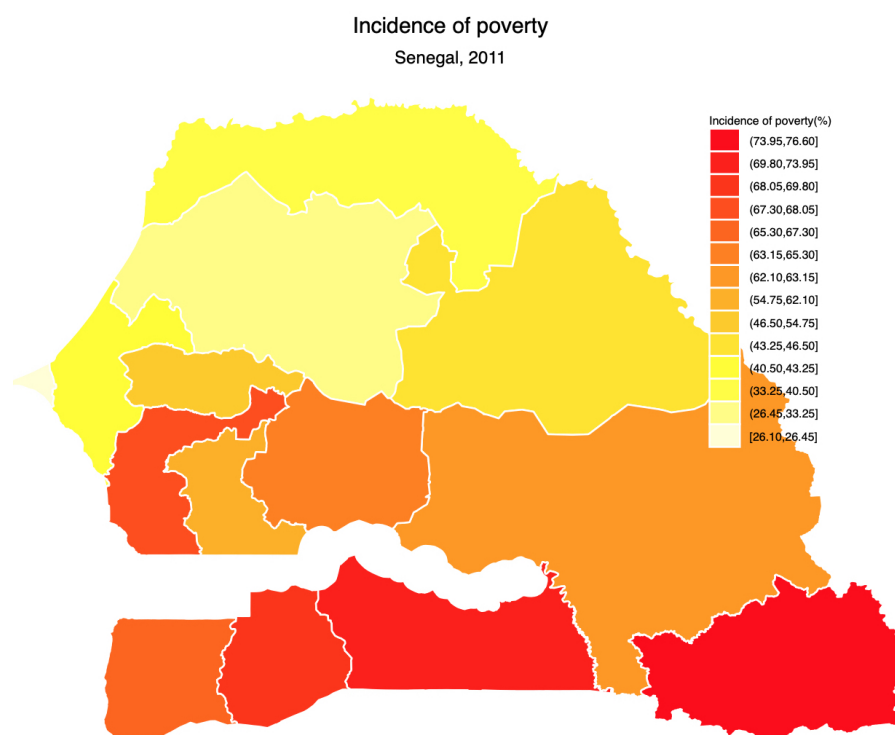
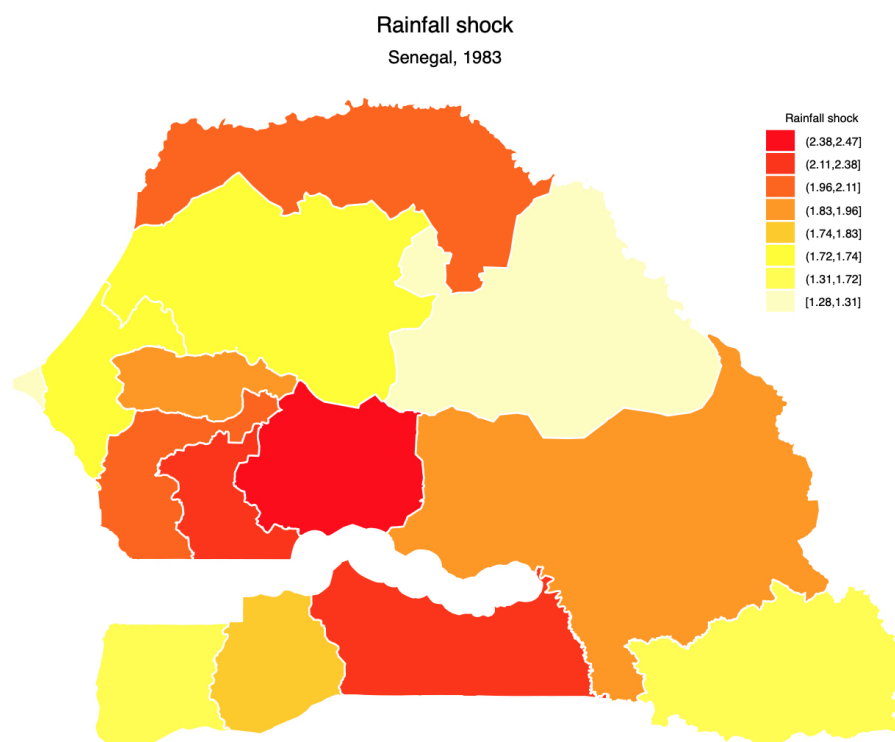


Figure 2.5: Incidence of poverty in 2010 vs Magnitude of 1983 drought shock by Region



Source : ANSD/ESPS-II 2011



Source : Author using GeoQuery data

Figure 2.6: Probability of sending internal cash transfers across total expenditure per capita by international remittances receiving status

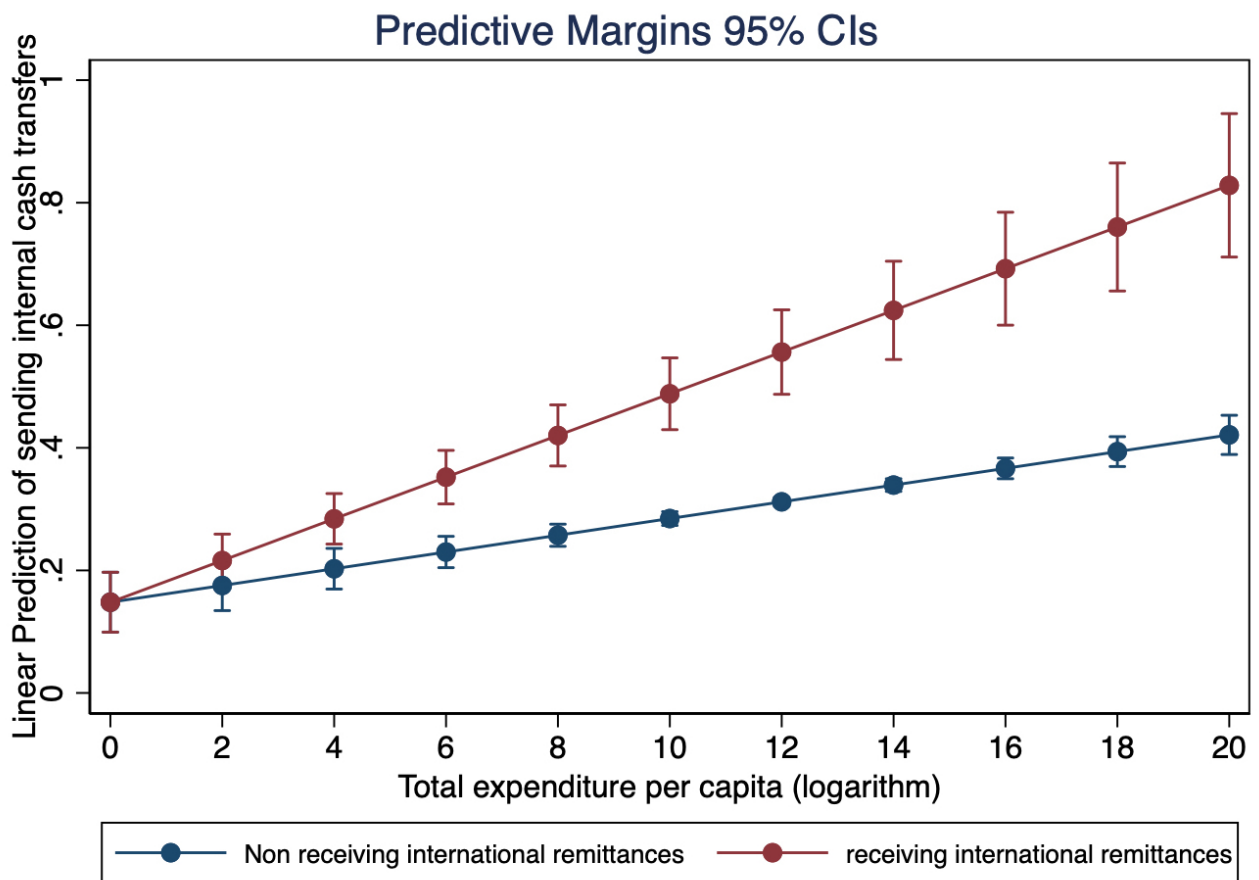


Figure 2.7: Probability of receiving internal cash transfers across total consumption per capita

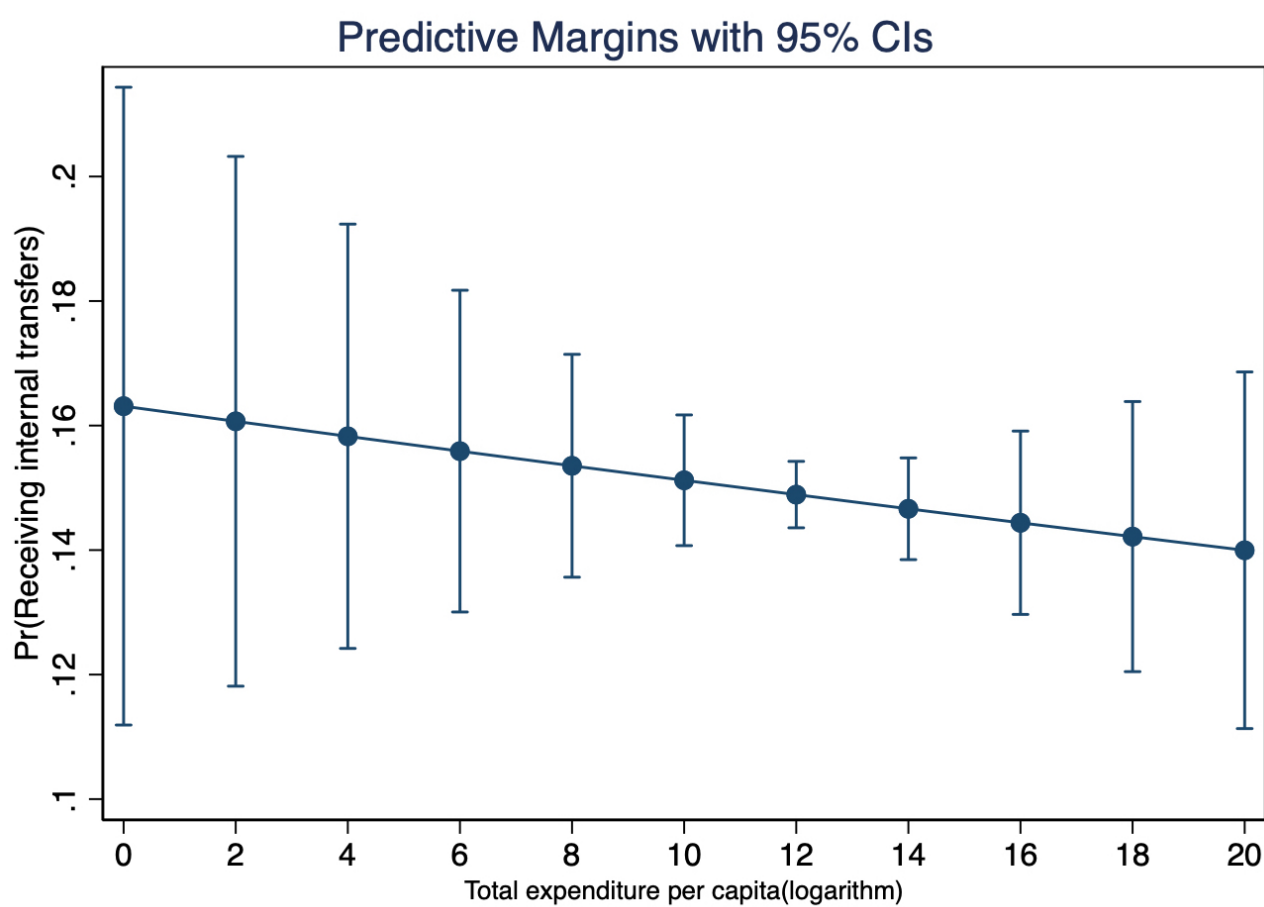
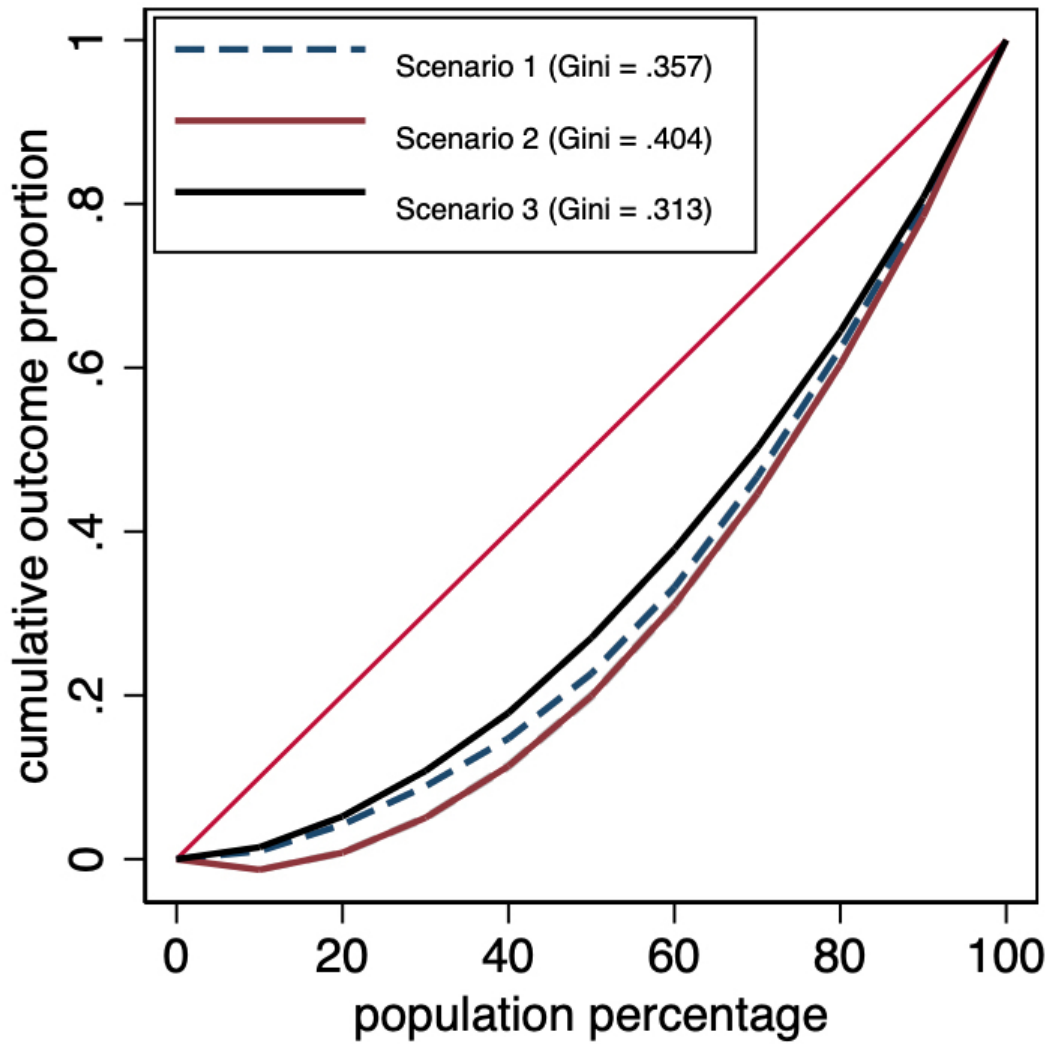


Figure 2.8: Lorenz curve according to the three different transfer scenarios



Source : Author using PSF data.

Notes : The simulations are performed on the whole sample, i.e. 16,615 observations.

Figure 2.9: Common Support

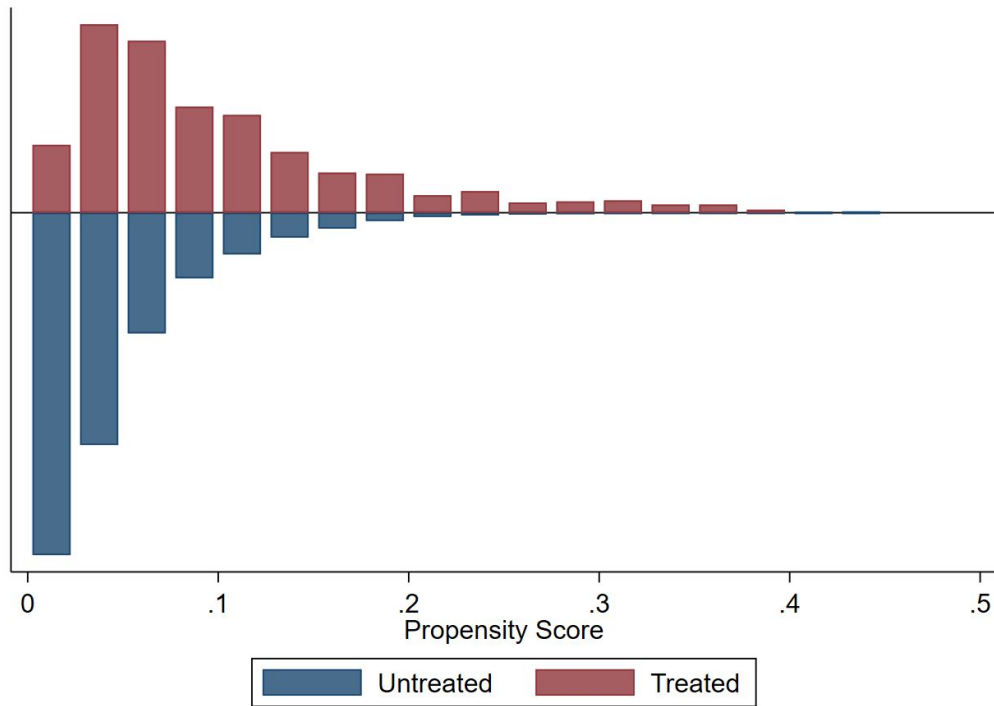
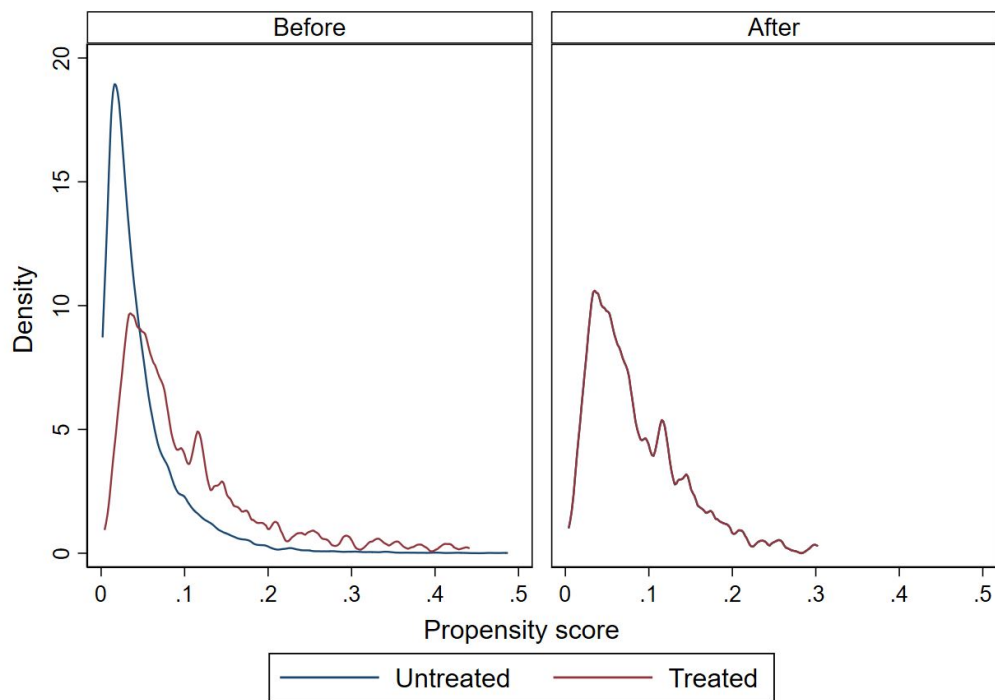


Figure 2.10: Distribution of the propensity score for treated and untreated before and after matching



# Appendix

## A.1 Procedures for simulating income inequality.

### 1. First stage equation

The first stage of the model predicts the probability of being in one of the three following scenarios : (1) without international remittances, (2) with international remittances but no internal sharing, and (3) with international remittances and internal sharing. Formally, the probability of being in situation  $s$  can be defined as follows :

$$Prob (situation_s) = f[W_j, Z_j] \quad (4)$$

$W_j$  includes a set of individuals' characteristics and  $Z_j$  represents the two instruments used above.

