Oil boom, job prospects and schooling decisions : Evidence from Chad

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Preliminary version, please do not quote or share

Abstract

This paper examines the effect of oil-induced employment opportunities for natives on secondary schooling decisions in the oil-rich region of Chad. Using a synthetic control method and a difference-in-differences approach, I find that these opportunities increased secondary school attendance in the region. Concerning the mechanism, the results suggest, on the one hand, a decrease in school dropouts, and on the other hand, that the observed effect does not come from an increase in parental income but incentives related to employment opportunities. Finally, I find similar results when I use survey data instead of regional administrative data.

Keywords: Oil boom, Labor market, Education, Economic Development, Africa, Chad.

JEL Classification : I25, J08, N37, Q33

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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 º 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) developed by Abadie et al. (2010), I find that oil-induced employment opportunities for natives have significantly increased the net secondary school enrollment rate in the oil region compared to its synthetic control. I then perform several placebo tests. All these tests confirm the robustness of this effect. This result is also robust to the method chosen since a difference-in-differences (DID) analysis confirms the positive impact found with SCM. The analysis of transmission mechanisms suggests, on the one hand, a decrease in school dropouts and, on the other hand, that the observed effect does not come from the increase in parental income but incentives linked to employment opportunities. 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 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. In section 4, I show the main results. Next, I examine some transmission channels and check the robustness of the findings in sections 5 and 6 respectively. Finally, section 7 concludes and discusses the policy implications.

2 Background

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

2.1 The program

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 nº 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.

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 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). 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 11.

The oil region is located in the extreme south of Chad and covers an area of 22,951 km^2 (Figure 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.

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.

2.2 Education in Chad

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

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 to15.

- **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.

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 Empirical specification

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

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 : (3.1.1) the Synthetic Control Method (SCM) and (3.1.2) the Standard Difference-in-Differences Approach.

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 (*1*) 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 *1* and at time ($t = T_0 + 1, ..., T$) can be defined as follows :

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

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 ($\alpha_{1T_0+1}, ..., \alpha_{1T}$). To estimate the counterfactual situation Abadie et al. (2010) consider the following factor model :

$$Y_{1t}(0) = \delta_t + \theta_t Z_1 + \lambda_t \mu_1 + \varepsilon_{1t} \tag{2}$$

Where δ_t is an unobserved common factor (fixed-time effect). Z_1 is a vector of observed covariates. μ_1 is a vector of unknown factor loadings and ε_{1t} is zero-mean transitory shocks.

Consider a $(J \times 1)$ vector of weights $W = (w_2,..., w_{J+1})'$ 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

$$\sum_{j=2}^{J+1} w_j^* Y_{jt} = Y_{1t} \;\; and \;\; \sum_{j=2}^{J+1} w_j^* Z_j = Z_1, \forall t \in \{1, ..., T_0)\} \tag{3}$$

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

$$\widehat{\alpha}_{1t} = Y_{1t}(1) - \sum_{j=2}^{J+1} w_j^* Y_{jt} \tag{4}$$

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

$$||X_1 - X_0 w||v = \sqrt{(X_1 - X_0 w)'(X_1 - X_0 w)} \tag{5}$$

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.[1]

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.

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[1] see Abadie & Gardeazabal (2003) for more details.

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.

3.1.2 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 :

$$Y_{it} = \alpha + \beta_1 Treatment_i + \beta_2 Post_t + \delta(Treatment * Post)_{it} + \epsilon_{it} \tag{6}$$

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 δ corresponds to the effect of the Treatment. ϵ_{it} is the error term.

The identification hypothesis underlying equation (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(*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.

3.2 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 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 (2016*a*), Pinkovskiy & Sala-i Martin (2016*b*)) 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 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.

4 Results

4.1 Synthetic control results

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 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 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 4 between the oil region and the rest of the country.

Table 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 2 shows a high degree of equilibrium in all enrollment predictors, and Figure 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 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 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.

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 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 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 4).

The results of the synthetic control are summarized in Table 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 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.

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 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 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 5. Only the precision changes compared to the first column. The evolution of the estimated DID coefficient presented in Figure 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.

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.

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 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 12 and Table 6, respectively.

The SCM results displayed in Figure 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 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.

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 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 14 and Table 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 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.

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 elementary and middle school, using the same econometric approaches as above.

First of all, we see in Figure 15 that the primary and middle schooling rate is initially higher in the oil region than in the rest of Chad. In Figure 16, I construct a synthetic oil region as in subsection 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 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 secondary school enrollment. Placebos tests confirm this absence of a positive and statistically significant effect. Indeed, in Figure 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 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 9 and 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.

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 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.

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 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 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 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.

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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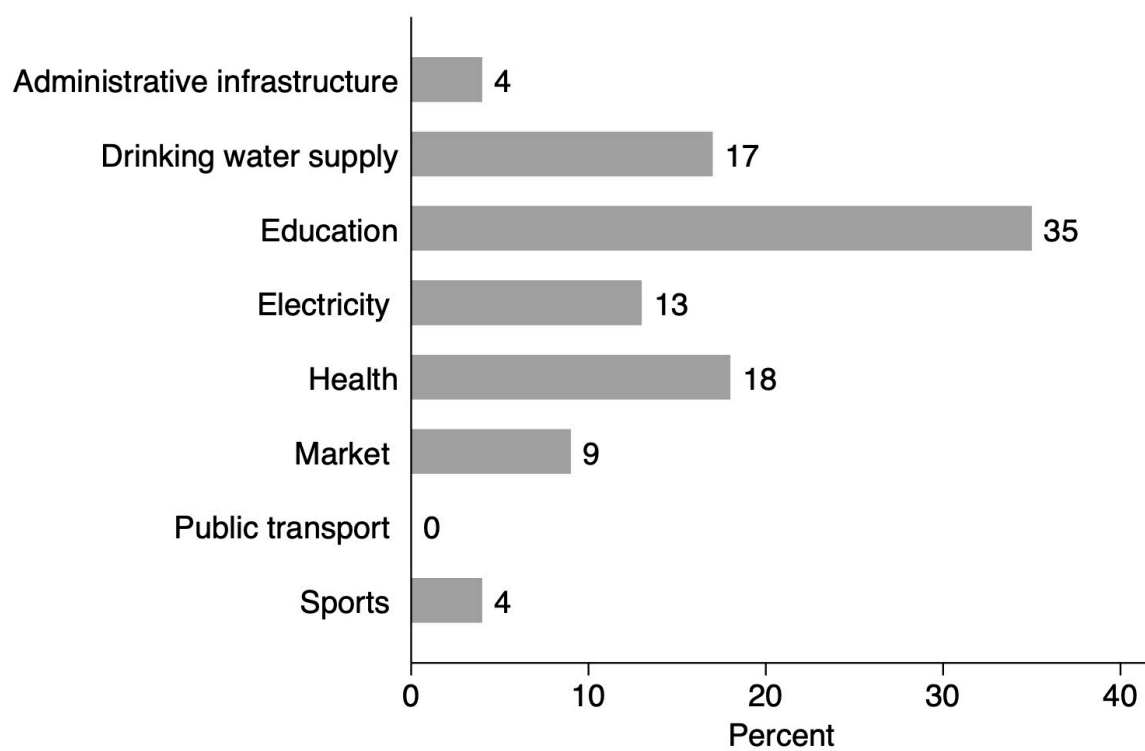Figure 1: Administrative map (region) of Chad

