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The Economics of Natural Resources and Decentralization

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ABSTRACT

THE ECONOMICS OF NATURAL RESOURCES AND DECENTRALIZATION

BY

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This dissertation comprises three essays on natural resources and decentralization. The first chapter of the dissertation estimates the causal impact of natural resources on economic growth and job creation or unemployment reduction in Ghana. There is a dearth of research on the impact of natural resources in developing countries because of the unavailability or the prohibitively costly nature of data acquisition in those countries. These hurdles present methodological challenges to conducting research in this area. We use an innovative approach – the synthetic control method for comparative case studies to circumvent these challenges. We exploit the quasi-experimental nature of the oil discovery in 2007 in Ghana and its subsequent production in Ghana and find that oil discovery and production has had a positive impact on economic growth and a negative impact on the reduction of unemployment. Over the period 2009-2018, GDP per capita increased by 501.11USD per year on average. This amounts to approximately 45.5% of the 2009 baseline level. During the end period of the analysis, which is 2018, the GDP per capita gap between Ghana and synthetic Ghana was about 950 USD. This implies that GDP per capita was 76% higher in the real Ghana relative to the synthetic Ghana. The average unemployment surge in Ghana between 2009-2018 following oil discovery was about 1.85%. This translates to 36.96% relative to the 2009 baseline unemployment level.

The second chapter of the dissertation examines the impact that a grapple over natural resource rents has on ethnic and tribal tensions and subsequent conflicts using a panel of African countries. We use the system GMM to get around the problem of endogeneity. We find out that natural resource rent exacerbates the risk of ethnic and tribal tensions and conflicts significantly. As a mediation policy, political and administrative decentralization have an impact in reducing the tensions generated by natural resource rents.

The last chapter of the dissertation explores the ability of fiscal decentralization in reducing the unemployment rate in countries. Using a panel dataset of some 51 countries across the world and geographic variables as instruments, we find out that fiscal decentralization has a significant impact on unemployment reduction. The results are robust across different checks and specifications. The instrumental variable approach helps to tackle the problem of endogeneity faced in empirical research.

THE ECONOMICS OF NATURAL RESOURCES AND DECENTRALIZATION

BY

BENARD AYINBOME AKALBEO

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ACCEPTANCE

      This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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Introduction

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Chapter 1

Does the Resource Curse Exist? Evidence from the Discovery and Production of Oil in Ghana

1.1   Introduction

Does the resource curse exist? Is the discovery of a natural resource such as oil a blessing or a curse? Despite the large literature addressing these questions, they still linger in the academic literature on the economic impact of natural resources. The outcomes of interest in this literature include, among others, the crime rate, economic growth rate, investment, and the unemployment rate. Alexeev and Conrad (2009), Arezki and Van der Ploeg (2011), Boyce and Emery (2011), Brunnschweiler (2008), Brunnschweiler and Bulte (2008), Hamdi and Sbia (2013), James (2015), Ji et al. (2014) posit that the fiscal windfalls associated with resource revenue could foster development and positive outcomes. In contrast, Ahmed et al. (2016), Apergis et al. (2014), Badeeb et al. (2017), Cockx and Francken (2016), Shahbaz et al. (2019), Shao and Yang (2014) describe several adverse effects resulting from the discovery and production of oil, such as rent seeking, which may result in public corruption, and appreciation of the nominal exchange rate, which may negatively impact domestic industries. A large proportion of these studies concern advanced economies, such as the Netherlands and Norway, with only a few focusing on developing countries. We examine the case of Ghana, using the synthetic control methodology.

The potential economic rewards to a developing country from oil production are substantial but are not always realized following a discovery. For example, Apergis et al. (2014) and Sarmidi et al. (2014) contend that the economic impact of natural resources is only realized after a country achieves a certain threshold of institutional quality. Sarmidi et al. (2014) and Aragón et al. (2015) contend that natural resource discoveries have a positive effect on economic

growth when strong institutions are present.[1] In contrast, Angrist and Krueger (2008) find that the discovery of natural resources may lead to armed conflict, with Indonesia, Nigeria, and the former country of Sudan being prominent examples.