### 2. Second stage equation

In the second step, I estimate the following income equation and use the parameters from this second step to predict the selection-adjusted income of individuals in situation  $s$  :

$$income_s = \beta_s + \alpha_s W_j + \sum_{h \neq s} \pi_h m_h + v_s \quad (5)$$

Where  $m_h$  represents the selection correction variable related to choice  $h$ .  $v_s$  is idiosyncratic shock with mean of zero.

### 3. Inequality index

Finally, once the selection-adjusted incomes of individuals in each of the three situations are predicted, I compute the inequality indices: the Gini index, the Palma ratio, the interquartile ratio, from these incomes. I then compare the different inequality indices of scenarios 2 and 3 to scenario 1.

### 3.1 Introduction

The importance of education in the development process has been widely studied in the economics literature. It has been shown that a high level of education promotes growth and improves national well-being (Lucas (1998), Mankiw et al. (1992)). However, despite an increase in the number of children attending school in recent years, early dropout remains an issue, especially in developing countries (Unesco (2018)). For instance, secondary school attendance in sub-Saharan Africa was about 38% in 2018, while it turned around 80% for primary school in the same period. In countries like Niger, the Central African Republic, and Chad, about 80 percent of children drop out before secondary school. The main obstacles to school attendance identified in this region are low expected returns to education, social pressure for immediate income, and lack of educational infrastructure (Unesco (2016)). Therefore, any measures to improve school infrastructure and the expected education benefits could increase secondary school attendance and reduce early school dropout. While the role of infrastructure on schooling decisions has been the subject of numerous articles (Duflo (2001), Akresh et al. (2018)), examining the effects of employment prospects on demand for education is not straightforward due to the difficulty of identifying differences in prospects between different individuals. The ideal experiment for estimating the effect of perspective on the education decision would be to randomly assign the job prospect for some individuals and not for others and then compare the education decisions between individuals. In the absence of evidence of such an experience, I exploit the Chadian oil boom, particularly the oil sector employment promotion measures that provide a quasi-natural experimental setting for estimating the effect of employment opportunities on education demand.

Chad is an oil-exploiting country since 2004 with the financial support of the World Bank. The World Bank considers that projects can accelerate poverty reduction and promotes economic development (Kojucharov (2007)). Nevertheless, the country's ability to manage oil revenues to achieve this poverty reduction objective has been a major concern for the Chadian government and its partners involved in this project. The main fear was that the management of oil revenues would exacerbate existing political tensions instead of favoring its socio-economic development. To address this concern, a law called **law n ° 001/PR/1999** was adopted in 1999. This law aims to ensure greater transparency in the use of oil revenues. According to this law, the distribution plan for oil revenues (dividends and royalties) is as follows : 10% goes to future generations, 72% is allocated to capital expenditures, 13.5% to operational expenses, and the remaining 4.5% is transferred to the oil region. Besides the financial transfer, the oil



region also benefits from labor market-oriented measures, such as employment opportunities in the oil sector and the priority given to local workers in recruitment.

This article's identification strategy uses the fact that these labor market-oriented measures only benefit the oil region. These measures can influence schooling decisions in several ways. First, positively, as they can increase the demand for education. Indeed, if employment prospects in the petroleum sector involve skilled workers, the investment returns on education increase, raising the incentive to pursue education. Second, the prioritization of local workers in hiring can give rise to immediate unskilled job opportunities, making the opportunity costs of staying in school higher. Which one of these two opposing effects prevails remains an empirical question. In any case, this work-study trade-off is mostly involving secondary school students. I, therefore, focus on individuals in the 16-18 age group.

This article is closer to both the literature on expected returns and schooling decisions and the literature on the oil boom and schooling decisions. Studies on the relationship between expected returns and schooling decisions are not new. The earliest work on this issue dates back to [Becker \(1964\)](#) and his work on human capital. In this seminal paper, Becker presents education as an investment triggered by a comparison between current costs and the discounted stream of expected future benefits, primarily in the form of higher wages. Therefore, individuals may decide to pursue further education if the expected future gains are more significant than the current opportunity costs. Such a trade-off assumes that the returns to schooling are known. In most developing countries, however, this is not the case because of the lack of earnings data and guidance counselors who can provide information on the benefits of schooling ([Manski et al. \(1983\)](#), [Jensen \(2010\)](#)). As a result, students and their parents are not as well informed about the benefits of education. The handful of existing studies on developing countries involve providing information to students or parents and examining the effect of this information on the schooling decision. These include [Nguyen \(2008\)](#), who conducted a field experiment in Madagascar and showed that increasing the perceived returns to education strengthens incentives to enroll when agents underestimate the actual returns. Similarly, using survey data on eighth-grade boys in the Dominican Republic, [Jensen \(2010\)](#) finds that perceived returns to secondary education are meager, despite high measured returns. He shows that students in randomly selected schools who received information about actual returns completed an average of 0.20 to 0.35 more years of schooling over the next four years than those who did not receive such information. In Mexico, [Kaufmann \(2014\)](#) used data on individuals' subjective expectations of returns to understand the huge differences in university enrollment rates between poor and wealthy individuals. He finds that higher expected returns are required for poor individuals to have an incentive to attend university, suggesting that they face higher opportunity costs than individuals with wealthy parents. Finally, [Attanasio & Kaufmann \(2014\)](#) found that expected returns and perceptions of risk are important determinants of schooling decisions in Mexico. This expected return and the perception of future risks are essential to consider in Chad. Secondary education remains consistently low in this country, despite the considerable increase in educational provision (the number of schools increased from 6,104 schools in 2005 to 11,490 schools in 2013). Oil-induced employment opportunities for natives could change their perception of the future local labor market and hence the expected return to education.

Regarding the relationship between the oil boom and school decisions, very few articles have addressed this issue. The existing studies are either transnational or focus on the United States and Canada. The effect of the oil boom on schooling decisions also remains ambiguous. Some articles found a negative impact, while others found adverse effects. In the first set, for example, [Gylfason \(2001\)](#) in a study of 90 countries showed that the share of natural resources in GDP negatively affects education spending, expected years of schooling for women, and the gross secondary school enrollment rate. Similarly, [Cascio & Narayan \(2015\)](#) showed that the shale gas boom increased dropout rates among adolescents in several US states. In the same vein, [Kumar \(2017\)](#) used a synthetic cohort approach to compare cohorts that attended high school during the pre-and post-boom period in the United States.

He showed that the cohort reaching high school age during the oil boom was about 2 percentage points less likely to have a college degree by the time they turned 34 to 37 years of age in 2000. [Rickman et al. \(2017\)](#) found similar results in Montana, North Dakota, and West Virginia, where shale growth has led to considerable reductions in high school enrollment. More recently, [Zuo et al. \(2019\)](#), using data from 15 US states with oil and gas production over the period 2000-2013, show that intensive drilling activity hurts student enrollment in grades 11 and 12. Specifically, they find that one additional oil or gas well drilled per 1,000 core workers results in a 0.24% decline in county-level 11th and 12th-grade enrollment, all else being equal. Alternatively, other papers argue that oil does not negatively affect schooling and improves school resources. In this category, we have [Emery et al. \(2012\)](#), which finds, using school-age birth cohorts before, during, and after the oil boom of the 1970s, that educational attainment did not decline in the Canadian province of Alberta. In Brazil, [Caselli & Michaels \(2013\)](#) showed that oil revenues increased education spending, teachers, and classrooms per capita in oil-rich municipalities. Similarly, [James \(2015\)](#), [Raimi & Newell \(2014\)](#), and [Weber et al. \(2016\)](#) show that the shale oil and gas boom has dramatically increased spending on education and schooling in some US counties.

This study offers three clear contributions to the literature. First, unlike existing research, which focuses on the effect of information on actual returns to education on schooling, I assess the impact of promised jobs on educational decisions in this article. These jobs are more likely to influence education decisions than information on actual returns to education. Second, to the best of my knowledge, this study is the first to focus on a country in sub-Saharan Africa. Indeed, the existing literature on the oil boom and school decisions has focused on countries like the United States or Canada. This article is also the first to highlight the effect of the Chadian oil project presented as a model for fragile countries rich in natural resources on education outcomes.

This paper examines how oil-induced employment opportunities for natives have influenced secondary education decisions in the oil region. I use administrative education data from the Chadian Ministry of Education. Applying the synthetic control method (SCM) and a difference-in-differences (DID) approach, I find that oil-induced employment opportunities for natives significantly increased the oil region's net secondary school enrollment rate. I then conduct several placebo tests, and all of these tests confirm the robustness of this effect. The analysis of transmission mechanisms suggests, on the one hand, a decrease in school dropouts and, on the other hand, that the observed effect is not due to the increase in the local population's income. I also examined whether the results are linked to a massive migration to the oil region to take advantage of the oil boom. Population census data show no significant migration to the oil region from its pre-oil trend. Furthermore, the priority to local workers in the recruitment process mentioned above seems to discourage migration to the oil region. Finally, I obtain similar results using nationally representative survey data instead of administrative data.

The rest of the paper is organized as follows. Section 3.2 provides an overview of the program and education in Chad. The data, the empirical model, and the identification strategy are presented in Section 3.3. In section 3.4, I show the main results. Next, I examine some transmission channels and check the robustness of the findings in sections 3.5 and 3.6 respectively. Finally, section 3.7 concludes and discusses the policy implications.

## 3.2 Background

I first present the program. Then, I will describe the education system and the educational situation in Chad.

### 3.2.1 The program

#### 3.2.1.1 Chadian oil project

The Chadian oil story began in 1969 when the Chadian government granted the very first oil exploration license to the American company Conoco. In 1973, the first oil explorations started in the south of the country. However, this initial exploration period ended in 1975 with the overthrow of Chad's first president, which also marked the departure of Conoco. Another consortium composed of Chevron (20%), Exxon (40%), and Shell (40%) was set up to continue exploration three years later. However, institutional instabilities have long disrupted the activities of this consortium.

It was not until 1996 that an oil pipeline project through Cameroon under the aegis of the consortium mentioned above became possible. The specificity of this new project is the presence of the World Bank among the main partners of the project. Indeed, at the request of the Chadian government and the oil consortium, the World Bank provided financial support for the project. Two main reasons explain the involvement of the World Bank in this project. The first is that the Chadian state does not have the financial, material, and human resources to exploit its oil alone. Second, there are the fears inherent in oil exploitation, such as Dutch disease, the resource curse, and conflicts, especially in states with weak governance, which could generate political instability. In return, the World Bank required guarantees for transparent management and sound allocation of oil revenues. This request led the Chadian government to pass a bill (**loi n° 001/PR/1999**) on the governance and distribution of oil resources inspired by the Norwegian model, the best-known example of rational and beneficial exploitation of oil revenues, January 11, 1999. This law established the distribution of oil revenues (dividends and royalties) as follows : 10% were to be hoarded on a Citibank account in London for the benefit of future generations. Of the remaining 90%, development expenditures (public health, social infrastructure, education, agriculture, livestock, etc.) receive 72%, 13.5% goes to operating expenses, and the oil region (Logone Oriental) receives 4.5%. Subsequently, in June 2000, the World Bank provided the \$ 3.7 billion in financial guarantees owed to the Chadian government, representing 13% of the project's total cost.

On October 10, 2003, Chad officially became an oil-producing country. The Chadian government expected production to reach 225,000 barrels per day gradually. Reserve estimates are close to one trillion barrels.

#### 3.2.1.2 Treatment

The law 001/PR/1999, which constitutes the legal framework guaranteeing transparent management of the oil rent, includes two significant measures for the benefit of the oil region. The first one is the decision to allocate 4.5% of oil resources to the oil region mentioned above. Under this law, between 2004 and 2012, the oil region received more than \$ 121 million. Although the share attributed to the oil region is constant, the amount received varies from year to year due to variation in the price on the world market and the quantity produced annually (Figure 3.2). The highest and lowest amounts were collected in 2012 (\$22 million) and 2004 (\$4 million), respectively. As expected, most of the resources (80%) were used for socio-economic infrastructure (Figure 3.3). The education sector received the largest share(35%), followed by health (18%), water (17%) and electricity (13%) sectors. The remaining resources were used to finance a solidarity fund and income-generating projects (GRAMPTC(2013)). The second measure in favor of the oil region concerns the labor market. In addition to benefiting from employment opportunities in the petroleum sector, the aforementioned law gives priority to local workers in the recruitment process. Thus, oil companies should prioritize the recruitment of the region's natives. Native designates the following ethnolinguistic group: the Ngambay, the Gor, the Mboum, the Gourlay and the Mongo.

In this paper, I consider labor market measures as treatment. More specifically, I focus oil-induced employment opportunities for natives. These measures apply only to oil-region natives. They are therefore unlikely to benefit other regions. Moreover, including these measures in Law 001/PR/1999 gives them an excellent legal basis. It may

be tempting to use the amount of rent transferred to the region as the treatment as [Mabali & Mantobaye \(2015\)](#), but the oil region is not the only one to benefit from the rent. On the contrary, other regions such as BET, Biltine, Logone occidental received a larger share of rent per capita than the oil region, as shown in [Figure 3.11](#).

The oil region is located in the extreme south of Chad and covers an area of 22,951 km<sup>2</sup> ([Figure 3.1](#)). It includes four departments. The region's population is approximately 800,000, making it one of the most populous regions in the country ([INSEED \(2013\)](#)). Historically, the main economic activity of this region is agriculture.

### 3.2.1.3 Conceptual Framework

The expected effect of oil-induced employment opportunities for natives on education decisions in the oil region is ambiguous. It depends on the type of jobs created by the oil boom. First, suppose this oil boom leads to a significant increase in skilled job opportunities. In that case, there will be more incentive to extend study time as the expected returns to education become higher. The anticipated effect of this case is an increase in school enrollment, especially at the secondary level in the oil region. Alternatively, if the oil boom creates immediate opportunities for low-skilled workers, an adverse effect is expected as the opportunity cost of staying in school may increase. In this case, even a significant increase in education supply will have little impact on schooling decisions. Which one of these forces drives the net effect of the oil boom on schooling decisions deserves an empirical investigation.

In addition to these two mechanisms, an income effect can also be expected. If the local population becomes richer from oil production, they consume more, and if education is a normal good, then higher income means higher education. But there are two points that are likely to offset this potential income effect. The first is the one pointed out earlier, the rent did not benefit the oil region more than other regions. Many other regions even received a larger share. Second, [Mabali & Mantobaye \(2015\)](#), using survey data and the difference-in-differences approach, found no positive effect of the oil boom on poverty reduction in the oil region. However, I will conduct several placebo tests to investigate this potential income effect.

## 3.2.2 Education in Chad

This subsection describes the Chadian education system and presents the current situation.

### 3.2.2.1 Chadian education system

The Chadian education system has six cycles, five of which are formal. The formal cycles are :

- **Preschool (ISCED 0)** : this is a non-compulsory 3-year cycle for children aged 3 to 5.
- **Primary (ISCED 1)**: this 6-year cycle is for children aged 6 to 11. It is compulsory for this age group. At the end of this cycle, students must pass a mandatory exam called CEPET (certificat d'études primaires élémentaires tchadien). Only students who successfully pass this exam can move on to the following cycle.
- **Middle school (ISCED 2)** : it is a 4-year program intended essentially for children aged 12 to 15.
- **Secondary (ISCED 3)** : this cycle welcomes students from 16 to 18 years old who have obtained their BEF (Brevet d'Etude Fondamentale) at the end of middle school. This 3-year cycle is not compulsory and ends with the baccalaureate, allowing access to higher education.
- **Higher Education (ISCED 5, 6, 7, 8)** : this last formal cycle welcomes young people over 18 years of age who have obtained the baccalaureate.

In addition to these formal cycles, the Chadian education system includes an informal cycle consisting of community schools for out-of-school youth aged 9 to 14 and literacy programs for out-of-school adults.

### 3.2.2.2 Educational situation

The education sector in Chad has received significant investment since the start of oil exploitation in 2004. Alas, education in Tchad remains among the worst in the world. In 2010, the net school attendance rate was only 50.9% in primary and 19.6% in secondary (EDS-MICS (2014)). According to the UNESCO Institute for Statistics, the completion rate is around 32% in primary and 16% in secondary. Regarding school life expectancy, it is currently less than six years. In addition to supply-side concerns (educational infrastructure, etc.), the low returns expected from education (lack of job prospects) are the main factors explaining the poor educational situation in Chad (Unesco (2015)).