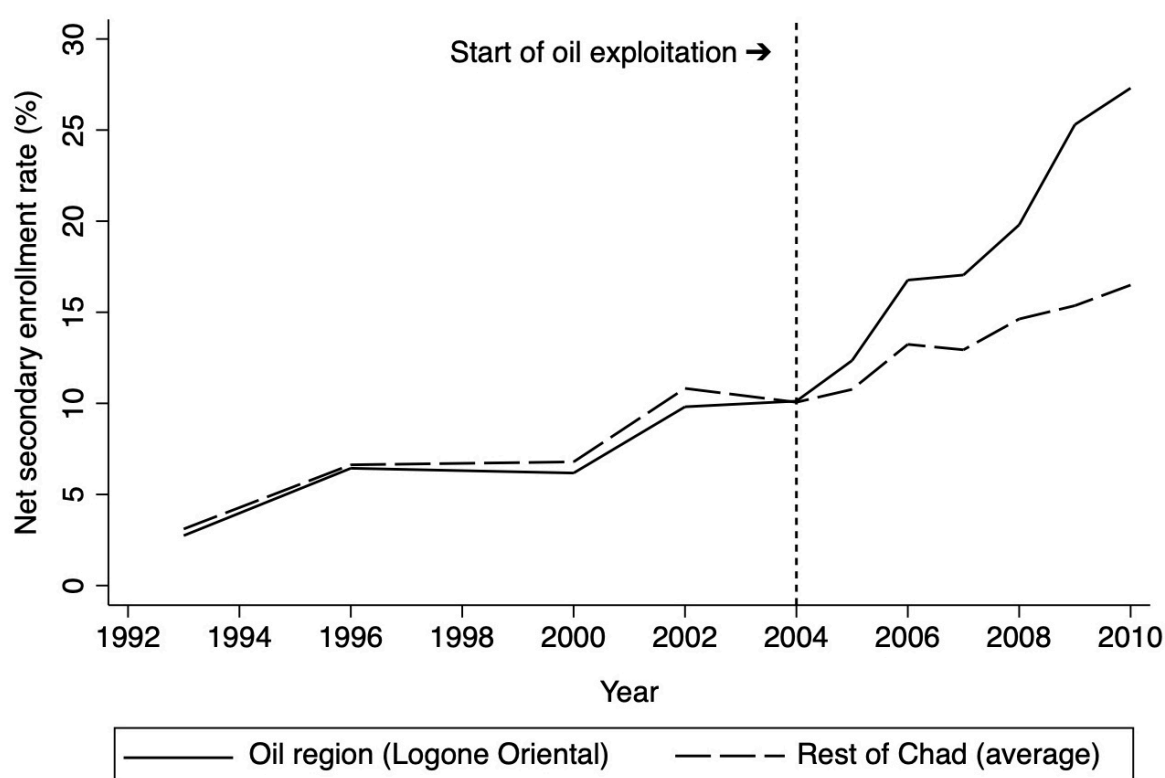Figure 2: Oil revenues collected by the oil region from 2004 to 2012

Figure 3: Investments by sector in the oil region over the period 2005-2012
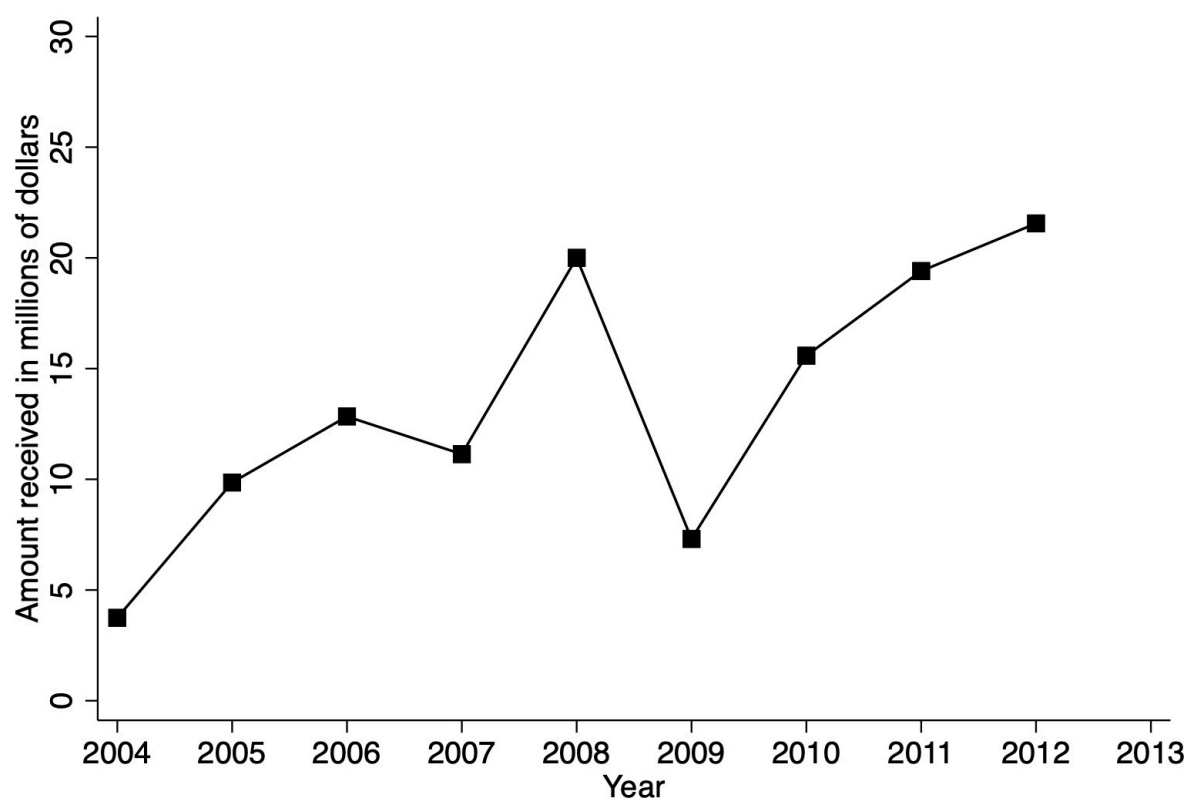
Source : Author from GRAMPTC(2013) data

Figure 4: Trends in the net secondary school enrollment rate : oil region vs rest of Chad

Start of oil exploitation ➜

Oil region (Logone Oriental)   — — — Rest of Chad (average)

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

Table 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
N	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 2: Balancing table of predictors of the net secondary school enrollment rate

| | (1) | | (2) |
| | Oil Region | | Average of |
	Real	Synthetic	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.

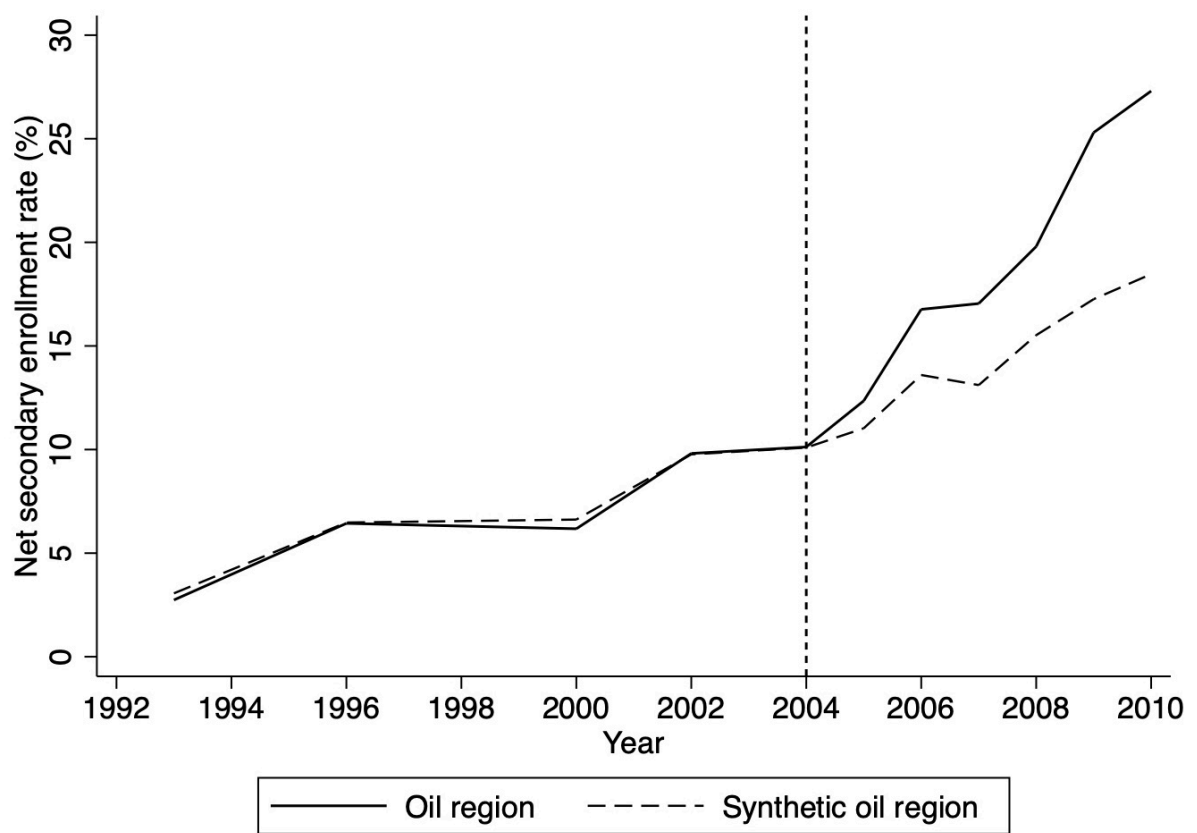Figure 5: Oil region net secondary school enrollment rate vs Synthetic oil region