Furthermore, the discovery of a natural resource, such as oil, creates expectations by both the government of the day as well as the public. Some countries successfully manage these expectations through fiscal and monetary discipline.[2] Shahbaz et al. (2019) argues that natural resources may not be problematic, but an overdependence on them may result in negative outcomes. Van der Ploeg's (2011) 'anticipation of better times' hypothesis may be a precursor to some other economic pitfalls. Mansoorian (1991) contends that the 'anticipation effect' in countries with a resource discovery may lead governments, encouraged on by a false sense of greater fiscal space, to assume unsustainable levels of debt. Cust and Mihalyi (2017) refer to this as the 'pre-source curse'. They contend the pre-source curse is a phenomenon that occurs even before a single drop of oil is produced; it is purely an optimistic effect from discoveries. It is an expectation curse; countries and their citizens form expectations of now being rich. Collier (2017) finds that governments respond to these expectations from the citizens and increase spending and in some cases borrowing. This may have adverse effects on the economies of such countries. These expectations are sometimes created by forecasts of reputable bodies, such as the International Monetary Fund (IMF). The forecasts may serve as signals for unconstrained borrowing. A resource discovery constitutes a positive shock to national wealth, and, assuming

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[1] Sarmidi et al. (2014) use an innovative technique to investigate the impact of institutional quality on the resource curse. They contend that the impact of natural resources has a meaningful effect on economic growth only after a certain threshold of institutional quality is achieved. Their results also shed light on the fact that the nations that have low institutional quality depend heavily on natural resources, while countries with high quality institutions are relatively less dependent on natural resources to generate economic growth.

[2] The literature describes the experiences of such countries as Botswana and Norway. Van der Ploeg (2011) contends that these countries have managed the expectations from resource discoveries quite well and maximized the potential of natural resource discoveries.

rational expectations, the country should move to a new and improved steady-state equilibrium, however, as the literature shows, this is not always the case.

Before 1969, Norway was the poorest country in Scandinavia. This changed in 1969 with the discovery of oil in the North Sea. Norway is now the world's fourth richest country, as measured by Gross Domestic Product (GDP) per capita, through the prudent management of this resource. According to Van der Ploeg (2011), Norway's experience is consistent with that part of the literature which contends that natural resource endowments promote economic growth. In sharp contrast, Sachs and Warner (1995, 2001) contend that the discovery of oil in Angola and Nigeria, among others, have little to no effect on economic growth and may have had a negative effect. Oil revenues per capita in Nigeria increased from nominal US $33 in 1965 to US $325 in 2000 in PPP terms. In contrast, Nigeria's national income per capita has remained stagnant at around US $1,100 in purchasing power parity (PPP) terms since its independence in 1960. Consequently, Nigeria is among the 15 poorest countries in the world as of 2010. Between 1970 and 2000, the share of the population living on less than US $1 per day increased from 26 to almost 70 percent. Van der Ploeg (2011) finds that the top 2 percent had the same share of income as the bottom 17 percent in 1970; in 2000, the top 2-percent's share of income equals the same share as the bottom 55 percent in 2000. These data show that oil revenue has not benefited the average Nigerian. Poverty levels continue to increase, and income inequality had grown worse following the discovery of oil.

To the best of our knowledge, there are no studies on the economic impact of the discovery and production of oil in Ghana, except for a few research questionnaires in the region where the oil was discovered. The impact of oil production on the Ghanaian economy is an unexamined issue. As the literature shows, it may be positive, negative, or neutral. Black,

McKinnish, and Sanders (2005) and Marchand, (2017) show that standard economic models predict the discovery of a natural resource result in economic benefits by increasing the demand for labor not only in the oil sector but also in the non-oil sector. The effect could be a spiraling down one to all other industries both related and unrelated. Whether this has been the case following oil discovery and if the discovery has impacted economic growth is what we seek to find. One long-standing discussion in the macroeconomics literature is the exact relationship between economic growth and unemployment. This paper offers an opportunity to conduct an empirical test of this relationship using the case of Ghana.