With this discussion in mind, this article explores how changing employment prospects affect school attendance decisions in Chad's oil-rich region.

## 3.3 Empirical specification

I start with the methodological approach and then describe the data used in this study.

### 3.3.1 Methodology

This paper aims to examine the effect of oil-induced employment opportunities for natives on the decision to attend school in the oil-producing region. To achieve this, I need a control that gives me the counterfactual situation, that is, the situation in the region without oil. In this paper, I use two different methods to construct this counterfactual : (3.3.1.1) the Synthetic Control Method (SCM) and (3.3.1.2) the Standard Difference-in-Differences Approach.

#### 3.3.1.1 Implementation of the Synthetic Control Method (SCM)

Given the level of analysis (region) and the nature of the available data (administrative), I first use the SCM recently developed by Abadie & Gardeazabal (2003) and extended in Abadie et al. (2010) to investigate the relationship between the job opportunities provided by the oil boom and investment in education. This method consists of constructing a control unit (synthetic control) from a weighted combination of untreated units that best reflect the treated unit's pre-intervention characteristics (predictors). The basic idea of this approach is that a combination of units often provides a better comparison for the unit exposed to the intervention than any unit taken alone. The synthetic control then estimates what would have happened to the treated unit if it had not received treatment. The treatment effect on the treated unit is the difference in results between this treated unit and its synthetic control.

More formally, suppose that we observe a panel of  $J+1$  regions over  $T$  periods and that only the first region ( $I$ ) receives the treatment (oil-induced employment opportunities for natives) at time  $T_0 < T$ . If we also assume that nothing is happening in the other regions, the treatment effect for region  $I$  and at time ( $t = T_0 + 1, \dots, T$ ) can be defined as follows :

$$\alpha_{1t} = Y_{1t}(1) - Y_{1t}(0) \quad (3.1)$$

Where  $Y_{1t}(1)$  and  $Y_{1t}(0)$  represents the potential outcome with and without treatment, respectively. Since  $Y_{1t}(1)$  is observed, we would have to find the counterfactual scenario ( $Y_{1t}(0)$ ) to estimate the vector  $(\alpha_{1T_0+1}, \dots, \alpha_{1T})$ .

To estimate the counterfactual situation Abadie et al. (2010) consider the following factor model :

$$Y_{1t}(0) = \delta_t + \theta_t Z_1 + \lambda_t \mu_1 + \varepsilon_{1t} \quad (3.2)$$

Where  $\delta_t$  is an unobserved common factor (fixed-time effect).  $Z_1$  is a vector of observed covariates.  $\mu_1$  is a vector of unknown factor loadings and  $\varepsilon_{1t}$  is zero-mean transitory shocks.

Consider a  $(J \times 1)$  vector of weights  $W = (w_2, \dots, w_{J+1})'$  such that  $w_j \geq 0$  and  $\sum w_j = 1$ . Each particular value of the vector  $W$  represents a potential synthetic control for region 1. [Abadie et al. \(2010\)](#) show that as long as we can choose  $w^*$  such that

$$\sum_{j=2}^{J+1} w_j^* Y_{jt} = Y_{1t} \quad \text{and} \quad \sum_{j=2}^{J+1} w_j^* Z_{jt} = Z_{1t}, \forall t \in \{1, \dots, T_0\} \quad (3.3)$$

an unbiased estimator of  $\alpha_{1t}$ ; for  $t > T_0$  is then given by :

$$\hat{\alpha}_{1t} = Y_{1t}(1) - \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad (3.4)$$

Note that the vector  $W^*$  is chosen so as to minimize the distance:

$$\|X_1 - X_0 w\|_v = \sqrt{(X_1 - X_0 w)'(X_1 - X_0 w)} \quad (3.5)$$

where  $X_1$  and  $X_0$  are vectors of the pre-treatment characteristics of the treated unit and the untreated units, respectively and  $v$  is a  $(k \times k)$  symmetric and positive semi-definite matrix.<sup>1</sup>

This method, described as "arguably the most important innovation in the policy evaluation literature in the last 15 years" by [Athey & Imbens \(2017\)](#), has several advantages. The first advantage of this method is its transparency. In addition to clearly indicating each unit's relative contribution to the counterfactual construction, it allows us to observe the similarities between the treated unit and the weighted combination of untreated units in terms of predictors. Second, this method protects against extrapolation because the weights are non-negative, and their sum is equal to 1. A final advantage of SCM is its protection against specification searches and p-hacking since, during the design phase, post-intervention results are unknown.

However, it is essential to note that the synthetic control method does not test the significance of effects using conventional (large sample) inference techniques. To test the statistical significance of the results obtained with this method, I use placebo tests based on permutation techniques, as suggested by [Abadie et al. \(2010\)](#). More concretely, I start by iteratively applying the synthetic controls method to each unit in the pool of potential controls to obtain a placebo effect distribution. I then calculate the root mean square error of prediction (RMSPE) for each pre-and post-treatment period of the placebo. This RMSPE serves to compute the ratio of post-treatment to pre-treatment RMSPE and rank it in descending order. Finally, the p-value is given by  $p = \frac{RANK}{TOTAL}$ , where RANK is the rank of the treated unit in terms of post and pre-treatment RMSPE ratio and TOTAL is the total number of units.

### 3.3.1.2 Difference-in-differences Approach

In addition to the synthetic control method, I implement the standard difference-in-differences approach as a second specification. The regression model of this approach can be written as follows :

$$Y_{it} = \alpha + \beta_1 Treatment_i + \beta_2 Post_t + \delta(Treatment * Post)_{it} + \epsilon_{it} \quad (3.6)$$

Where  $Treatment_i$  is a dummy whether the unit is in the treatment group or not,  $Post_t$  is a post-treatment dummy. The interaction coefficient  $\delta$  corresponds to the effect of the Treatment.  $\epsilon_{it}$  is the error term.

The identification hypothesis underlying equation 3.6 is that the evolution of the outcome variable (school attendance) over time would have been precisely the same in the control and treatment groups, in the absence of treatment

<sup>1</sup>see [Abadie & Gardeazabal \(2003\)](#) for more details.



(oil-induced employment opportunities for natives). This means that, unlike SCM, which allows the impact of unobservable heterogeneity to vary over time, this model requires it to be constant over time (parallel trend assumption). If this parallel trend assumption is not verified, a causal relationship cannot be established.

### 3.3.2 Data

I use annual regional-level panel data for the period 1993–2010. However, data does not exist for all of these years. The years for which data are available are: 1993, 1996, 2000, 2002, 2004, 2005, 2006, 2007, 2008, 2009 and 2010, i.e. 5 pre-oil and 6 post-oil observation points. The limitation of the post-oil period to 2010 is due to the discovery of oil fields in other parts of the country, which significantly reduced the number of units in the donor pool.

The outcome variable is the net enrollment rate at the regional level. It is measured in the data set as the number of boys and girls aged 16-18 enrolled in secondary education, expressed as a percentage of the total population aged 16-18. I obtained this variable and all education data from the Chadian Ministry of Education's annual statistical yearbooks. Figure 3.4 shows the evolution of our outcome variable throughout the study period considered in the oil region and the average of the other regions. We note that for the oil region, the net secondary school enrollment rate increased from less than 10% throughout the pre-oil period to about 27% in 2010. In addition, while the oil region has a lower enrollment rate than the rest of the country before oil exploitation, it caught up with and even surpassed the rest of the country from 2004.

As explained above, to construct the synthetic control, in addition to the pre-intervention enrollment rates, I use a set of pre-oil predictors of schooling decisions. My predictors of the school attendance rate are: share of the urban population, annual rainfall, area of cultivable land, share of 15-64 year olds, nighttime lights per density, education expenditure per pupil, private tuition fees per pupil. All of these variables are considered to be significant predictors of schooling in Chad. First, the proportion of the region's urban population is a determining factor in school attendance since barriers to education are more significant in rural areas. Second, since agriculture is the main activity and source of income in Chad, annual rainfall and the area of cultivable land can significantly influence school attendance. Likewise, the share of the working population, which can be considered a sign of saturation of the local labor market, can be decisive in schooling decisions, particularly for secondary students. The level of development is also a significant determinant of education. However, since regional GDP data are not available, I use nighttime lights to indicate the level of development of the regions. Several articles have already used this variable as an indicator of development. ([Henderson et al. \(2012\)](#), [Keola et al. \(2015\)](#), [Pinkovskiy & Sala-i Martin \(2016a\)](#), [Pinkovskiy & Sala-i Martin \(2016b\)](#)) Finally, I include as predictors, public expenditure per student and private tuition fees per student, which respectively reflect public investment in education and barriers to enrollment. Except for data on education spending, taken from annual statistical yearbooks, all other variables used as predictors come from [Goodman et al. \(2019\)](#). The means and standard deviation of the main predictors are presented in the Table 3.1.

In addition to these regional data, I use nationally representative household survey data to ensure the results' robustness. More specifically, I use three surveys: the Demographic and Health Surveys (1996, 2004), the Multiple Indicator Cluster Surveys (2000, 2009), and the Chad Household Living Conditions and Poverty Survey (2010). The sampling frame for all these surveys is the enumeration areas (ZD) of the central census bureau of the National Institute of Statistics and Economic and Demographic Studies (INSEED) in Chad.

## 3.4 Results

### 3.4.1 Synthetic control results

#### 3.4.1.1 Main results

Let us start by looking at the synthetic control method step by step before presenting the treatment effect on the treaties. First, as mentioned, I used the pre-oil results and the predictors shown above to build the synthetic oil region. Table 3.2 shows the average of these variables for the oil region, the synthetic oil region, and the rest of the country. This balancing test shows that the oil region is closer to its synthetic control than the rest of Chad on average during the pre-oil period in almost all variables used as predictors. Figure 3.5 presents the evolution of secondary school enrollment rates in the oil region and its synthetic control. We can note that there is no difference between the two before oil exploitation, unlike what we observed in Figure 3.4 between the oil region and the rest of the country.

Table 3.3 displays the weights of each control region used in the construction of the synthetic oil region. This table shows that the pre-oil trend of secondary education in the oil region is best reproduced by a combination of ET (7%), Biltine (17%), Lac (29%), Moyen Chari (10%), N'djamena (9%) and Tandjilé (28%).

Table 3.2 shows a high degree of equilibrium in all enrollment predictors, and Figure 3.5 shows a perfect similarity in the trajectory of this variable in the oil region and the synthetic oil region throughout the pre-oil period. These two figures suggest that the synthetic oil region provides a reasonable proxy for the net secondary enrollment rate that would have been observed in the oil region in 2004-2010 without oil. The effect of employment prospects and pro-native policies on the net secondary education rate in the oil region is the difference between the net secondary education rate in the oil region and its synthetic control in the post-oil period. We can see in Figure 3.5 that immediately after the start of oil exploitation, the net secondary school enrollment rate begins to diverge considerably. Although secondary school attendance increases in the synthetic oil region, the increase is much more significant in the oil region. The magnitude of the estimated impact of oil-induced employment opportunities for natives, shown in Figure 3.6 is substantial. Over the period 2004-2010, the net secondary school enrollment rate increased by around 9% in the oil region compared to its synthetic control.

#### 3.4.1.2 Placebo test

In this subsection, I perform a series of placebo tests to ensure that the observed effect is indeed the effect of oil-induced employment opportunities for natives and not a simple error of prediction that could have been observed even without this treatment. Specifically, I repeat the above exercise for each of the regions in the control group. The idea is that if the placebo studies create gaps of a magnitude similar to the one estimated in the oil region, then the treatment considered has no significant effect on secondary education in the oil region. If, on the contrary, this difference is abnormally greater for the oil region than for all non-oil placebo regions, then the treatment had a significant effect on secondary education in the oil region.

I first, follow [Abadie et al. \(2010\)](#) and overlay the oil region with all the placebos with a pre-oil root mean squared percentage error (RMSPE) similar to this one. The results presented in Figure 3.7 show that no other region has experienced such a significant increase in secondary school enrollment than the oil region. I then evaluated the outcome of the oil region versus the placebo regions by examining the distribution of post-oil MSPE ratios. The main advantage of examining ratios is that it avoids choosing an exclusion threshold for unsuitable placebo analyzes. Figure 3.8 shows the distribution of post-pre-oil MSPE ratios for the oil region and the 14 control regions. We can see in this figure that the oil region stands out from other regions and has the highest post-pre-oil ratio. Numerically, the post-oil MSPE is approximately 22 times the MSPE for the pre-oil period (Table 3.4).

The results of the synthetic control are summarized in Table 3.4. Panel A shows the adjustment of the pre-



intervention model. When I use synthetic oil to predict the net secondary school enrollment rate in the oil region from 1993 to 2004, the RMSPE is 0.25, representing less than 4% of the average value of results before oil. As shown in the last line of Table 3.4, the oil region is ranked 1st out of 15 regions. This gives an exact p-value of  $1/15 = 0.06$ , which is below the standard significance level of 10%. This means that if the intervention were to be randomly assigned, the probability of obtaining a post-pre-oil MSPE ratio as high as that of the oil region is 0.06. Overall, the synthetic control method shows that the oil boom increased the net secondary school enrollment rate by about 4.78% in the oil region.

### 3.4.2 Difference-in-differences results

In addition to SCM, I use the difference-in-differences method as an alternative approach. As mentioned above, the identification strategy for this method is based on a parallel trend assumption. Figure 3.4 shows that this hypothesis is respected since the evolution of secondary school enrollment rates in the oil region and the rest of Chad follows a parallel trend to the pre-oil period. Therefore, the difference-in-differences method can be used to estimate a causal effect of oil-induced employment opportunities for natives on secondary education.

The results of this estimate are shown in Table 3.5. In the first column, I present the results of the standard difference-in-difference approach. In the second column, I control for a set of pre-oil characteristics. More precisely, I use the means of the pre-oil predictors used for the synthetic control method as controls. The treatment effect is the coefficient of the interaction term DID (Treatment\*Post). The positive effect previously found with the synthetic control method remains unchanged. However, the magnitude of the effect is slightly higher (6.28 versus 4.78 with synthetic control). Using pre-oil variables as controls also does not change the result, as can be seen in column 2 of Table 3.5. Only the precision changes compared to the first column. The evolution of the estimated DID coefficient presented in Figure 3.9 is unequivocal. The effect is practically zero throughout the pre-treatment period. This coefficient only started to increase from the start of oil exploitation, reaching around 10% in 2010.

## 3.5 Mechanisms

The results described in the previous section show a positive and significant effect of employment opportunities for natives on secondary education attendance. In this section, I explore some transmission channels.

### 3.5.1 Is it a job prospect effect or an income effect?

Since the oil boom may increase the local population's income, one might expect the observed effect to be due to the increase in parental income. To test this possibility, I conducted a placebo test based on the share of rent received by each region. Indeed, as mentioned above, the oil region is not the one that received the largest share of the oil rent per capita in the post-oil period (Figure 3.11). It comes far behind BET, Biltine, Logone occidental. I take advantage of this situation to do a placebo analysis by considering regions that received more rent than the oil region as treated groups. The idea is that if there is an income effect, we might see a more noticeable effect in these regions compared to the oil region in the post-oil period. The result of this analysis using the synthetic control method and the difference-in-differences approach are shown in Figure 3.12 and Table 3.6, respectively.

The SCM results displayed in Figure 3.12 show that none of the regions that received more rent per capita experienced an increase in secondary school enrollment rates relative to their synthetic controls like that of the oil region. The difference-in-difference results reported in Table 3.6 confirm these findings. There are no positive and statistically significant effects for these regions, unlike the oil region. Therefore, the results are more consistent with an effect due to oil-induced employment opportunities for natives rather than an income effect.

### 3.5.2 Is it a supply or demand effect?

Second, the oil boom could also increase the budget of the oil region. One might expect that the positive effect observed above is, in fact, due to an increase in the supply of education. To determine which of the demand or supply side explains the observed effect, I performed the same placebo analysis as before, this time focusing on education expenditures. Figure 3.13 shows per-pupil spending in the post-oil period in the different regions. We find that the oil region ranks only fifth among the regions with the highest per-pupil spending. The 4 regions with the highest education expenditures per student are: Tandjilé, Moyen Chari, BET, Ouaddai. I used these four regions as treated groups.

The synthetic control method and difference-in-difference approach results are shown in Figure 3.14 and Table 3.7, respectively. The SCM results indicate that none of the regions that spent more per student than the oil region experienced as large an increase in secondary education enrollment as the oil region. Similar results are found in Table 3.7 using the difference-in-differences approach. These results argue for a job prospect-induced demand effect rather than a supply effect due to increased education spending.

### 3.5.3 Is it an increase in attendance at all levels or a decrease in dropouts?

In this subsection, I investigate whether the observed positive effect is due to increased enrollment at each grade level or a reduction in dropouts. To do this, I looked at what is happening at other levels of education, particularly in primary and middle school, using the same econometric approaches as above.

First of all, we see in Figure 3.15 that the primary and middle schooling rate is initially higher in the oil region than in the rest of Chad. In Figure 3.16, I construct a synthetic oil region as in subsection 3.4.1 using a number of pre-treatment predictors. The predictor variables are the same as those used for secondary education, except for the proportion of children aged 6 to 17 and the primary and middle school enrollment rate before treatment considered in this subsection. We particularly note that the evolution of the net primary and intermediate schooling rate before the oil is the same in the oil region and its synthetic control.

In Figure 3.17, I present the difference in results between the region's oil and its synthetic control over the entire period considered. This graph clearly shows that the difference is almost zero even after oil. Oil-induced employment opportunities for natives do not appear to have positively affected primary and middle school enrollment. Placebos tests confirm this absence of a positive and statistically significant effect. Indeed, in Figure 3.18, we observe that compared to the non-oil regions used as placebos, the oil region does not record a significant increase as in the previous section. Furthermore, Table 3.8 shows that the oil region is ranked in sixth place in post-pre-oil MSPE ratios. The use of survey data or the difference-in-differences method does not change the results, as shown in Tables 3.9 and 3.12. Regardless of the specification chosen, these two tables show that the oil-induced employment opportunities and pro-native policies had no statistically significant effect on primary and middle education.

These results are consistent with the lack of a positive effect noted above. The fact that there is no effect on elementary and middle school enrollment indicates that the effect observed at the secondary school level is less likely to be due to increased parental income.