Figure 6: Gap between actual oil region vs Synthetic oil region in net secondary school enrollment rate
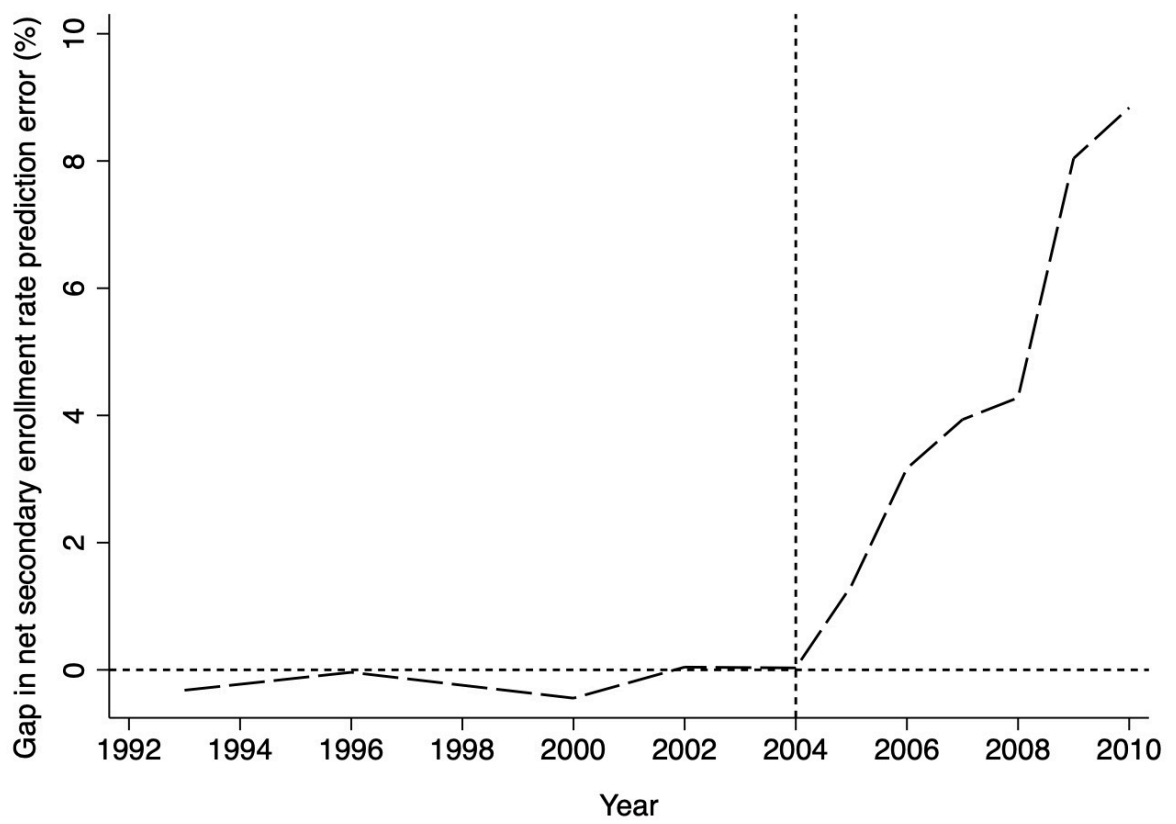

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Table 3: Region weights in the synthetic Oil Region

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 7: Oil Region and Placebo distribution
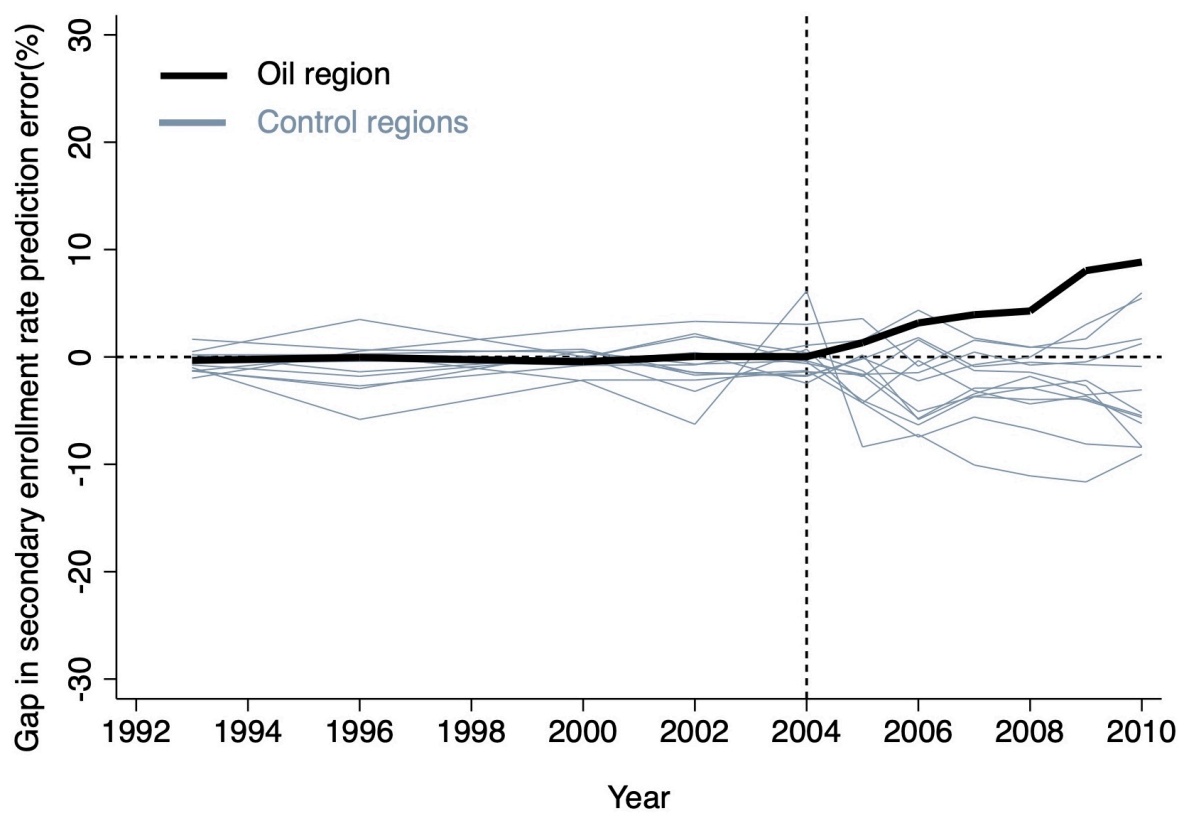
Figure 8: Ratio of post-oil MSPE and pre-oil MSPE: Oil region and control regions.
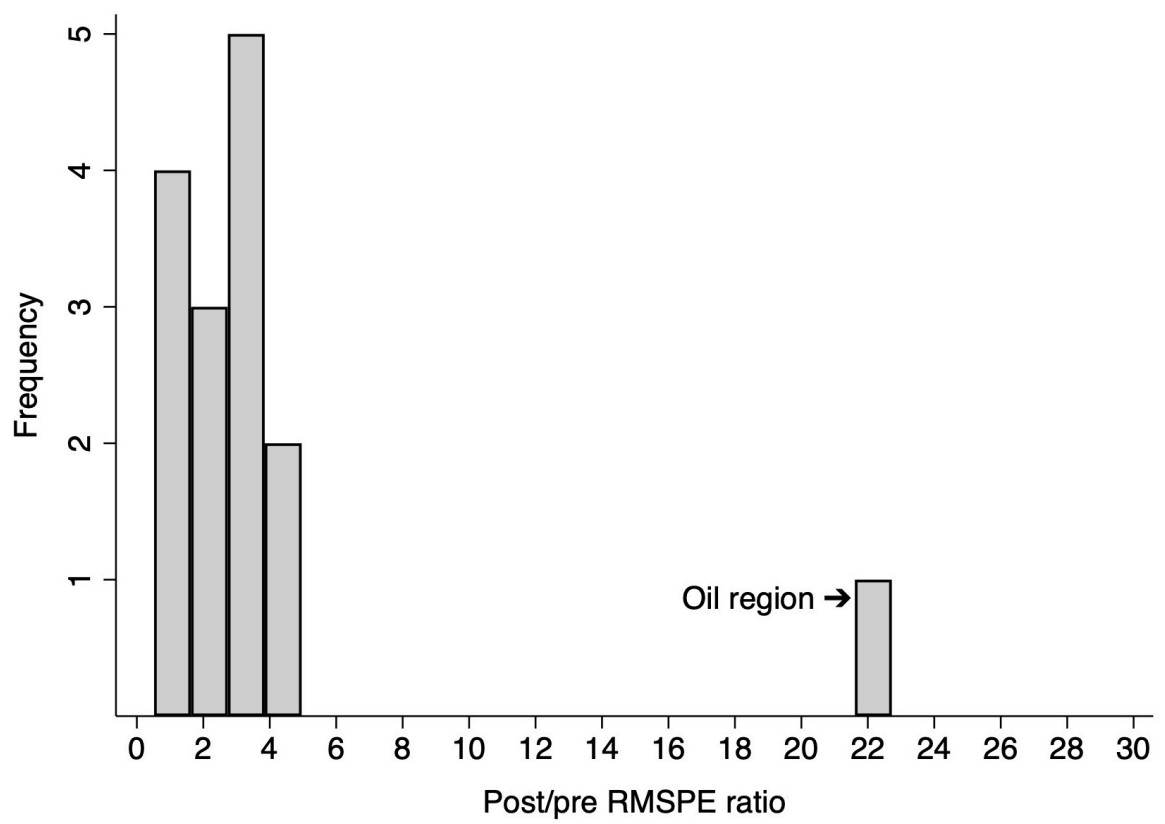
Table 4: Synthetic control results