Exploiting the quasi-experimental nature of Ghana's oil discovery in 2007, we compare Ghana to a synthetic counterfactual country, or, in other words, a 'synthetic Ghana', constructed from a pool of 40 other countries in sub-Saharan Africa that did not have an oil or any significant discovery in 2007. The analysis covers the period 1998-2018. Our identification strategy supposes that in the absence of an oil discovery, the evolution of economic growth and the unemployment rate in Ghana and the synthetic Ghana would be similar. Therefore, any statistically significant disparities in the observed evolutions of the economic growth rates and unemployment rates between Ghana and the synthetic Ghana is attributed to the treatment effect. Since oil production is a high value-added activity, it should mechanically lead to an increase in GDP, barring any incidence of the Dutch disease.[3] But a high economic growth rate does not necessarily translate into higher living standards for most of the population nor does it necessarily translate into higher job opportunities for them. Oil-rich Angola is a case in point. Stewart (2012) reports that even though Angola is one of the world's fasting growing economies during the period from 2005 to 2010, averaging 17 percent annually, its score on the human

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[3] The divergent experiences of countries such as Norway on one hand, and Angola and Nigeria on the other, does not make any result certain.

development index is 0.49, which is on the low end of this index, and its infant mortality rate is lower than the average among sub-Saharan African countries.

We find a positive impact of oil discovery on economic growth. This is consistent with Aragon and Rud (2013) who find a positive effect on income, household consumption, and poverty reduction from the expansion of the gold mines in Peru. On the negative side of the ledger, we find no evidence of a spillover effect on employment. In fact, we find that the discovery of oil discovery has a negative effect on the unemployment rate in Ghana relative to the synthetic Ghana. The treatment effect reduces the employment rate in the agricultural sector relative to the synthetic Ghana. We find evidence of a positive effect on employment in the service and industrial sectors, but this is more than offset by the negative impact on employment in the agricultural sector, which is the largest employer in Ghana. This is plausible evidence of a crowding out effect. This observation is consistent with Karl (2004) who contends that the oil and gas sector create fewer jobs per unit of capital invested. This paper therefore contributes to the literature in two important ways. First, it provides additional evidence of whether indeed the resource curse exists or not. Second, it provides evidence regarding whether economic growth translates into job creation leading to a reduction in the unemployment rate.

The remainder of this paper is organized as follows. In the next section, we provide a brief historical and institutional background of Ghana's oil industry. Section 3 provides a review of the relevant literature, section 4 lays empirical methodology for our identification strategy. Our data is discussed in section 5, section 6 provides the results and robustness tests, and section 7 concludes.

1.2   A Brief Historical and Institutional Background

Oil and gas in Ghana pre-2007 existed in minimal quantities, but nothing close to commercial quantities. Oil was first discovered off the shore Ghana in the 1970s. The Ghana National Petroleum Corporation (GNPC) was established in 1983 to promote hydrocarbon exploration and production of Ghana's petroleum and natural gas reserves. The GNPC prospected in ten offshore blocks between Ada along the eastern border of Ghana and in the Tano River Basin and in the Keta Basin. In June 1992, the Tano basin well produced about 6,900 barrels (1,100 cubic meters) of crude oil per day. Most of the work by the GNPC since then involved mainly the rehabilitation and building of distribution channels. The major rehabilitation work was on the Tema Oil Refinery (TOR) which is still the major oil refinery in Ghana. This was the trend up until the end of the early 2000s. However, there was a major discovery of oil in 2007, specifically the discovery of an oil field with three (3) billion barrels or 480 million cubic meters of sweet crude oil in the western region of Ghana. This oil field is called the Jubilee Oil field because its discovery coincided with 50th anniversary of Ghana's independence. This discovery put Ghana on the map as an oil producing country, with the oil beginning to be produced in 2010. Further discoveries have been made in the same region. These included the Tweneboa Enyenra Ntomme (TEN) and the Sankofa Gye-Nyame (SGN) oil fields which are all currently actively producing wells. In 2018, production at Jubilee, TEN and SGN for 2018 equaled 28, 24 and 10 million barrels of oil, respectively, or a total of approximately 62 million barrels of oil.

Ghana is believed to have up to 5 billion barrels (790 million cubic meters) to 7 billion barrels (1.1 million cubic meters) of petroleum reserves, which is the sixth largest in Africa and the 25th largest proven reserves in the world. There are also up to 6 trillion cubic feet of natural

gas reserves. There are ongoing explorations in this region. In 2019, Springfield E&P and its local partner the GNPC in 2019 announced that it discovered 1.5 billion barrels of oil and 700 billion cubic feet of gas offshore Ghana in Block 2 of the West Cape Three Points (WCTP). According to a press release by Springfield S&P, the current undiscovered potential of this block is estimated to be over 3 billion barrels of oil and gas.