### 3.5.4 Migration issues

The other main concern that could challenge the findings is migration. Indeed, if many people migrate to the oil region to benefit from the oil boom, it may be that the observed effect is due to this migratory movement and not to a decrease in school dropout, as indicated in the previous subsection. I check this concern by looking at the evolution of the immigrant population's share before and after the oil boom. In figure 3.19, we successively present the evolution of the total population, the number of immigrants, and what these immigrants represent in the total population of the

oil region. Regarding the total population, we see that it almost doubled between 1993 and 2009, going from 376,875 to 750,649. At the same time, the number of immigrants to the region has tripled, from 17,414 in 1993 to 58,856 in 2009. Relative to the total population, the share of immigrants increased from 5% in 1993 to 8% in 2009. However, most of this increase occurred before exploitation started in 2004. The share of migrants in the total population increased by only 1% between 2004 and 2009. Unfortunately, in the regressions, the data do not precisely identify the immigrant population, but this low increase in the share of immigrants between 2004 and 2009 suggests that no mass migration could significantly affect the results. Moreover, as we will see in the next section, controlling or not by the household characteristics does not change the results.

### 3.6 Robustness Checks

Although the placebo tests and the difference-in-differences approach show the robustness of our results, the small sample size may pose a problem of statistical power. To solve this problem, I re-estimate the effect of the treatment on schooling using nationally representative survey data. More specifically, I use the Demographic and Health Surveys (1996, 2004), the Multiple Indicator Cluster Surveys (2000, 2009), and the Survey on Household Living Conditions and Poverty in Chad (2010). The sampling frame for all these surveys comprises the enumeration areas (ZD) of the central census office of the National Institute of Statistics and Economic and Demographic Studies (INSEED) in Chad. The main variables used in this section are presented in Table 3.10. This table shows no fundamental difference between the oil region and the rest of Chad in terms of main household characteristics (head, school-aged children, etc.).

Using the data from this survey, I then applied the difference-in-differences approach to estimate the effect oil-induced employment opportunities for natives on secondary schooling in the oil region. These estimates are presented in the Table 3.11. In the first column, I estimated the effect without any control variable. In the second, I control for household and head of household characteristics. These control variables are household size, sex, age, the household's head level of education, an indicator variable for the head of household, the share of dependents (child and eldest) in the household, and the sex of the child. In column 3, I add another variable to these controls, which indicates whether the household belongs to the first, second, third, fourth, and fifth wealth quintiles. Standard errors are clustered at the regional level.

First of all, it should be noted that the graph 3.20 presented in the appendix shows that the parallel trend assumption necessary to estimate a causal effect using the difference-in-differences method is respected. Then, the positive and significant effect of the treatment on secondary education in the oil region presented in the last section remains unchanged. Although the magnitude of the effect is slightly smaller than shown above, the interaction term shows a positive and significant effect of oil-induced employment opportunities for natives on secondary education. This finding is robust to all specifications. Therefore, the sample size issue mentioned above does not appear to alter our results drastically.

### 3.7 Concluding Remarks

This article analyzed the effect of oil-induced employment opportunities for natives on secondary school enrollment decisions in Chad's oil-rich region. First, I used administrative data and the synthetic control method to create a synthetic oil region, indicating what would happen in the oil region without these possibilities. I then compared the results for the synthetic oil region with the actual results for the oil region. I have found a positive and statistically significant effect of oil-induced employment opportunities for natives on the secondary school enrollment rate in the oil region. This rate increased by around 5% in the oil region compared to its synthetic control. Next, I used the

difference-in-differences method to compare the evolution of secondary school enrollment in the oil region before and after the oil boom with that of the control regions over the same period. This second analysis confirms those obtained by the synthetic control method previously. Specifically, I find that the treatment increased secondary school enrollment by 6% in the oil region. I obtained similar results when I used nationally representative survey data rather than administrative data.

In terms of mechanism, the results first show that the observed effect is not an income effect since none of the regions that received more rent than the oil region experienced an increase in enrollment equivalent to that of the oil region. Second, I show that the observed increase in enrollment results from an increase in demand for education rather than an increase in education spending. Indeed, no region that spent the most per student experienced a similar increase as the oil region. These results confirm the role of labor market incentives on schooling decisions. Furthermore, I investigated whether this result was due to a decrease in the dropout rate in the oil region or increased enrollment at all levels of education. When I analyzed primary and middle school enrollment, I found that the observed effect was more due to a decrease in dropouts than an overall increase in enrollment at all levels.

This paper raises important questions about human capital investment in developing countries and has significant policy implications. First, I find that employment prospects are vital determinants of educational decision-making in Chad. Therefore, programs to increase human capital should incorporate returns to education into their design. Second, the results suggest that demand appears to be a limiting factor in the level of education in Chad. This demand effect explains Chad's low secondary school attendance and higher early dropout rate despite massive investments in education. Hence, improving work prospects may be an effective way to combat school dropout in this country. Furthermore, to increase human capital in Chad and create decent jobs, the authorities should implement awareness campaigns for parents and children on labor market opportunities and the importance of education for professional success.



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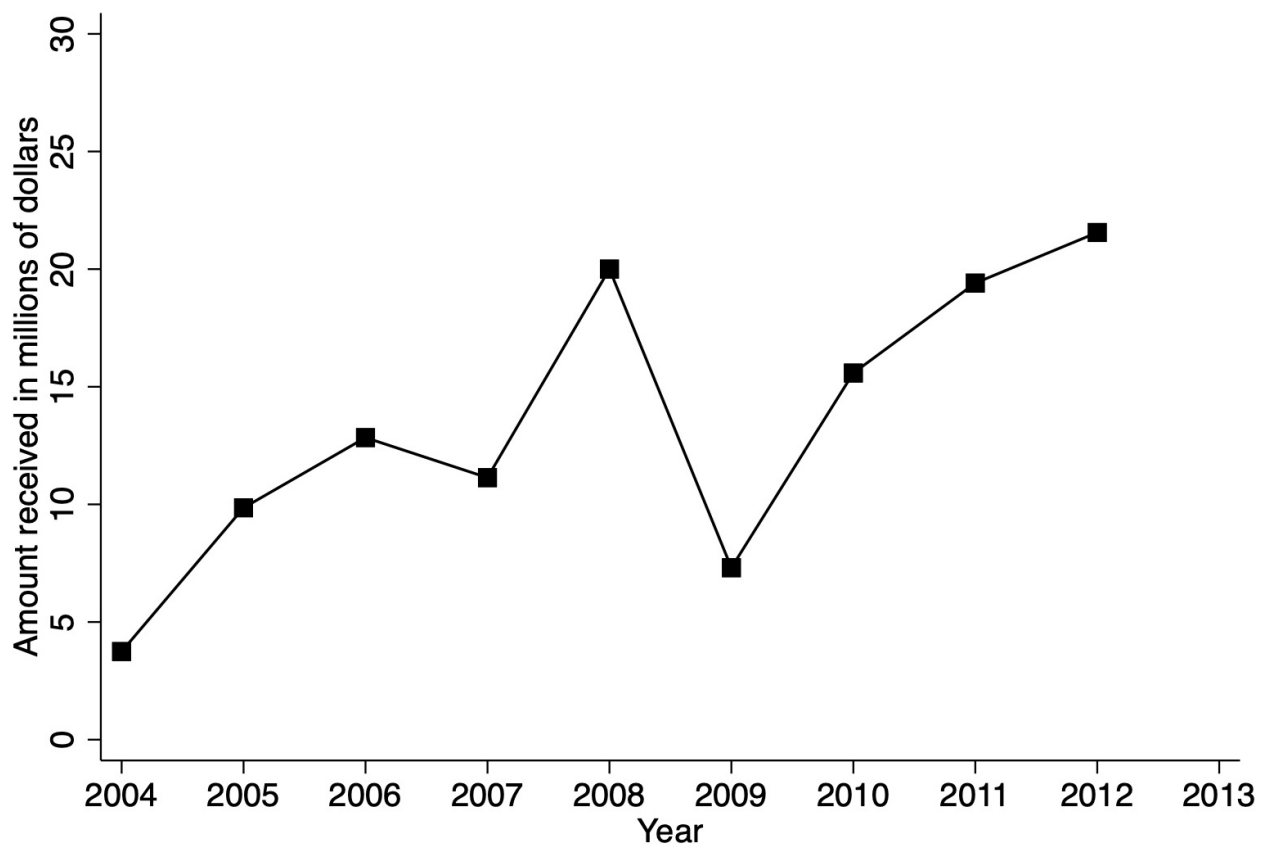
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Figure 3.1: Administrative map (region) of Chad



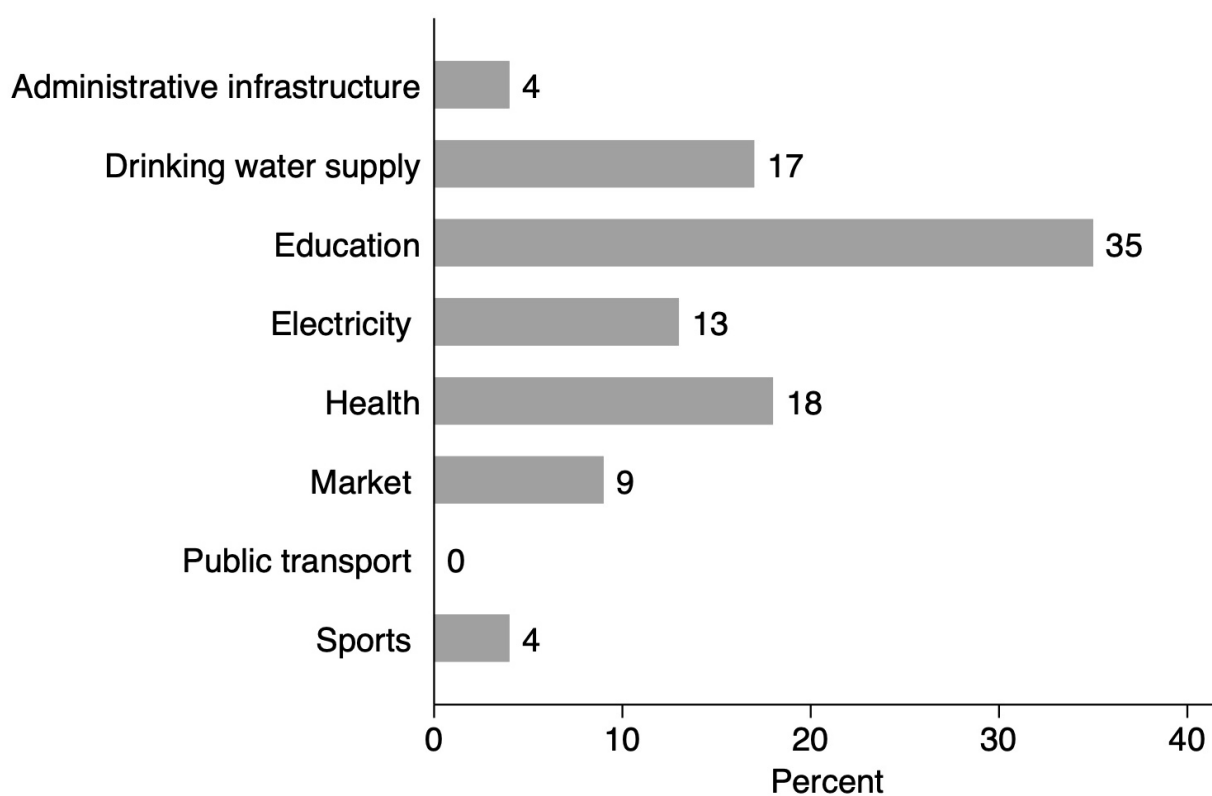


Figure 3.2: Oil revenues collected by the oil region from 2004 to 2012



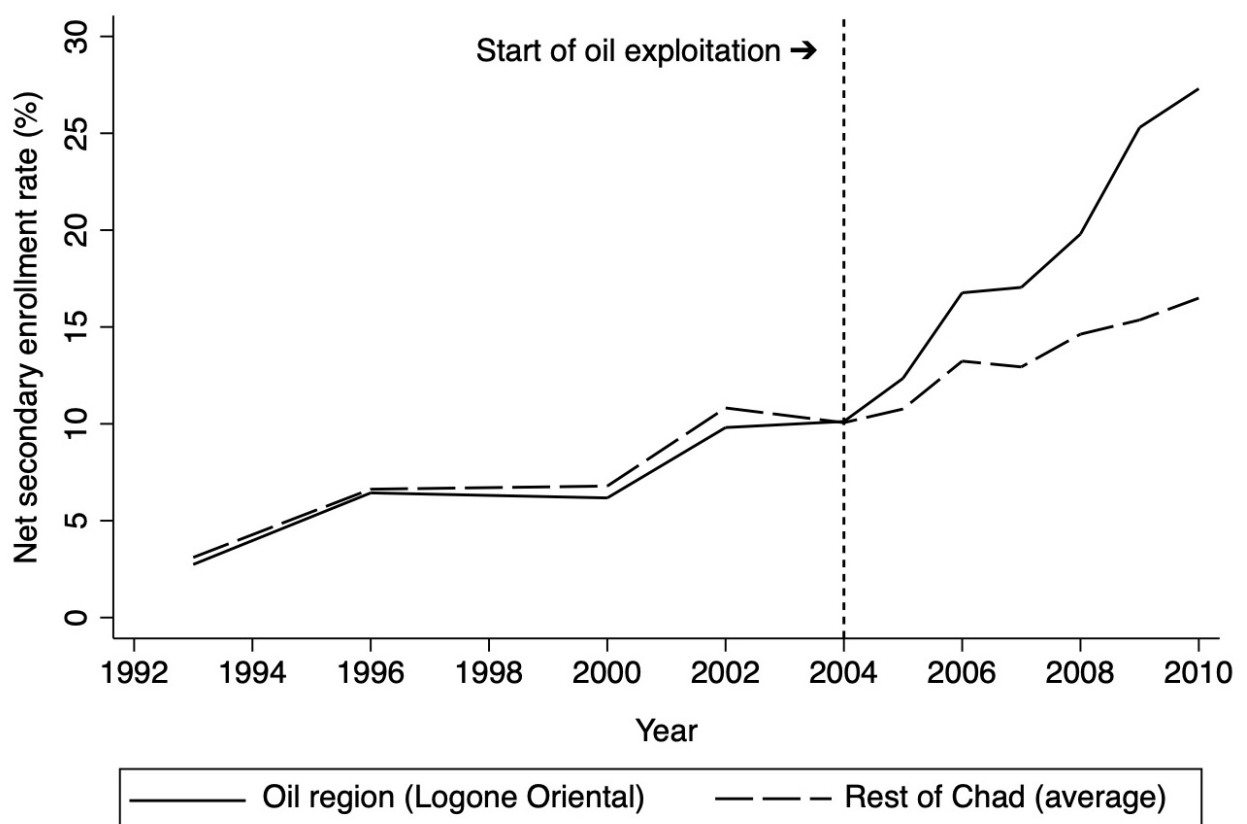
Source : Author from GRAMPTC(2013) data

Figure 3.3: Investments by sector in the oil region over the period 2005-2012



Source : Author from GRAMPTC(2013) data

Figure 3.4: Trends in the net secondary school enrollment rate : oil region vs rest of Chad



Source : author using the annual statistical yearbooks of the Chadian Ministry of Education

Table 3.1: Descriptive statistics of predictors

	Mean	Sd
Enrolment (1993)	3.08	3.71
Enrolment (1996)	6.61	5.58
Enrolment (2000)	6.75	5.54
Enrolment (2002)	10.8	11.7
Enrolment (2004)	10.1	8.86
Share of 15-64(1993)	35.8	2.98
Share of 15-64(1996)	34.0	2.70
Share of 15-64(2000)	30.9	3.14
Share of 15-64(2002)	36.0	3.76
Share of 15-64(2004)	32.9	3.21
Urbanisation (1993)	2.79	0.75
Urbanisation (1996)	3.34	0.54
Urbanisation (2000)	3.84	0.36
Urbanisation (2002)	3.56	0.45
Urbanisation (2004)	3.56	0.45
Precipitation (1993)	3.48	0.97
Precipitation (1996)	3.60	1.05
Precipitation (2000)	3.71	0.74
Precipitation (2002)	3.57	0.70
Precipitation (2004)	3.68	0.88
Cropland (1993)	10.4	1.70
Cropland (1996)	10.5	1.69
Cropland (2000)	10.5	1.69
Cropland (2002)	10.5	1.69
Cropland (2004)	10.5	1.69
Nighttime lights (1993)	0.080	0.19
Nighttime lights (1996)	0.073	0.14
Nighttime lights (2000)	0.057	0.10
Nighttime lights (2002)	0.055	0.096
Nighttime lights (2004)	0.088	0.12
Private tuition per pupil(2004)	1409	1834
Education expenditure per pupil(2004)	12621	19891
<i>N</i>	75	

Note: Share of 15-64 is the percentage of the population aged 15 to 64. Urbanization is the logarithm of the share of the urban population in the total population. Cropland represents the logarithm of rain-fed cropland area. Nighttime lights are Nighttime lights per density. Education expenditure per pupil are averaged for the 1993–2004 period.

Table 3.2: Balancing table of predictors of the net secondary school enrollment rate

	(1)		(2)
	Oil Region Real	Synthetic	Average of control states
Enrolment rate(1993)	2.74	3.06	3.11
Enrolment rate(1996)	6.44	6.48	6.63
Enrolment rate(2000)	6.18	6.62	6.79
Enrolment rate(2002)	9.81	9.77	10.82
Enrolment rate(2004)	10.12	10.09	10.1
Share of 15-64(1993)	35.56	36.43	35.87
Share of 15-64(1996)	35.32	34.89	33.90
Share of 15-64(2000)	32.26	31.30	30.85
Share of 15-64(2002)	34.76	35.56	36.07
Share of 15-64(2004)	33.93	31.58	32.85
Urbanisation(1993))	2.31	2.45	2.83
Urbanisation(1996)	3.02	3.12	3.36
Urbanisation(2000)	3.69	3.66	3.85
Urbanisation(2002)	3.52	3.52	3.56
Urbanisation(2004)	3.52	3.52	3.56
Precipitation(1993)	4.33	3.28	3.41
Precipitation(1996)	4.55	3.39	3.53
Precipitation(2000)	4.49	3.59	3.65
Precipitation(2002)	4.28	3.42	3.52
Precipitation(2004)	4.52	3.47	3.62
Cropland(1993)	9.47	9.66	10.51
Cropland(1996)	9.62	9.68	10.53
Cropland(2000)	9.65	9.71	10.56
Cropland(2002)	9.66	9.71	10.56
Cropland(2004)	9.67	9.72	10.57
Nighttime lights(1993)	0.09	0.09	0.08
Nighttime lights(1996)	0.11	0.07	0.07
Nighttime lights(2000)	0.08	0.06	0.05
Nighttime lights(2002)	0.07	0.08	0.05
Nighttime lights(2004)	0.13	0.12	0.09
Private tuition per pupil (2004)	1553	1555	1399
Public expenditure per pupil(2004)	14943	14980	12455

Note: Share of 15-64 is the percentage of the population aged 15 to 64. Urbanization is the logarithm of the share of the urban population in the total population. Cropland represents the logarithm of rain-fed cropland area. Nighttime lights are Nighttime lights per density. Education expenditure per pupil are averaged for the 1993–2004 period.