Variables	Value
Panel A : Model fit pre-intervention	
RMPSE	0.25
APE-to-mean ratio	3.54%
Panel B : Placebo test	
RMSPE ratio	22.72
P-value*	0.06
Panel C : Synthetic control ATT	
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 5: Difference-in-differences estimation results

	(1)		(2)	
	Enrollment		Enrollment	
DID(Treatement*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	
N	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 9: Estimated effect of treatment on the net secondary school enrollment rate using difference-in-differences
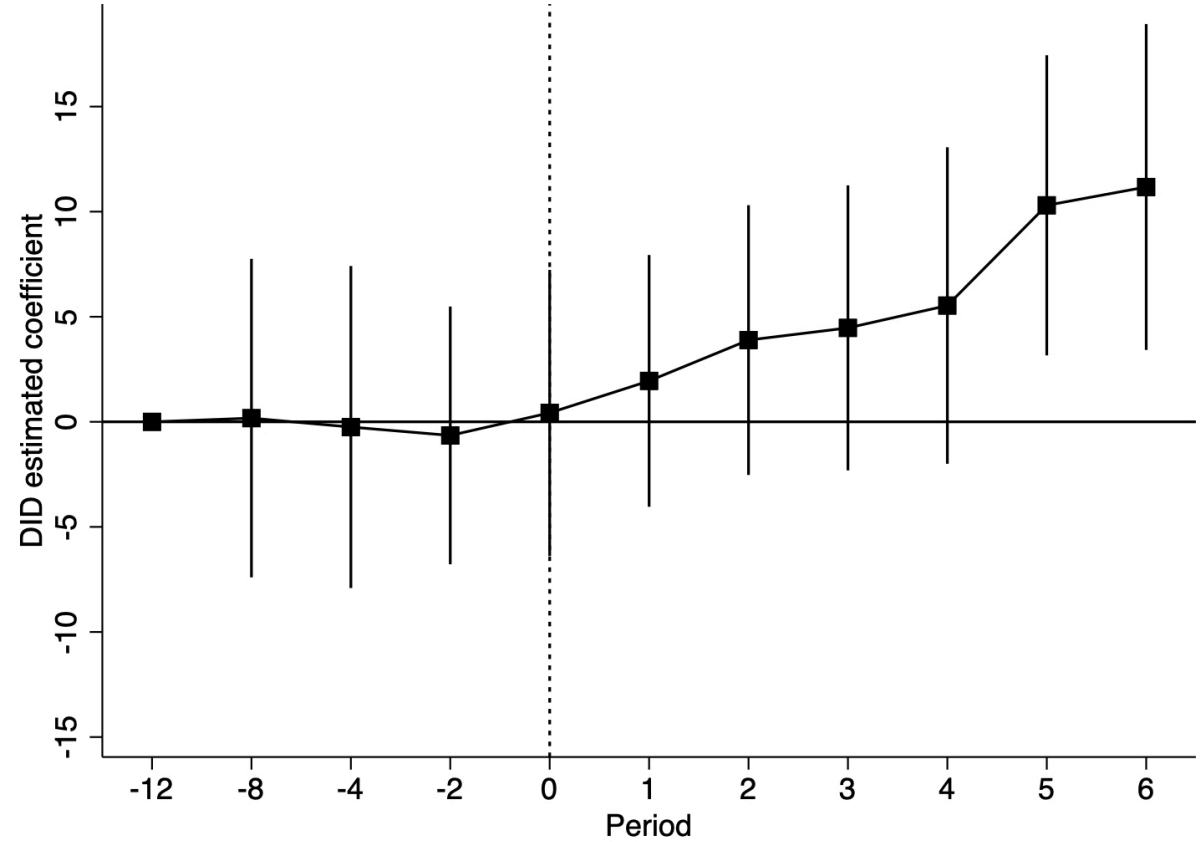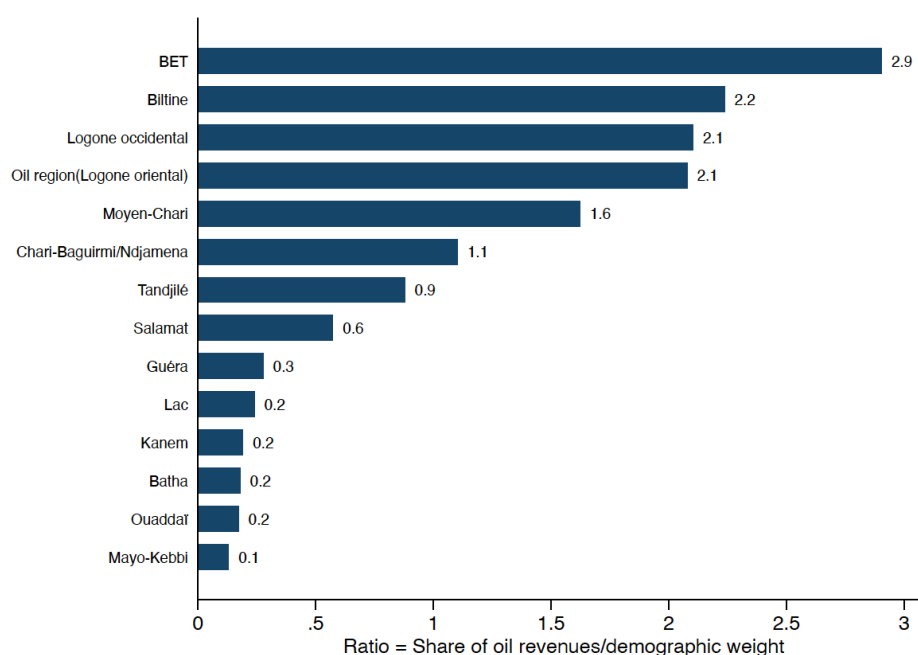
Figure 10: Share of oil revenues received and demographic weight by region
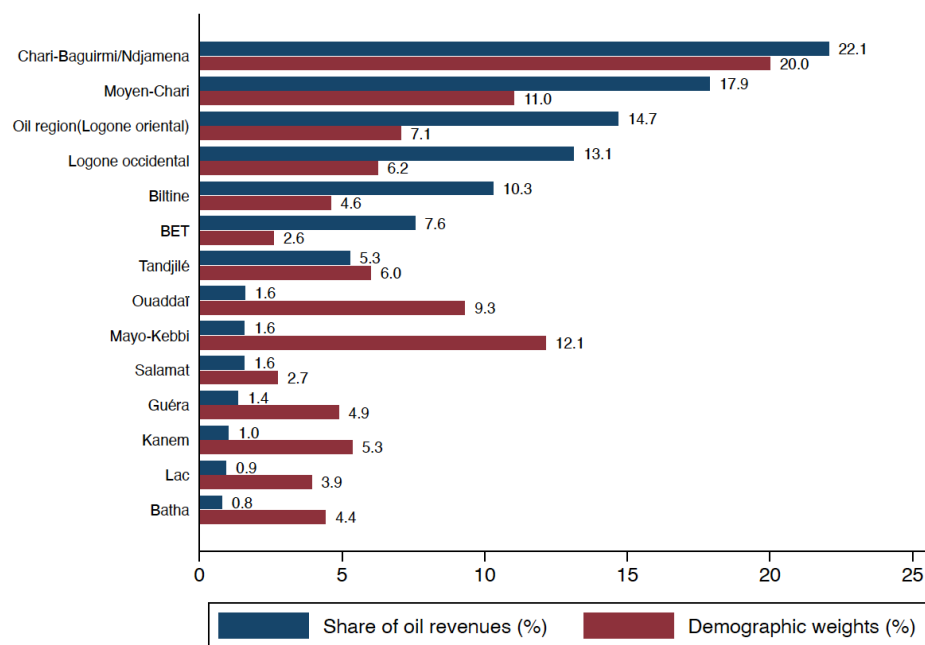
Source : Author from GRAMPTC(2013) and INSEED(2011)

Figure 11: The ratio of oil revenues received in proportion to the demographic weight by region

Source : Author from GRAMPTC(2013) and INSEED(2012) data

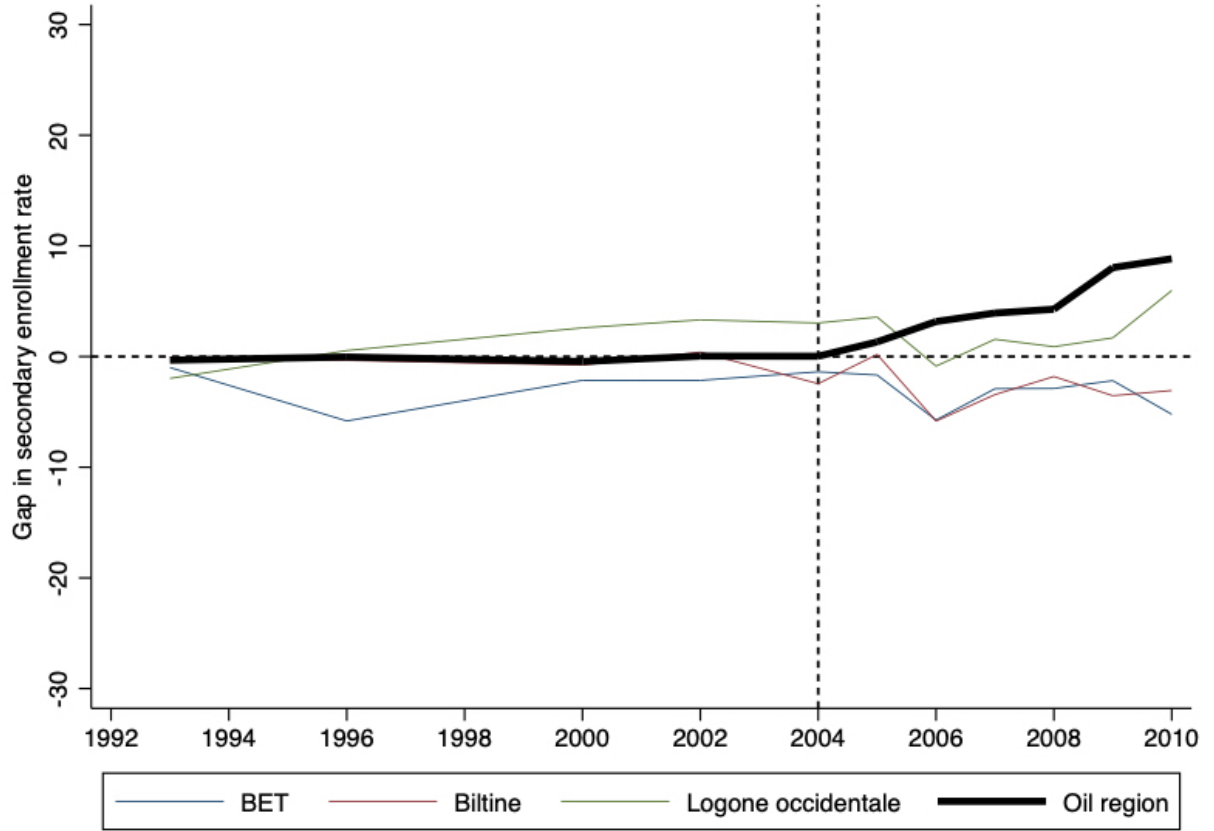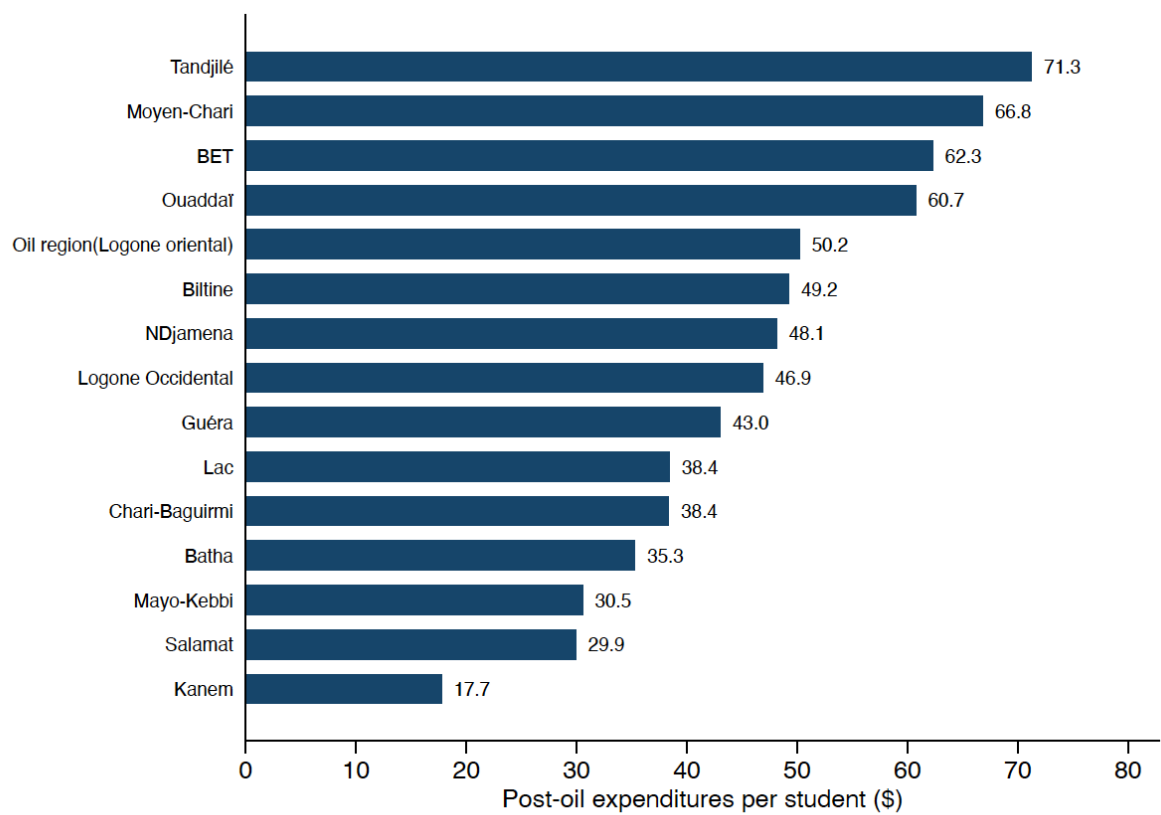Figure 12: Oil region vs Regions with the most oil revenue per capita