Figure 3.5: Oil region net secondary school enrollment rate vs Synthetic oil region

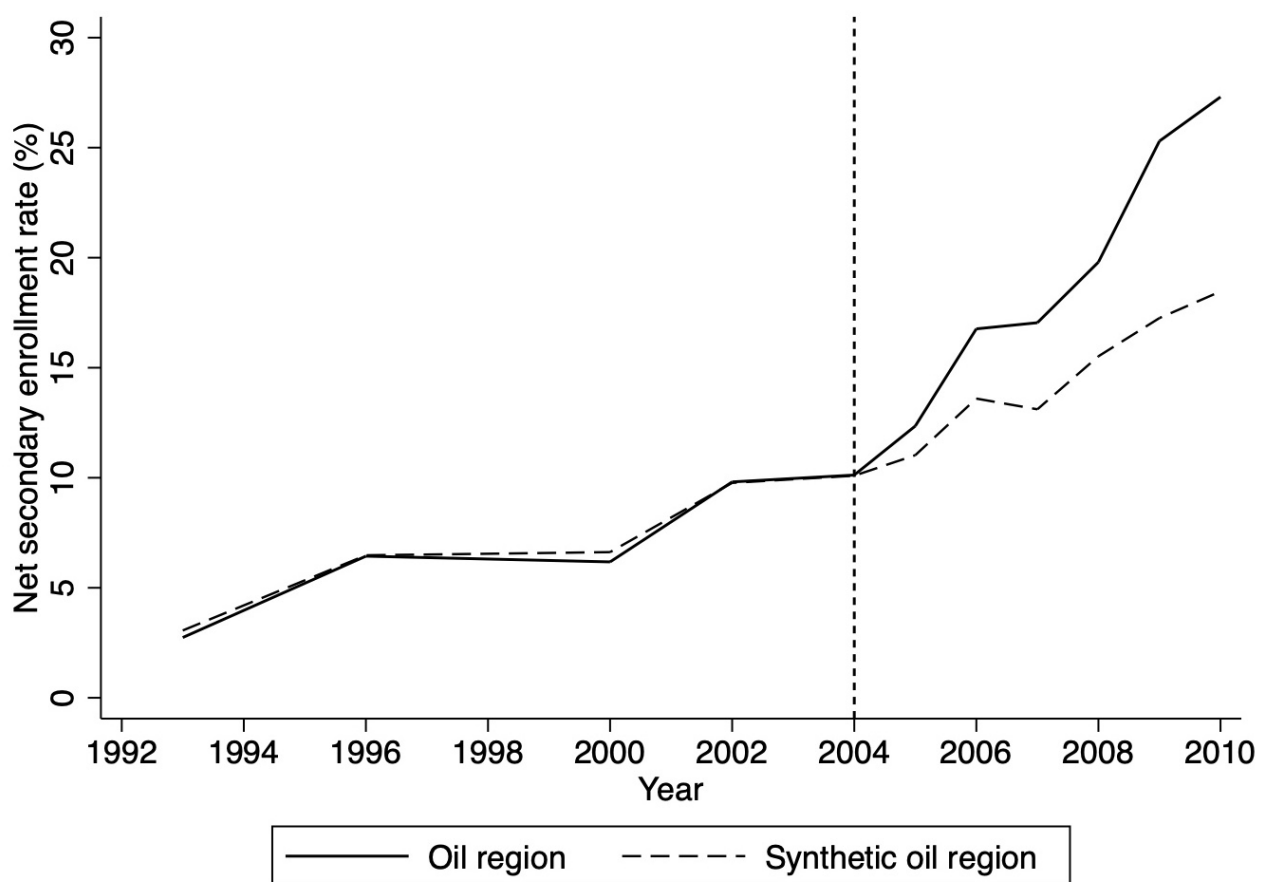


Figure 3.6: Gap between actual oil region vs Synthetic oil region in net secondary school enrollment rate

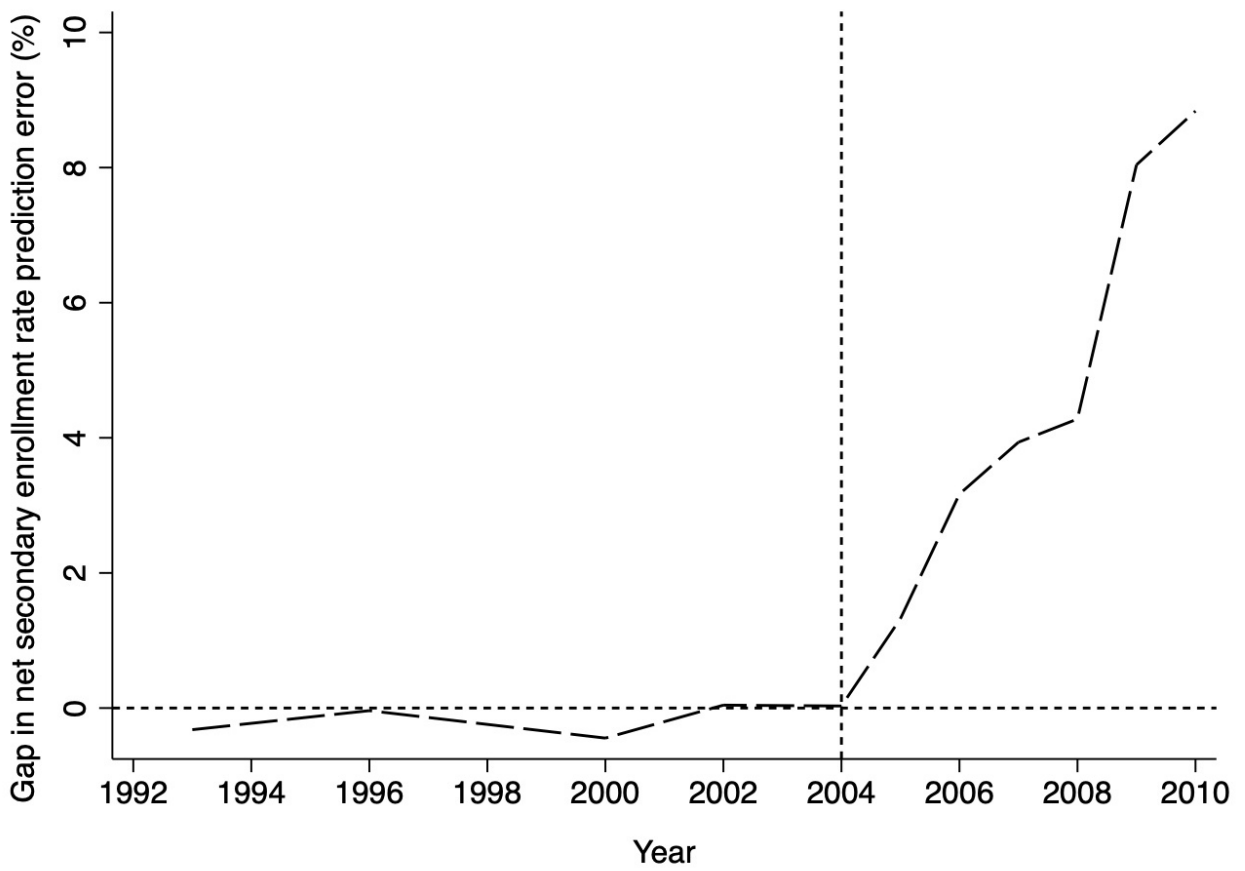


Table 3.3: Region weights in the synthetic Oil Region

Region	Weight
Batha	0
BET	0.07
Biltine	0.17
Chari-Baguirmi	0
Guéra	0
Kanem	0
Lac	0.29
Logone Occidental	0
Mayo-Kebbi	0
Moyen-Chari	0.10
Ouaddaï	0
Salamat	0
Tandjilé	0.28
N'Djamena	0.09
Treated Unit : Oil region(Logone Oriental)	1



Figure 3.7: Oil Region and Placebo distribution

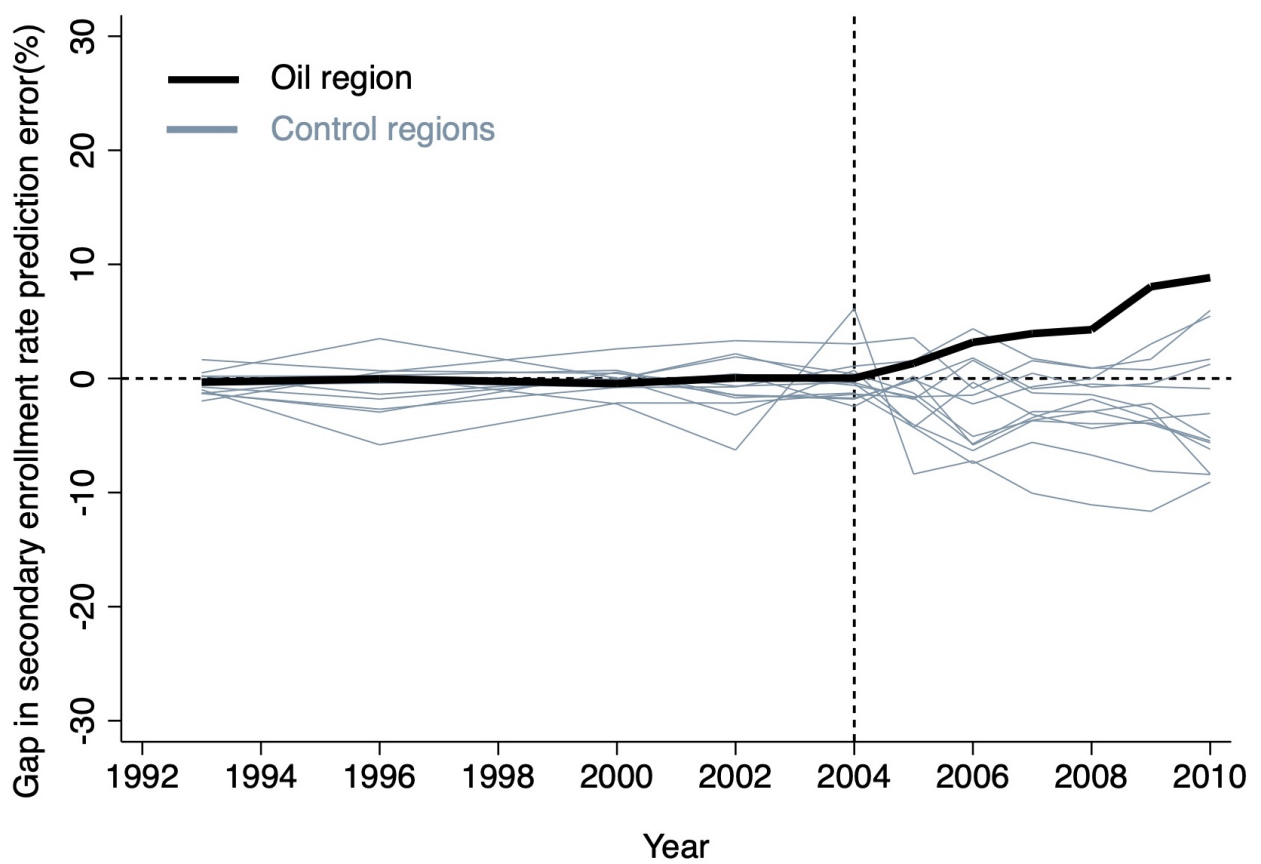


Figure 3.8: Ratio of post-oil MSPE and pre-oil MSPE: Oil region and control regions.

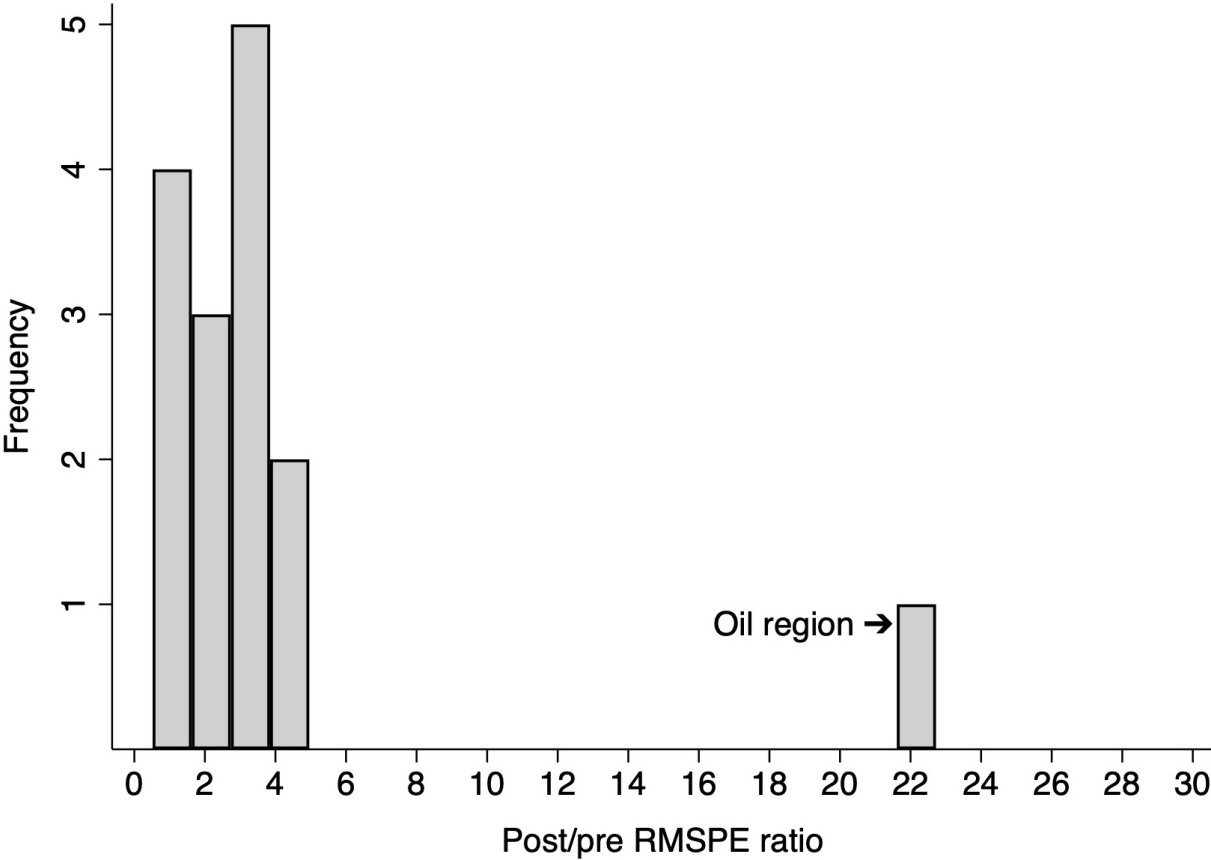


Table 3.4: Synthetic control results

Variables	Value
<b>Panel A : Model fit pre-intervention</b>	
RMPSE	0.25
APE-to-mean ratio	3.54%
<b>Panel B : Placebo test</b>	
RMSPE ratio	22.72
P-value*	0.06
<b>Panel C : Synthetic control ATT</b>	
ATT	4.78*
Treatment rank	1

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . ATT : difference in the mean differences, between enrollment rate in oil region and that of the synthetic control, in the pre-treatment period from that in the post-treatment period. APE-to-mean ratio indicates the average pre-oil prediction error divided by the average pre-oil outcome value. P-value\* calculated based on placebo tests

Table 3.5: Difference-in-differences estimation results

	(1)		(2)	
	Enrollment		Enrollment	
DID(Treatment*Post)	6.28*	(3.42)	6.28**	(2.82)
Treatment	-0.42	(1.57)	-7.67***	(2.04)
Post	6.43***	(2.37)	6.43***	(1.27)
Pretreatment characteristics controls	No		Yes	
<i>N</i>	165		165	
R-square	0.05		0.77	

Pretreatment characteristics controls : Active population Urbanisation, Precipitation, Cropland area, Nighttime lights per density, Private tuition per pupil and Public expenditure per pupil. Robust standard errors are in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Figure 3.9: Estimated effect of treatment on the net secondary school enrollment rate using difference-in-differences