Table 6: Difference-in-difference estimation results for major rent recipients

| | (1) | | (2) | | (3) | |
| | BET | | Biltine | | Logone occidental | |
	Coef.	se	Coef.	se	Coef.	se
DID(Treatement*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 13: Post-oil public expenditure per student

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

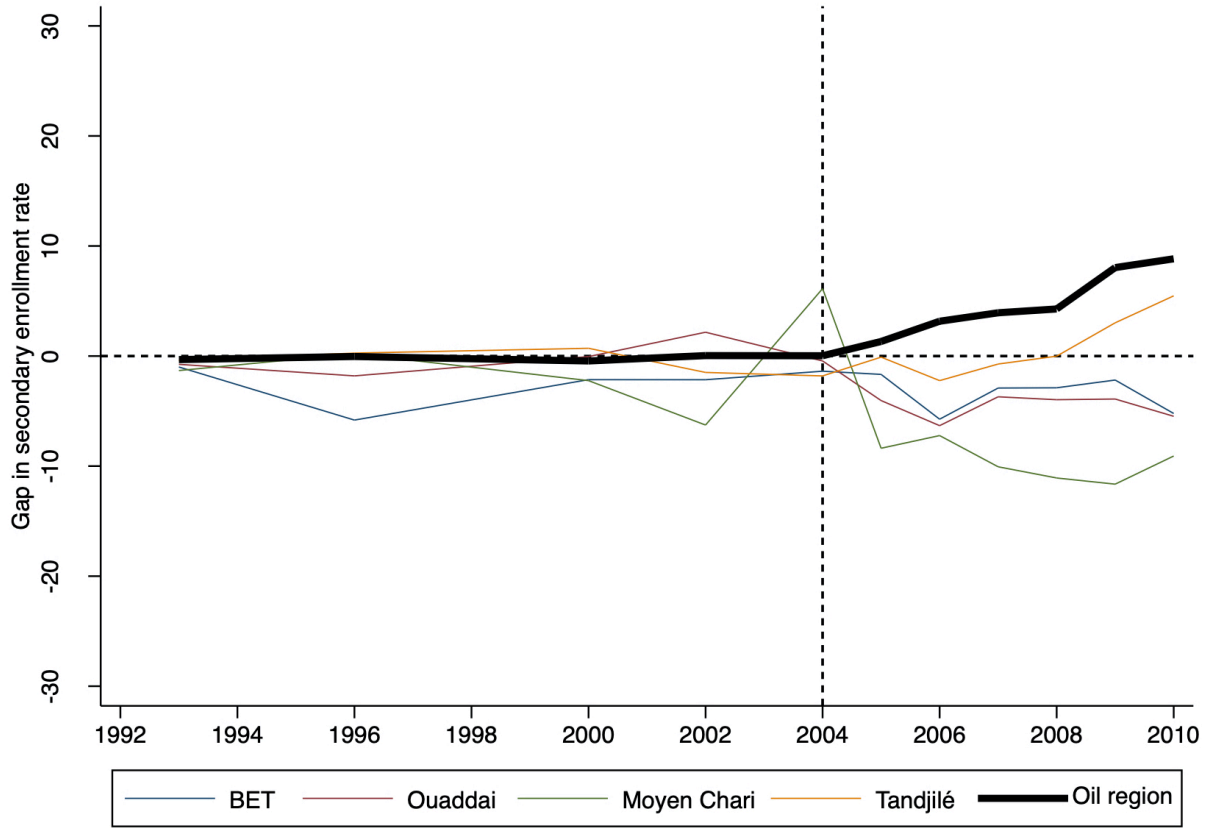Figure 14: Oil region vs Regions that spent the most on education per student

Table 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(Treatement*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 15: Trends in the net primary and middle school enrollment rate : oil region vs rest of Chad
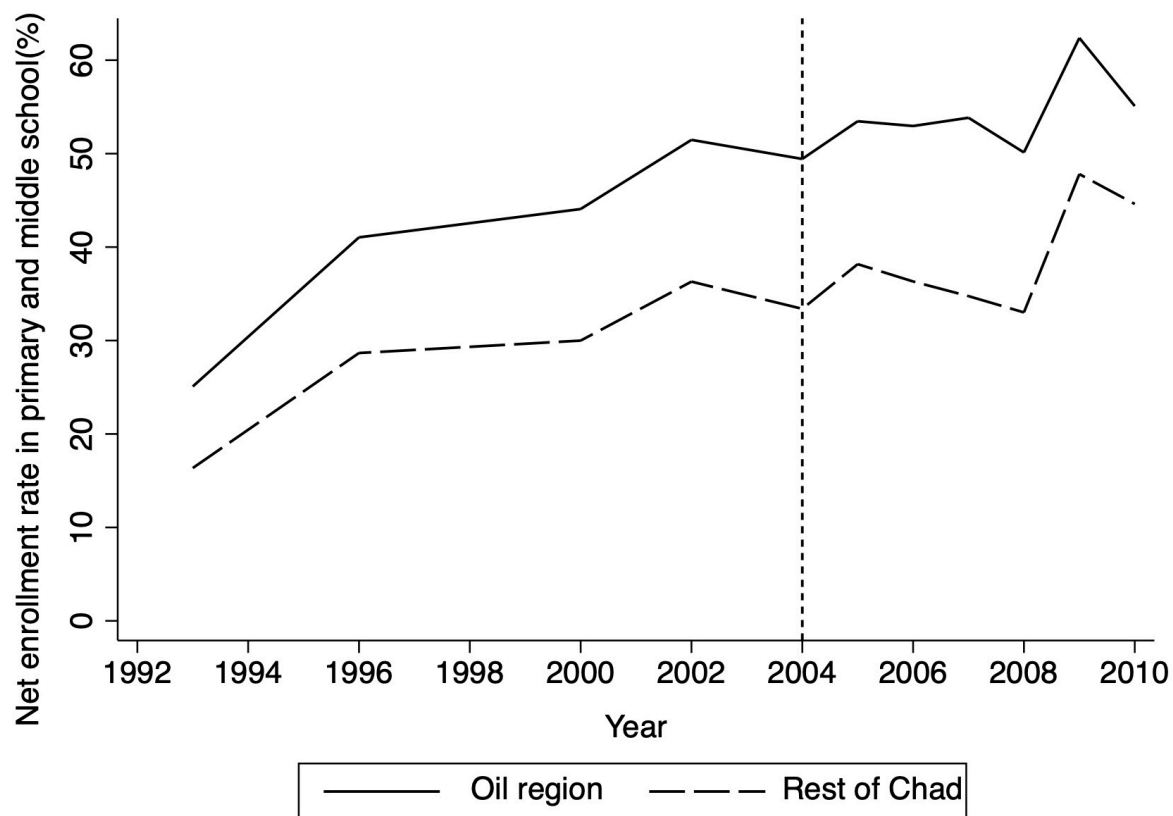
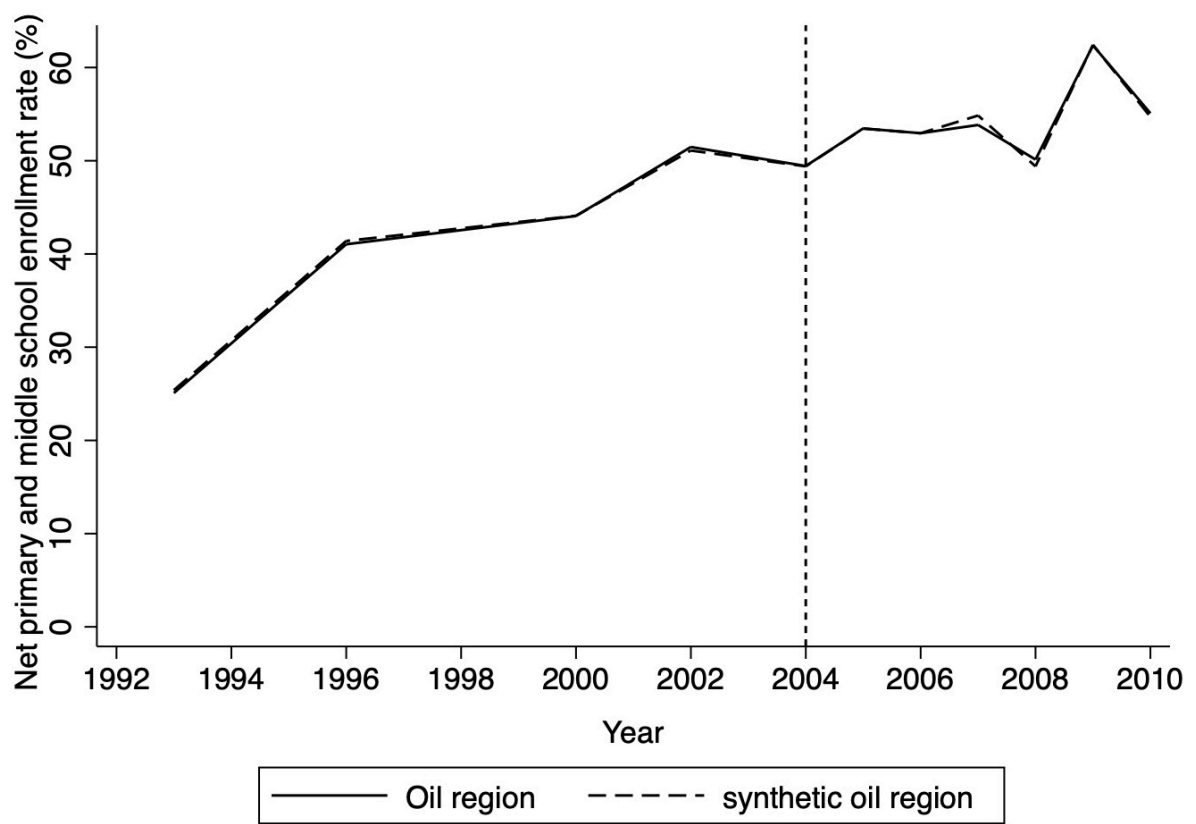Figure 16: Oil region net primary and middle school enrollment rate vs Synthetic oil region