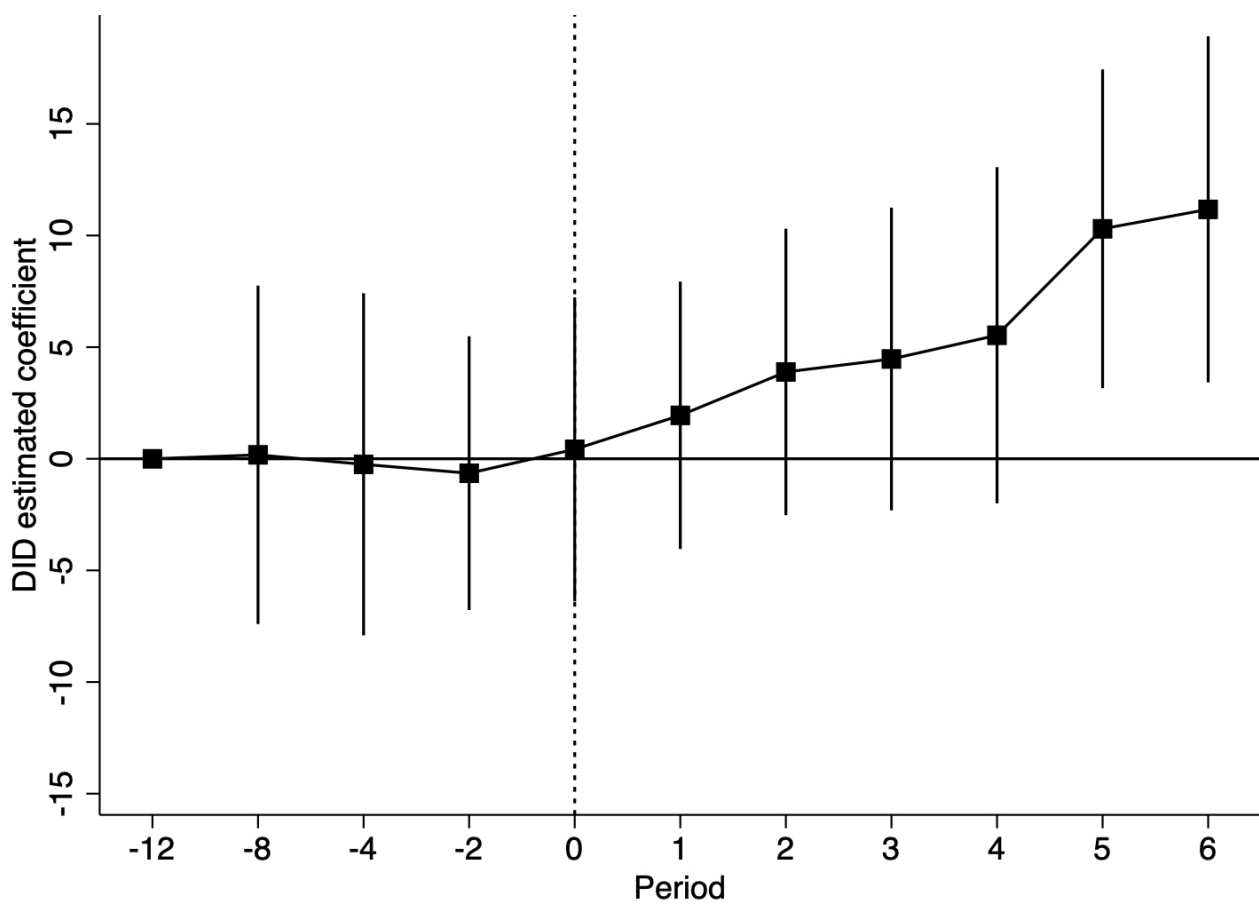


Figure 3.10: Share of oil revenues received and demographic weight by region

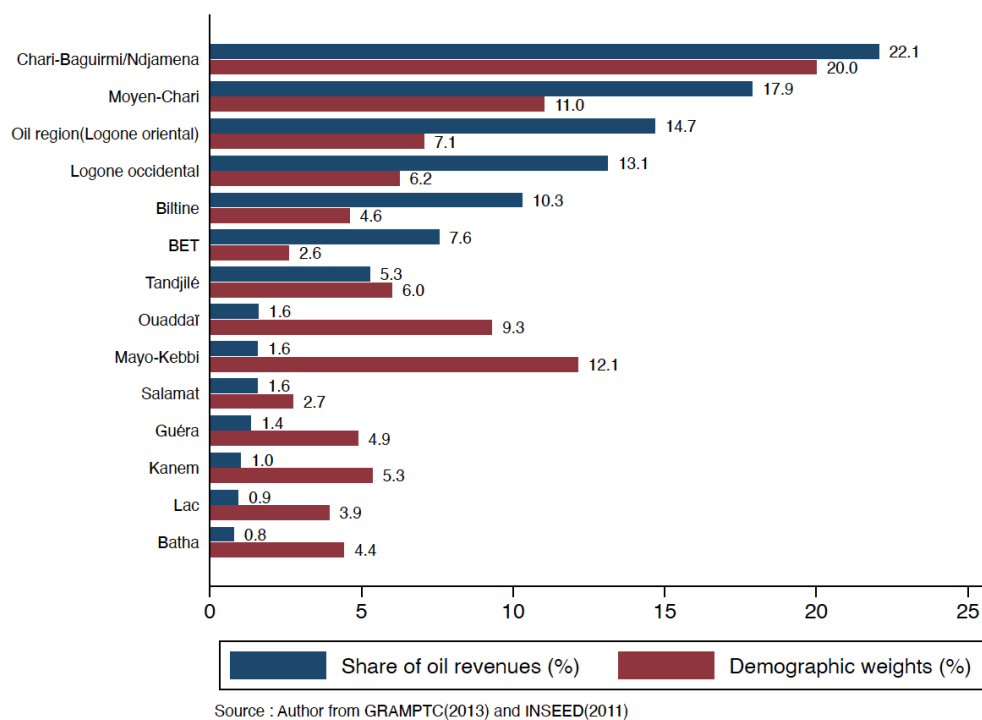


Figure 3.11: The ratio of oil revenues received in proportion to the demographic weight by region

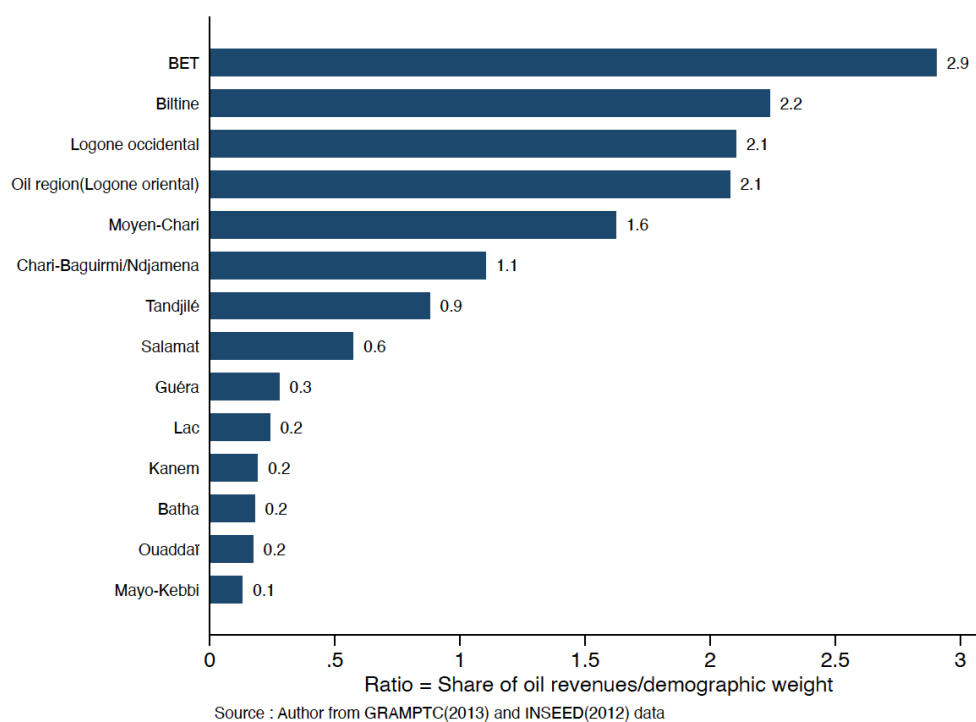


Figure 3.12: Oil region vs Regions with the most oil revenue per capita

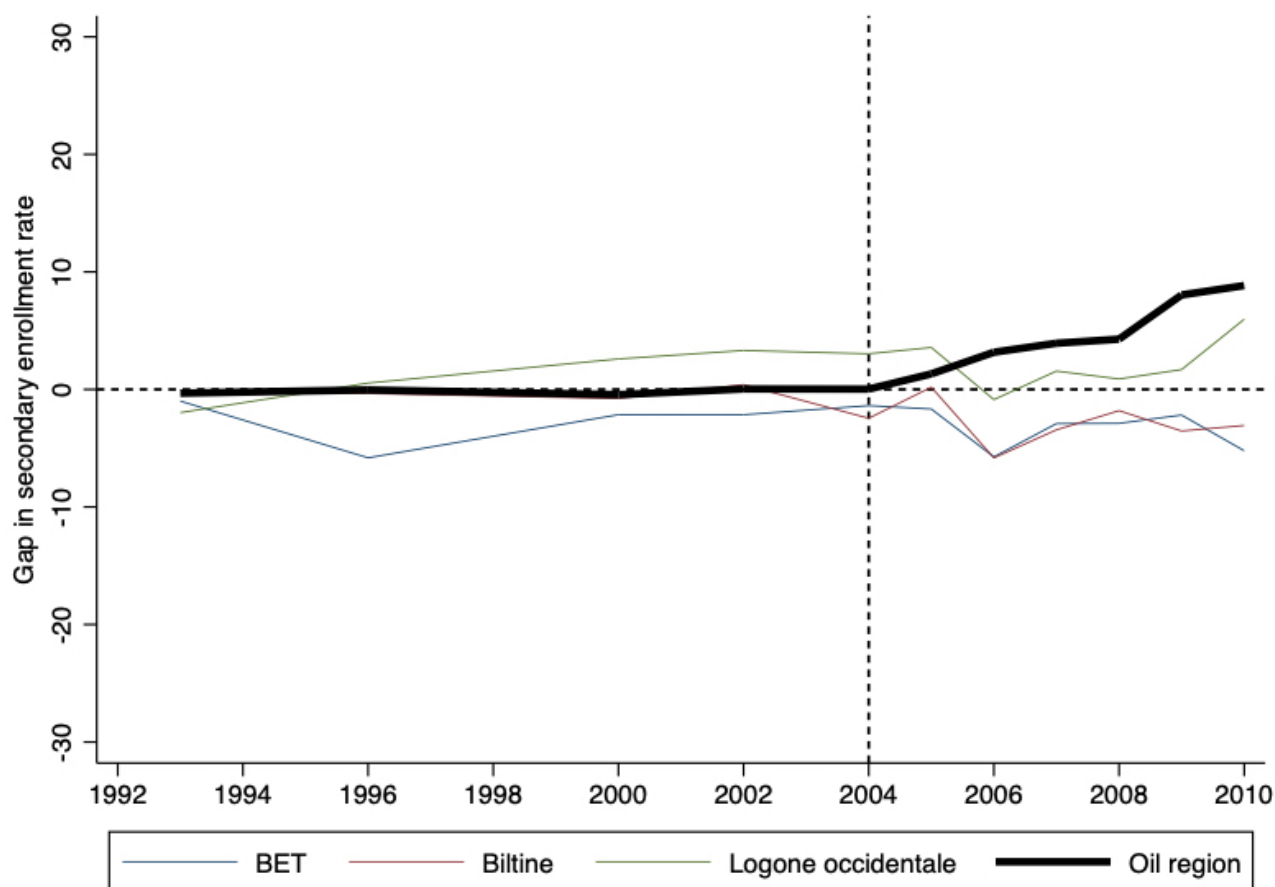
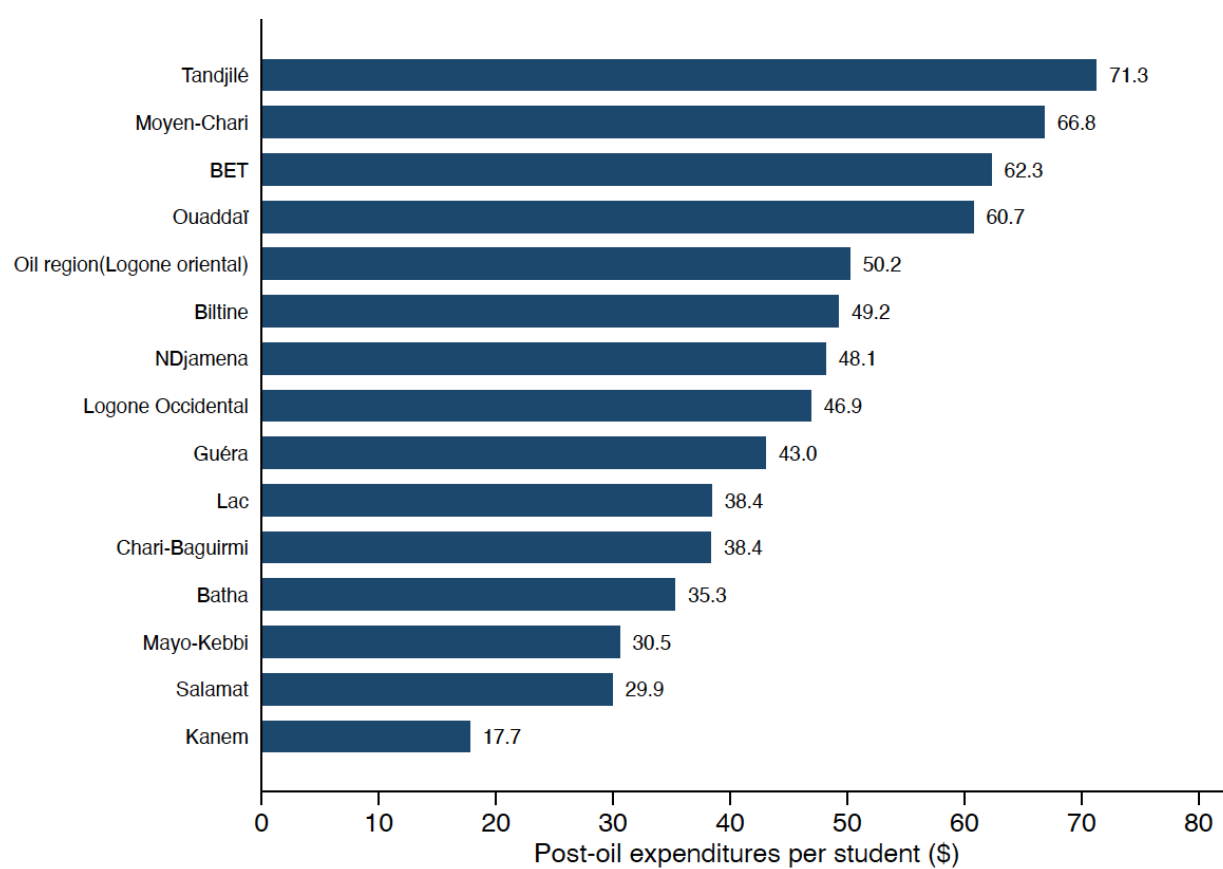


Table 3.6: Difference-in-difference estimation results for major rent recipients

	(1)		(2)		(3)	
	BET		Biltine		Logone occidental	
	Coef.	se	Coef.	se	Coef.	se
DID(Treatment*Post)	-6.97	(9.37)	-7.16	(9.40)	6.67	(9.38)
Treatment	-6.23	(6.92)	-5.07	(6.94)	6.41	(6.92)
Post	7.31***	(2.42)	7.32***	(2.43)	6.40***	(2.42)
R-square	0.08		0.07		0.08	

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

Figure 3.13: Post-oil public expenditure per student



Source: author from the annual statistical yearbooks of the Chadian Ministry of Education



Figure 3.14: Oil region vs Regions that spent the most on education per student

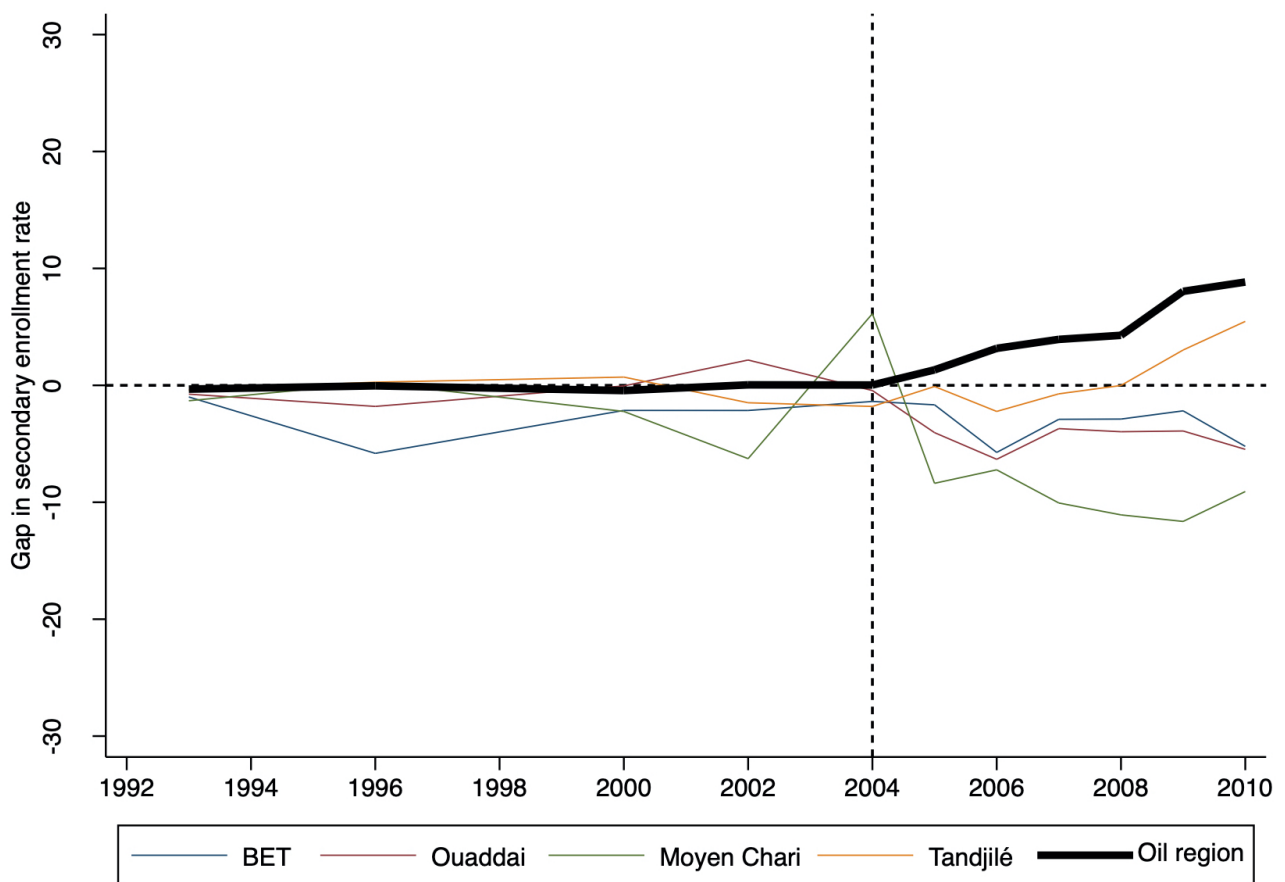


Table 3.7: Difference-in-difference estimation results : Regions that spent the most on education per student

	(1)		(2)		(3)		(4)	
	BET		Moyen Chari		Ouaddai		Tandjilé	
	Coef.	se	Coef.	se	Coef.	se	Coef.	se
DID(Treatment*Post)	-6.97	(9.37)	-1.28	(9.51)	-7.76	(9.44)	1.45	(9.52)
Treatment	-6.23	(6.92)	3.32	(7.03)	-2.56	(6.97)	-0.51	(7.03)
Post	7.31***	(2.42)	6.93***	(2.46)	7.36***	(2.44)	6.75***	(2.46)
R-square	0.08		0.05		0.07		0.05	