Figure 17: Gap between actual oil region vs Synthetic oil region in net primary and middle school enrollment rate
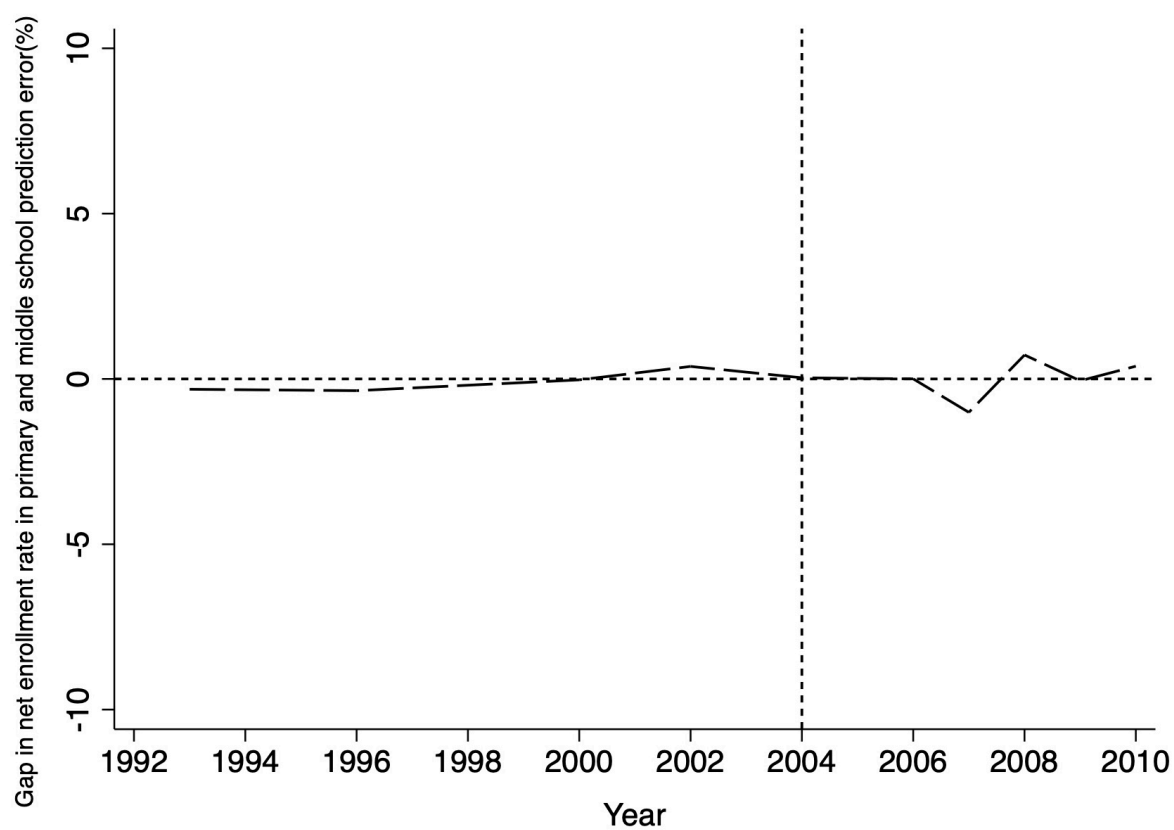
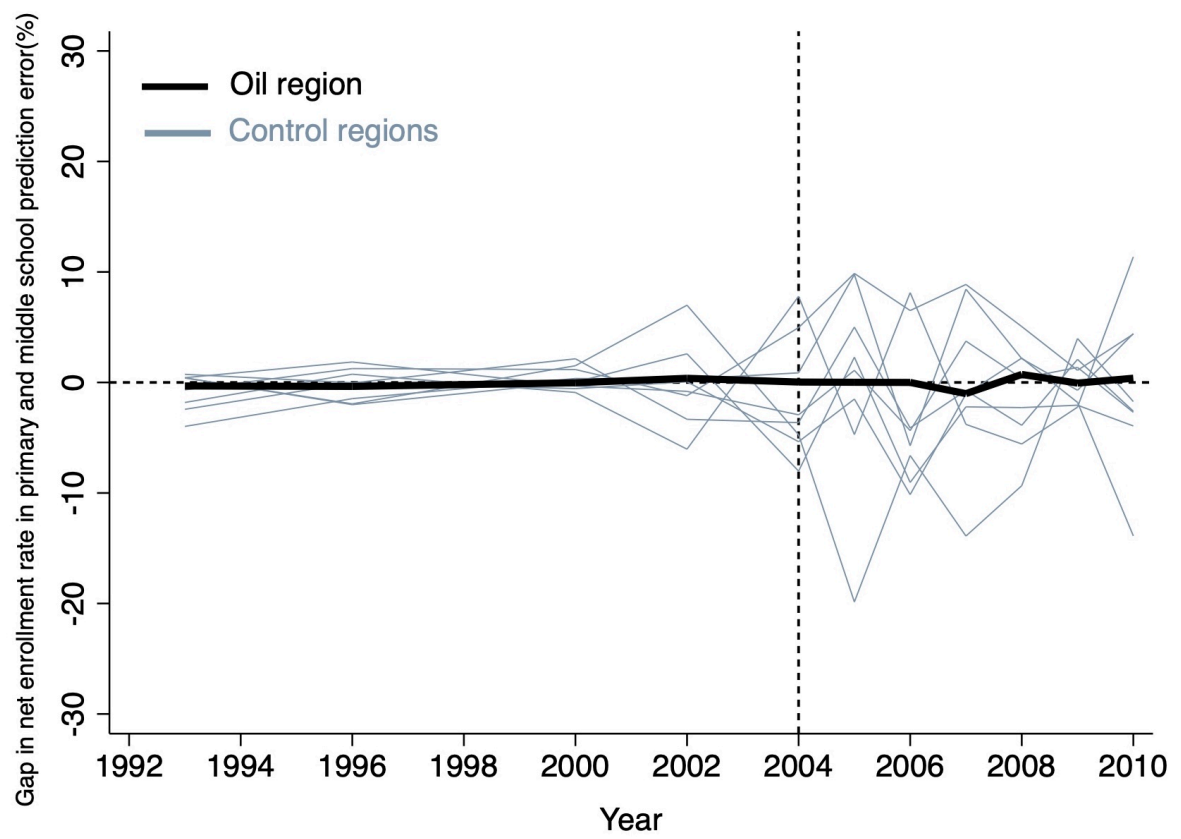Figure 18: Oil Region and Placebo distribution

Table 8: Synthetic control results : Effect of oil on net primary and middle school enrollment rate

| Variables	Value
Panel A : Model fit pre-intervention	
RMPSE	0.27
APE-to-mean ratio	4.86%
Panel B : Placebo test	
RMSPE ratio	1.96
p-value* :	0.40
Panel C : Synthetic control ATT	
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 9: Difference-in-differences estimation results : Effect of oil on net primary and middle school enrollment rate

	(1)		(2)	
	Enrollment		Enrollment	
DID(Treatement*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	
N	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 19: Evolution of the total population, the number of immigrants and the proportion of immigrants in the oil region
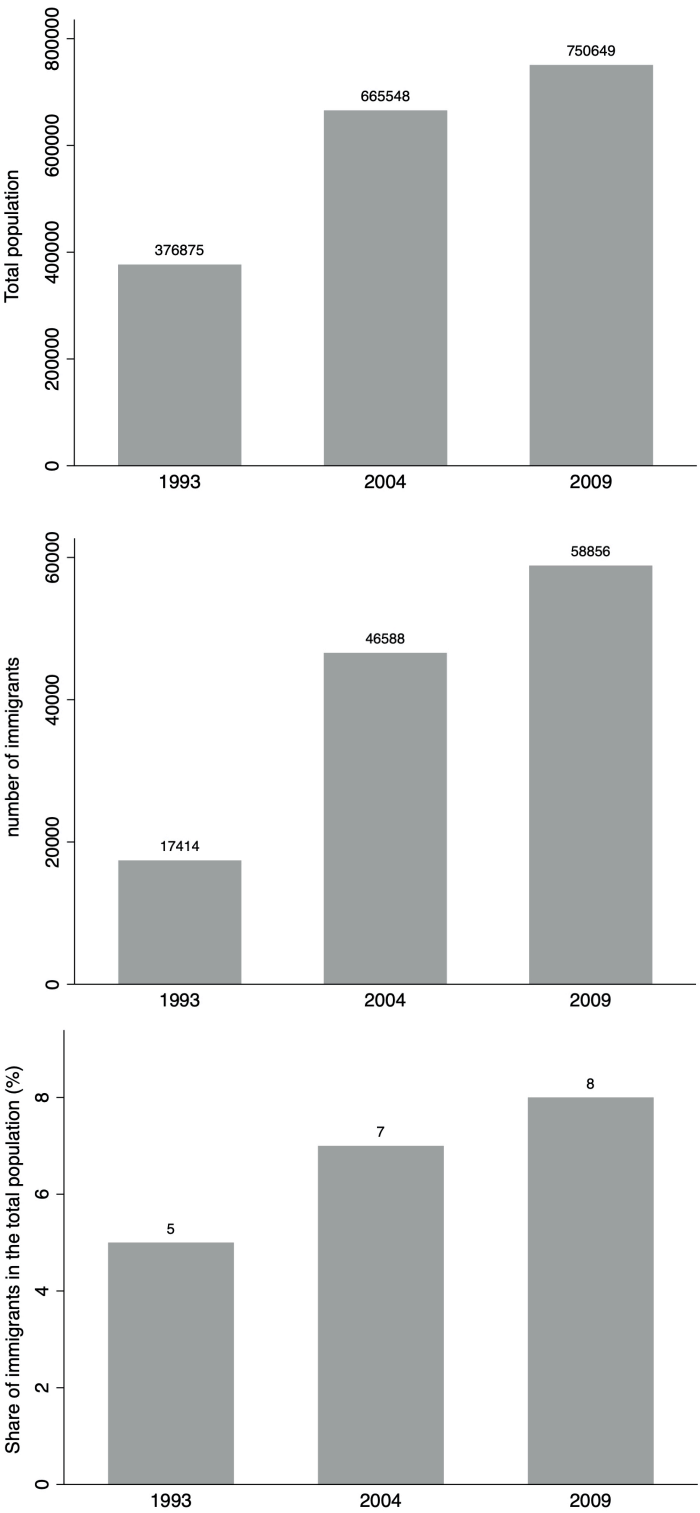

Source: author using the general population census (1993, 2009) and the Chad migration survey (2004) data

Table 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)
N	1441		28301	

Source : Authors from DHS, MICS and ECOSIT data. *** p<0.01, ** p<0.05, * p<0.1.

Figure 20: Parallel trend assumption
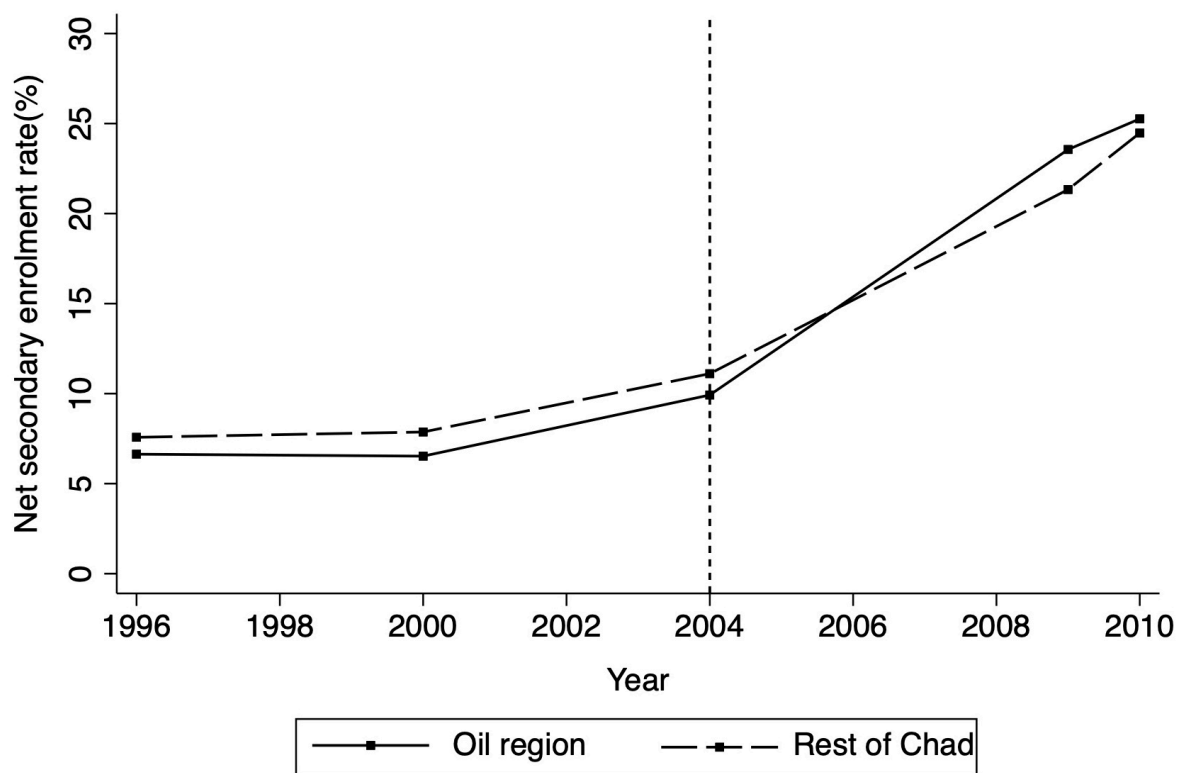
Source : Autor using DHS, MICS and ECOSIT data

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Table 11: Difference-in-differences estimation results using survey Data

	(1)		(2)		(3)	
	Enrolment		Enrolment		Enrolment	
DID(Post*Treatement)	3.36*	(2.03)	2.87*	(1.61)	3.19*	(1.64)
Treatement	-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	
N	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 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*Treatement)	2.32	(1.75)	1.47	(3.25)	0.49	(2.14)
Treatement	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.