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

Figure 3.15: Trends in the net primary and middle school enrollment rate : oil region vs rest of Chad

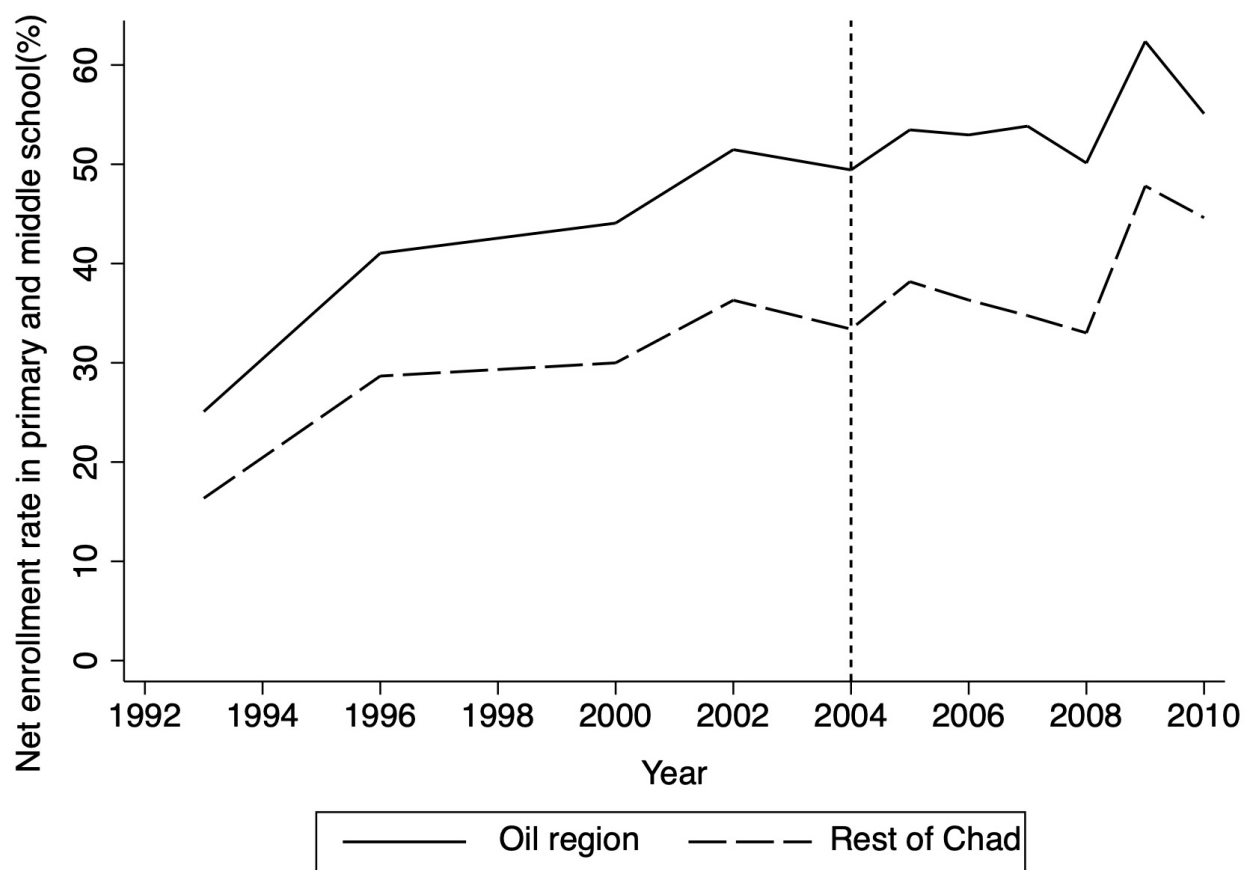


Figure 3.16: Oil region net primary and middle school enrollment rate vs Synthetic oil region

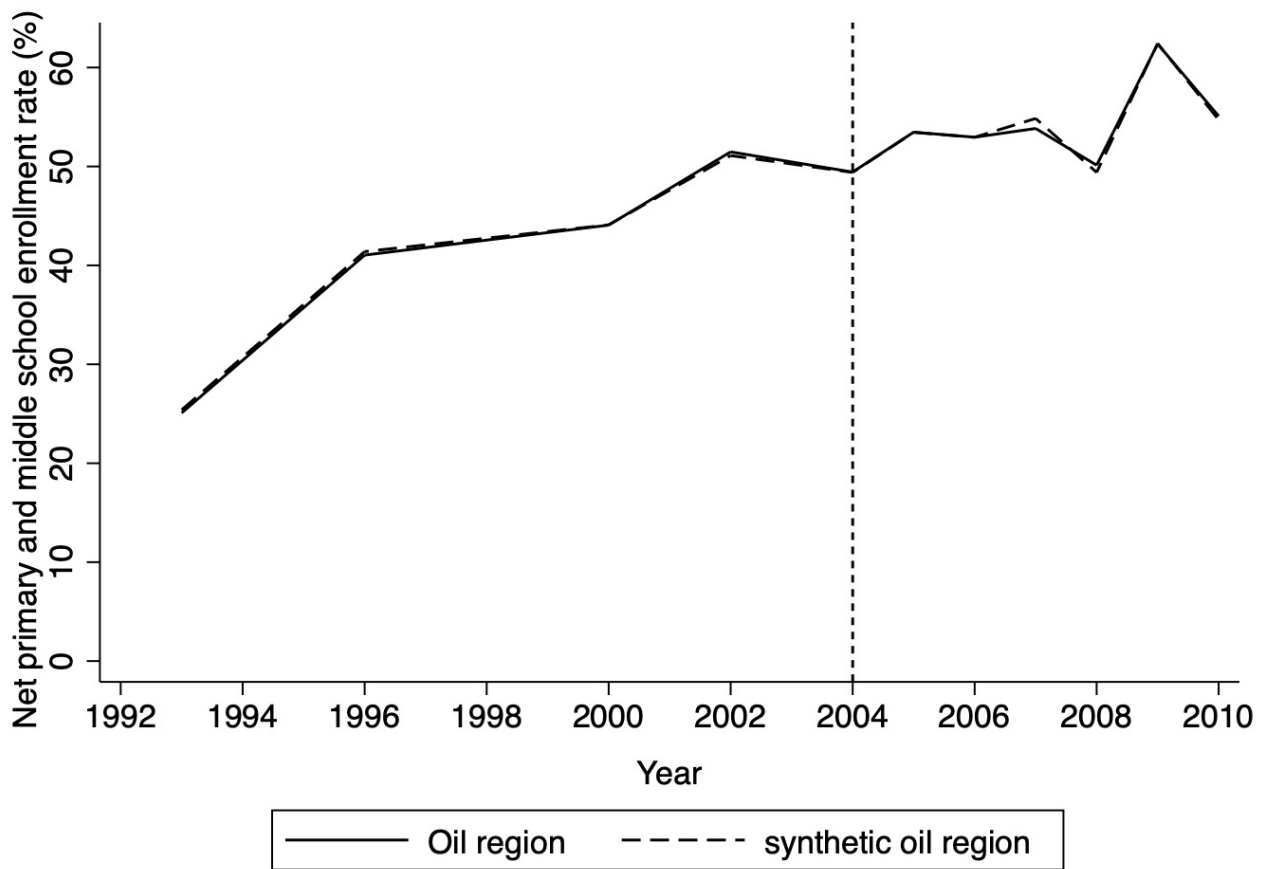


Figure 3.17: Gap between actual oil region vs Synthetic oil region in net primary and middle school enrollment rate

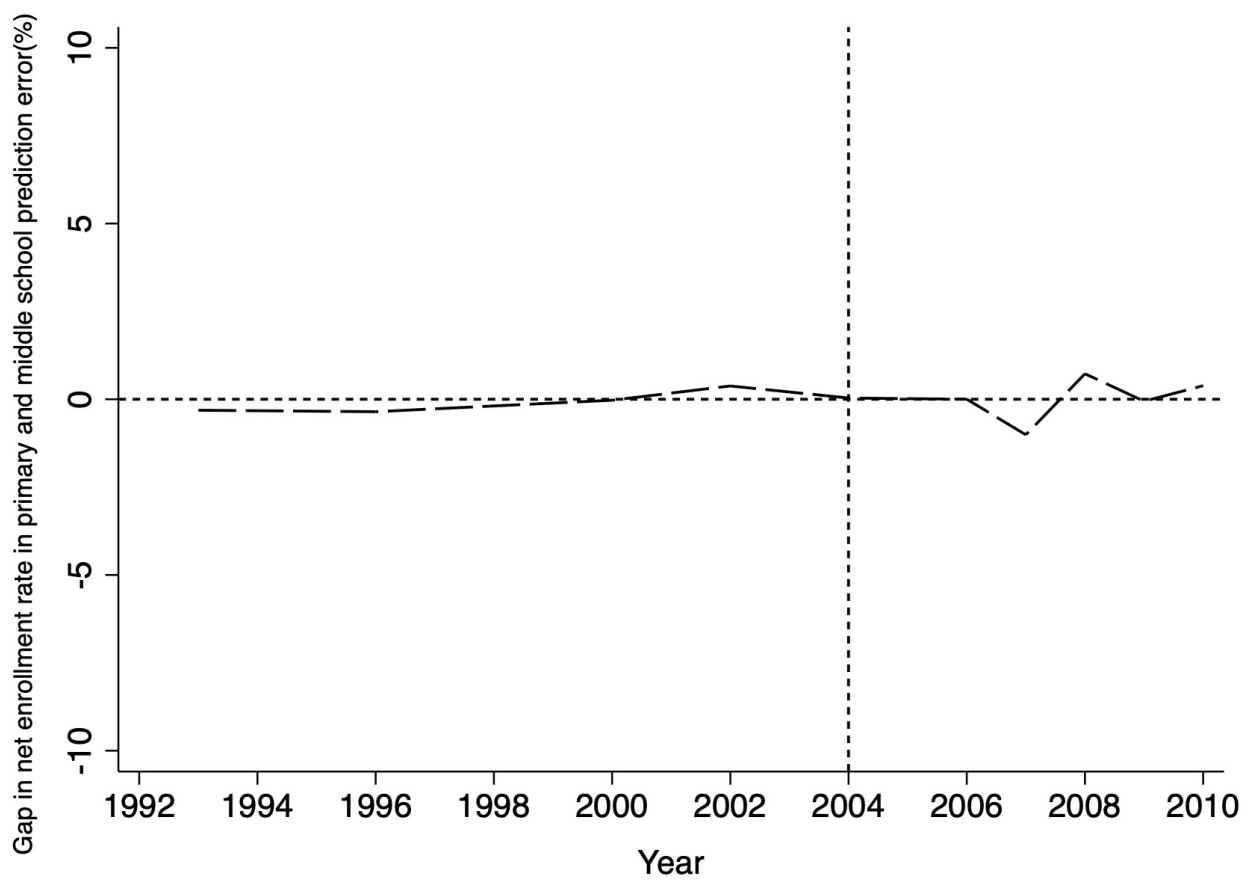


Figure 3.18: Oil Region and Placebo distribution

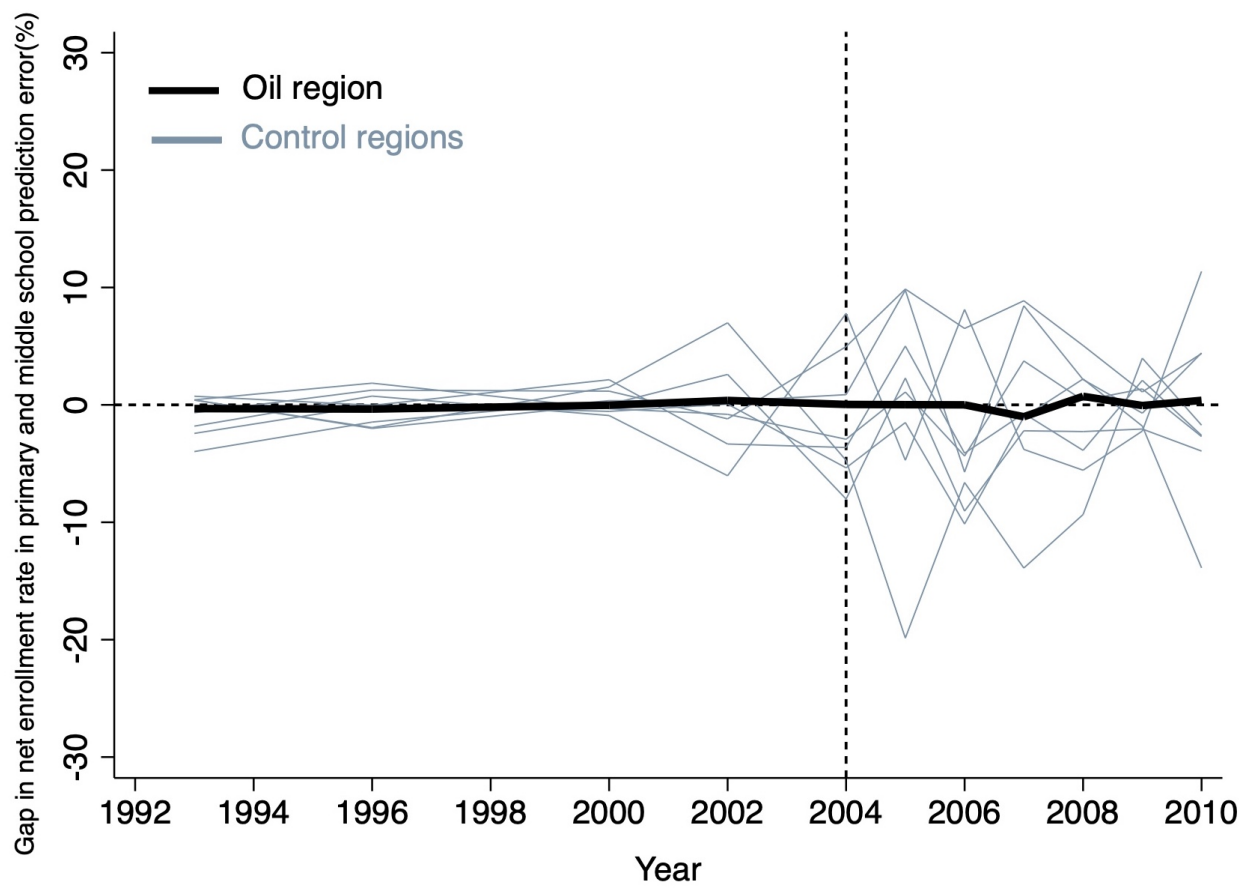


Table 3.8: Synthetic control results : Effect of oil on net primary and middle school enrollment rate

Variables	Value
<b>Panel A : Model fit pre-intervention</b>	
RMPSE	0.27
APE-to-mean ratio	4.86%
<b>Panel B : Placebo test</b>	
RMSPE ratio	1.96
p-value* :	0.40
<b>Panel C : Synthetic control ATT</b>	
ATT	0.011
Treatment rank	6

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . ATT : difference in the mean differences, between enrollment rate in oil region and that of the synthetic control, in the pre-treatment period from that in the post-treatment period. APE-to-mean ratio indicates the average pre-oil prediction error divided by the average pre-oil outcome value. p-value\* calculated based on placebo tests.

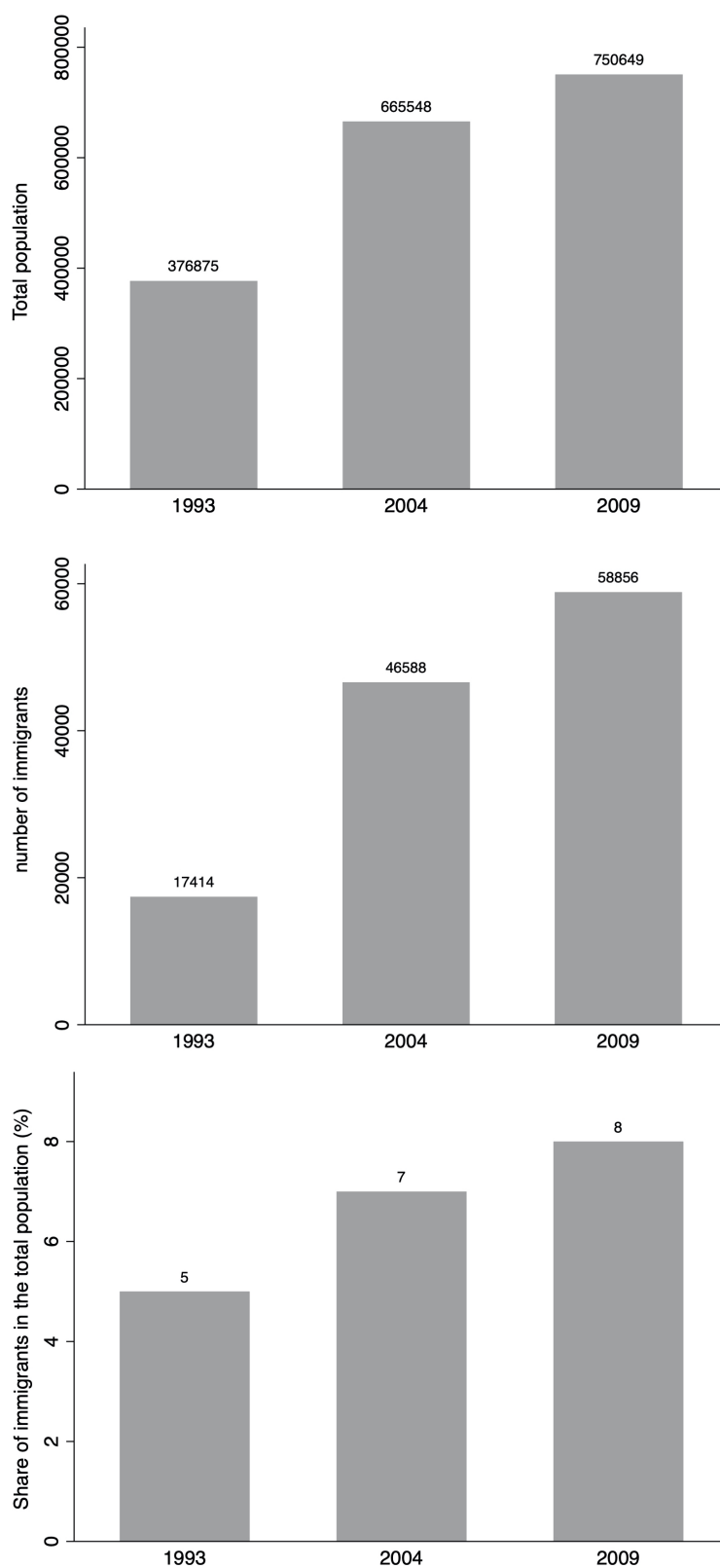
Table 3.9: Difference-in-differences estimation results : Effect of oil on net primary and middle school enrollment rate

	(1)		(2)	
	Enrollment		Enrollment	
DID(Treatment*Post)	2.25	(5.35)	2.25	(4.89)
Treatment	13.28***	(4.73)	1.27	(5.25)
Post	10.17***	(2.88)	10.17***	(1.63)
Pretreatment characteristics controls	No		Yes	
<i>N</i>	165		165	
R-square	0.12		0.73	

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Pre-treatment characteristics controls are the share of population under 15, Urbanisation, Precipitation, Cropland area, Nighttime lights per density, Private tuition per pupil and Public expenditure per pupil. Standard errors in parentheses are obtained clustering observations at region level.



Figure 3.19: Evolution of the total population, the number of immigrants and the proportion of immigrants in the oil region



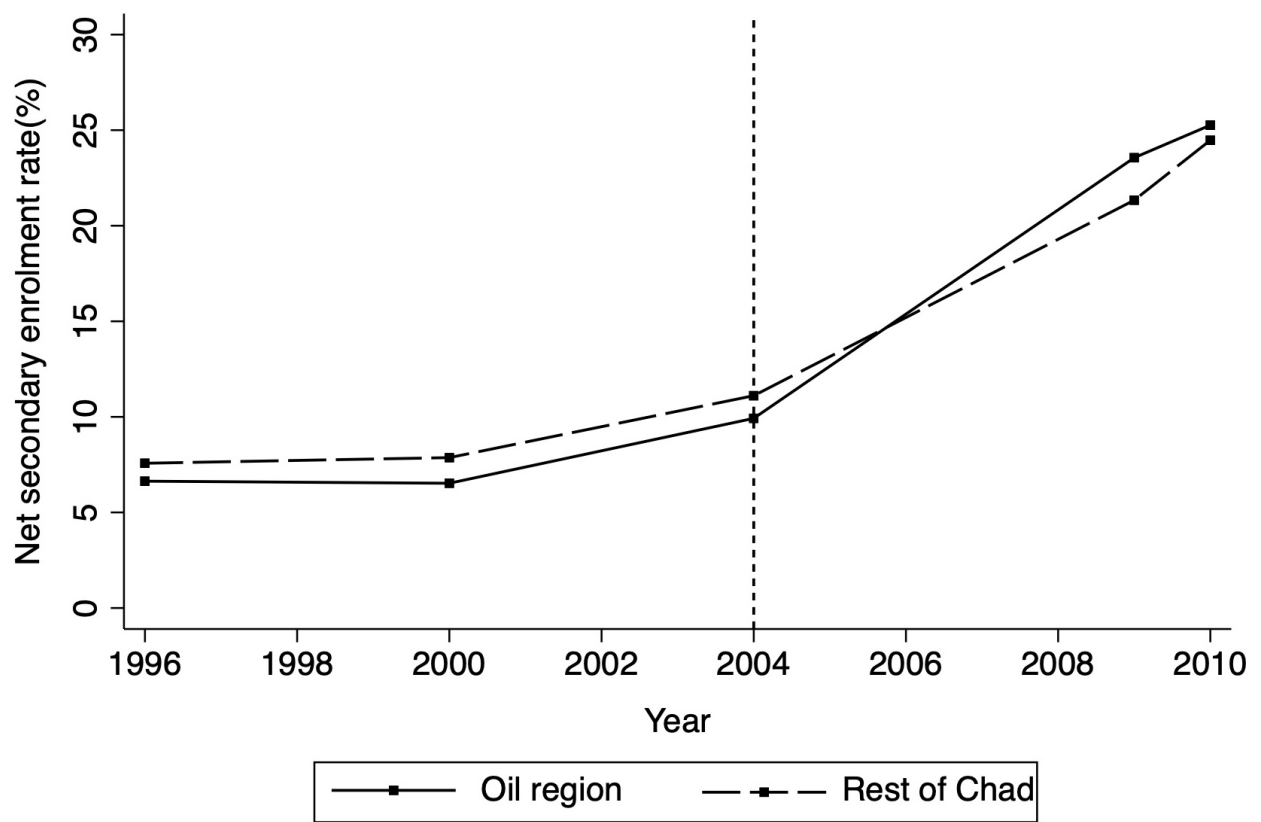
Source: author using the general population census (1993, 2009) and the Chad migration survey (2004) data

Table 3.10: Descriptive statistics of the main variables in the survey data

	(1)		(2)	
	Oil Region		Rest of Chad	
	Mean.	Sd	Mean.	Sd
Enrollment rate	14.96	(35.69)	15.30	(36.00)
household size	7.95	(4.52)	7.85	(5.05)
Age of HH	41.68	(14.67)	44.71	(14.91)
Sex of HH	0.84	(0.37)	0.82	(0.38)
Child of HH	0.39	(0.49)	0.48	(0.50)
Non educated HH	0.37	(0.48)	0.56	(0.50)
Share of women	0.31	(0.19)	0.34	(0.21)
Share of elder	0.02	(0.06)	0.02	(0.07)
Share of child < 6	0.16	(0.15)	0.13	(0.14)
Sex of child	0.49	(0.50)	0.49	(0.50)
Lowest 20%	0.14	(0.35)	0.12	(0.32)
Second 20%	0.20	(0.40)	0.15	(0.36)
Third 20%	0.20	(0.40)	0.17	(0.37)
Fourth 20%	0.23	(0.42)	0.22	(0.42)
Top 20%	0.24	(0.43)	0.34	(0.48)
<i>N</i>	1441		28301	

Source : Demographic and Health Surveys(DHS) , Multiple Indicator Cluster Surveys(MICS) and Enquête sur la Consommation des ménages et le Secteur Informel au Tchad (ECOSIT).

Figure 3.20: Parallel trend assumption



Source : Autor using DHS, MICS and ECOSIT data

Table 3.11: Difference-in-differences estimation results using survey Data

	(1)		(2)		(3)	
	Enrolment		Enrolment		Enrolment	
DID(Post*Treatment)	3.36*	(2.03)	2.87*	(1.61)	3.19*	(1.64)
Treatment	-1.69	(1.38)	-4.05	(2.77)	-2.20	(1.46)
Post	13.54***	(0.44)	13.92***	(1.67)	14.16***	(1.63)
Household characteristics	No		Yes		Yes	
Wealth controls	No		No		Yes	
<i>N</i>	26853		26552		26552	
R-square	0.04		0.12		0.14	

Source : Authors from DHS, MICS and ECOSIT data. Household and head of the household characteristics are the size of the household, sex, age, education of the head of the household, a dummy for the child of the household, the share of dependents (child and elder) in the household and the sex of the child. Wealth controls are dummy variables, which indicate whether the household is in the first, second, third, fourth and fifth wealth quintiles. Standard errors in parentheses are obtained clustering observations at region level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 3.12: Difference-in-differences estimation results using survey Data : Effect of oil on net primary and middle school enrollment rate

	(1)		(2)		(3)	
	Enrolment		Enrolment		Enrolment	
DID(Post*Treatment)	2.32	(1.75)	1.47	(3.25)	0.49	(2.14)
Treatment	14.14***	(1.26)	5.61	(4.33)	10.23***	(2.76)
Post	14.21***	(0.40)	12.59***	(3.61)	14.86***	(2.37)
Household characteristics	No		Yes		Yes	
Wealth controls	No		No		Yes	
N	65257		65226		65226	
R-square	0.02		0.17		0.20	

Source : Authors from DHS, MICS and ECOSIT data. Standard errors in parentheses are obtained clustering observations at region level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

In recent years, more and more households in developing countries are receiving external income such as remittances and government transfers. However, the use of this income remains relatively unexplored. This thesis contributes to understanding the role of external income in the development process by studying how recipients use it in these countries. Our results may be useful to policymakers as they provide insights into :

1. The effect of remittances on firm performance;
2. The role of remittances on income inequality;
3. The influence of oil rents on schooling decisions.

### **Main results**

#### **Do recipients of international remittances use these funds to invest in businesses and purchase products from domestic companies in SSA countries?**

Using 34,010 firms over 2006-2020 and a fixed-effect instrumental variable approach, we first found that international remittances positively affect the share of capital held by nationals in manufacturing firms. This result supports the idea that remittances can be used productively by recipients. Second, we find that international remittances increase the sales of non-manufacturing firms, while a negative effect on the sales of manufacturing firms is observed. This second finding highlights the role of remittances in ensuring consumption as well. In addition, the use of remittances for investment and consumption purposes has led to an increase in employment in firms. Indeed, we found a positive impact of international remittances on employment in manufacturing and non-manufacturing firms. It should be noted, however, that heterogeneity tests suggest that the effect of remittances on firm performance is larger in less financially developed and non-resource-rich countries.

#### **Do recipients of international remittances redistribute the funds they receive?**

Overall, I provide evidence that recipients of international remittances share a significant portion of the money they receive with their relatives in Senegal. Specifically, I notice that receiving international remittances increases the probability of sending internal cash transfers by about 26%. Concerning the individuals involved, I find that the wealthy who receive international remittances are the most likely to send internal cash transfers, while the poorest benefit the most from this internal sharing. Moreover, when people receive international remittances and send internal cash transfers, the Gini index is 4.50 percentage points and 9.2 percentage points lower than a situation

without international remittances and with international remittances but no internal sharing, respectively. These results illustrate the redistributive nature of international remittances in Senegal.

## **How does a public oil boom affect the demand for education ?**

By analyzing how the oil boom and underlying opportunities promote secondary school attendance in Chad, I found that the oil boom has positively affected school attendance in the oil-producing region. The oil boom increased secondary school attendance by about 6% in the oil-producing areas. As mechanisms, I note first a decrease in dropouts rather than an increase in attendance at all levels of education. Second, the results suggest that the rise in school attendance is not due to oil rent but to the incentive of employment opportunities.

## **Policy relevance**

The findings of the three chapters of this thesis have several implications. First of all, regarding chapter one, the positive effect of remittances on investment suggests a productive use of remittances. This demonstrates that remittances can be a source of funding for the manufacturing sector, which faces enormous difficulties in accessing finance. However, the lack of impact in the non-manufacturing sector suggests the persistence of other challenges to entrepreneurship, such as business profitability, poor infrastructure (roads, electricity, etc.), bureaucracy and corruption. If these barriers are removed, the investment effect of remittances in this region can be substantial. Secondly, the negative effect of remittances on manufacturing sales indicates a substitution of foreign industrial products for domestic manufactured goods. This phenomenon mainly affects small manufacturing firms. Therefore, to improve their sales and benefit from the spending effect of remittances, African manufacturing firms need to enhance the competitiveness of their products. Policymakers could also play a key role in improving the quality of local products by ensuring adequate transport and energy infrastructures. Policymakers could also help promote local products, especially those produced by small firms, by subsidizing them aside from the use of remittances for investment and consumption. As described above, chapter two showed that in Senegal, recipients of international remittances also use them to support relatives in need. This finding means that families in countries like Senegal can rely on the support of relatives who receive international remittances to sustain them in times of shock. Senegalese authorities can help by reducing the cost of remittances and improving financial inclusion, especially in rural areas. Further, implementing pro-poor programs could help international remittance recipients invest more in productive activities instead of supporting poor relatives. Second, the decrease in the Gini index when international remittances are shared within the country means that countries like Senegal can take advantage of international migration and remittances to reduce income inequality. Thus, policies to reduce the costs of remittances and international migration will reduce inequality within countries and between poor and rich countries. Finally, the significant gaps in the Gini index, when taking into account and not taking into account the internal sharing of international remittances, underline the importance of considering this element in the case of developing countries characterized by high solidarity. Consequently, analysts should not limit their studies to those directly receiving remittances from abroad to identify their impacts (not just on inequality). The final chapter raised important questions about human capital investment in developing countries. First, I found that employment prospects are key determinants of educational decision-making in Chad. Therefore, programs aimed at increasing human capital should incorporate returns to education in their design. Second, the results suggest that demand appears to be a limiting factor for educational attainment in Chad. This demand effect explains the low secondary school attendance and higher early dropout rate in Chad, despite massive investments in education. Accordingly, improving employment opportunities can be an effective way to combat school dropouts in this country. Furthermore, to increase human capital in Chad, the authorities should implement awareness campaigns for parents and children on labour market opportunities and the importance of

education for professional success.

## Limitations and further research

The various analyses we have performed in this thesis have some limitations and can be extended in several ways.

### A causal analysis?

All three chapters of this thesis use observational data. The use of such data raises a problem of endogeneity, although in each chapter we use different techniques to account for it as much as possible. Since we do not perform experiments, we cannot fully account for this problem. I discuss below the potential limitations of the techniques used in each chapter.

In the first chapter, we combine the instrumental variables approach with a fixed-effects model to correct the problem of endogeneity of international transfers received by SSA countries. Specifically, we use the following two instruments : (1) remittance prices and (2) foreign-born employment rates in OECD countries interacted with the emigrant rate from country  $c$  in OECD countries. To identify a causal effect of international remittances, these two instruments must be correlated with the suspected endogenous variable and not directly affect the outcome variables. If the first instrument respects these two conditions, one cannot completely exclude that the second instrument could directly affect investment, for example, via the transfer of standards. However, with the data available, this is the best we can do.

The second chapter also employs the instrumental variables approach. The instruments used are : (1) The magnitude of the great drought of 1983, measured as a deviation of 1983 rainfall from historical averages (for 22 years) at the district level and (2) GDP growth rate in major remittance-sending countries, weighted by the share of Senegalese in district  $i$  living in that country five years ago. Similarly, one can suspect that the migration rate of 5 years ago at the level of the districts of the main remittance-sending countries is endogenous in the same way as transfers. This concern should be raised even though we used several alternatives, approaches and tests that confirm the robustness of the results.

To estimate a causal effect in the last chapter, we use the synthetic control method and the difference-in-differences approach. For both methods to be valid, there must be no "shocks," i.e., other events that could differentially affect the outcome of interest in the treated unit or potential control units in the pre-intervention or post-intervention period, and no "contamination" or spillover of the intervention effect into the control units. To avoid the shock effect, I decided to limit the end of the study period to 2010 because other regions became oil-rich after that year. Nevertheless, one cannot exclude that the areas that have become oil producers have anticipated the same measures. Similarly, the regions bordering the oil-producing region may benefit from increased trade with the oil-producing region even if they cannot benefit directly from the oil boom. Both of these potential problems should be considered in further work.

### Further developments

First, Chapter 1 analyzed the effects of remittances received at the country level on firm-level outcomes. We justify our approach because there are no barriers preventing firms from selling in a different location than where they are based. Similarly, individuals can buy shares in firms located in another locality than their own. However, one would expect the impact of remittances to be much larger for firms located in the place of residence of the recipients of the remittances. Therefore, the availability of remittance data at a more decentralized level could better capture the impact of remittances on firm performance. Second, it would also be interesting to examine the effect of remittances



on broader measures of firm dynamics such as firm creation/destruction. Third, our database of firms includes only formal firms. It may be that remittances increase firms' incentives to move from the informal to the formal sector. It would therefore be interesting for future research to explore this possibility.

Regarding the second chapter, I find that international remittances reduce inequality if we consider the sharing effect of these transfers. However, the data do not precisely identify the characteristics of the individuals with whom the recipients of international remittances share the funds received. If the poorest individuals benefit from this internal sharing, the estimated effect of international transfers on reducing inequality may be underestimated. Therefore, future research should accurately identify the profiles of these recipients of internal sharing. It would also be interesting to investigate how the recipients of this internal sharing spend the funds they receive. Finally, work on other developing countries is needed to determine whether this internal sharing of international remittances occurs in countries other than Senegal.

In the last chapter, I show that the oil boom increases schooling. However, the effect of this boom on the quality of education remains unknown. Therefore, exploring how this affects the quality of education, such as high school graduation in the region, would be interesting. Similarly, as other provinces became oil producers after 2010, an interesting question would be whether the effect observed for this region is also valid for different areas. Finally, we could explore the effects of externalities in neighbouring territories by studying whether the oil boom in one region impacts schooling in border areas.



## RÉSUMÉ

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Ces dernières années, le nombre de ménages dépendant d'une aide extérieure pour satisfaire leurs besoins quotidiens n'a cessé d'augmenter en Afrique subsaharienne. Cependant, la façon dont ce revenu est perçu et utilisé par les bénéficiaires dans cette région reste inconnue. Cette thèse vise à combler cette lacune en examinant comment les bénéficiaires d'Afrique sub-saharienne utilisent les revenus externes.

Les deux premiers chapitres de la thèse se concentrent sur les transferts de fonds des migrants, tandis que le dernier chapitre examine l'impact des rentes des ressources naturelles. Plus précisément, le premier chapitre explore l'effet des transferts de fonds internationaux sur l'entrepreneuriat et les activités commerciales dans les pays d'Afrique subsaharienne. Le deuxième chapitre analyse la nature redistributive des transferts de fonds internationaux au Sénégal. En particulier, j'examine si les bénéficiaires sont plus susceptibles de partager ces transferts de fonds au niveau national. Dans le dernier chapitre, j'évalue comment le boom pétrolier favorise les décisions de scolarisation au Tchad.

## MOTS CLÉS

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Envois de fonds, Rentes pétrolières, Investissements productifs, Performance des entreprises, Inégalité, Education, Afrique subsaharienne, Sénégal, Tchad

## ABSTRACT

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In recent years, the number of households relying on external assistance to meet their daily needs has steadily increased in Sub-Saharan Africa. However, how this income is perceived and used by recipients in this region remains unknown. This thesis aims to fill this gap by examining how recipients in Sub-Saharan Africa use external income.

The first two chapters of the thesis focus on migrant remittances, while the final chapter examines the impact of natural resource rents. Specifically, the first chapter explores the effect of international remittances on entrepreneurship and business activities in SSA countries. The second chapter analyzes the redistributive nature of international remittances in Senegal. In particular, I examine whether recipients are more likely to share these remittances at the domestic level. In the final chapter, I assess how the oil boom favours schooling decisions in Chad.

## KEYWORDS

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Remittances, Oil Rents, Productive Investments, Firm Performance, Inequality, Education, Sub-Saharan Africa, Senegal, Chad