In 2019, Ghana's Ministry of Finance of Ghana projected oil production to increase to 500,000 barrels per day by 2024. Production as of 2019 stood at 196 thousand barrels per day. A report by Ecobank predicts Ghana will become the 4th largest producer of oil in sub-Saharan Africa by the end of 2020. This, it said would be possible if the country managed to push its production to 240,000 barrels per day. Comparing this projection to the realized production as of 2019, it is safe to say that the oil industry is on an upward trajectory. Ghana currently ranks as the 6th largest producer of oil in Africa, behind Algeria, Angola, Egypt, Nigeria, and the Republic of the Congo) and the 41st in the world in terms of proven reserves.

Putting the revenue from oil production into perspective, the total petroleum receipts paid into the Petroleum Holding Fund in 2018 was US $977 million (PIAC 2018 report). Figure 1 shows annual production volumes of crude oil in millions of barrels since 2010. The diagram shows a decline in production in 2016. This decline in petroleum production was caused by a 34-day shutdown of the Jubilee Field for maintenance from March 31 to May 3, 2016. But for this single decline, the diagram shows a progressive increase in the quantity of crude oil produced over the years. Figure A.2, however, shows an entirely different trajectory in terms of oil revenues. Oil revenues continued to increase from 2011 until 2014. The explanation for the sharp decline in oil revenue from 2014 through to 2016 was due to the precipitous fall in oil prices that began in 2014. This is indicative of the problem with oil revenue volatility. This problem, which

is evident in Figures A.1 and A.2, is largely due to the volatility in oil prices, rather than fluctuations in production volumes. The instability of global oil prices is a major cause of concern in the resource-development nexus.

To benefit from the experiences of countries like Nigeria, Ghana created a legal framework to regulate the oil industry. The Petroleum Revenue Management Act (PRMA), more specifically Act 815, Republic of Ghana 2011, establishes key parameters for the accounting and collecting of petroleum revenues owing to the government of Ghana[4]. This Act establishes limits on the percentage of the revenue to be allocated to the government's annual budget and to savings. It also provides for the operation and management of savings.

In addition, the Act provides for clear oversight, auditing, transparency, and reporting mechanisms to safeguard the management of oil revenues. Under section 51 of the same Act, the Public Interest Accountability Committee (PIAC) is established and assigned a single task: to conduct independent assessments and monitor the utilization of oil revenues to ensure accountability by government (Bawumia and Halland, 2017). Amoako-Tuffour and Ghanney (2013) put it differently; the government of Ghana strives to ensure that Ghana's oil resources are managed in a prudent manner. According to Bawumia and Halland (2017), Ghana has a good record of democratic governance, with a free press, rule of law, and reasonably strong

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[4] The PRMA was enacted to provide a framework for the upstream petroleum sector on the collection, distribution, and management of all revenue associated with the sale or other commercial activities of oil and gas resources produced in Ghana for the benefit of Ghanaians. The PRMA makes provision for the responsible use of such revenues and provides a framework through which the relevant public agencies are to collaborate. It ensures not only the sustainable use of the revenues for national development, but also the dissemination of information regarding all petroleum receipts on a regular basis for public knowledge and consumption. The PRMA is guided by one major principle: petroleum resources as stipulated in Article 257(6) of the Constitution belong to the people and is vested in the President in trust for and on behalf of the people of Ghana. As such, all activities related to such resources must benefit the citizens of Ghana. It is under this principle that the PRMA makes provision for a public accountability body (PIAC), which is charged with ensuring that the managers of the resource uphold their responsibilities in relation to the law.

institutions. Oil revenue is managed and distributed by the central government. In accordance with Mansoorian (1991), the central government of Ghana did not do a good job of managing expectations from the discovery of oil and increased government spending to unsustainable levels. This is the 'false' sense of greater fiscal space that a natural resource discovery creates which causes governments to incur unsustainable levels of debt. The government fell prey to this trap and increased expenditure in the following year (2008), which was an election year. In the immediate years before the discovery of oil, Ghana generally pursued a disciplined fiscal policy (Bawumia and Halland, 2017). That narrative changed in 2008 when public finances continued to deteriorate following the oil discovery. This trend continued for subsequent years and reached unmanageable levels in 2012 which was an election year, as well. Incumbent governments since the discovery and production of oil spend injudiciously during election years in a bid to retain power and have full control of oil revenues. This is consistent with the literature on political business cycles.[5]

The production of oil in Ghana began after the 2008 election; nevertheless, the campaign consisted of many unrealistic electoral promises motivated by the seeming incoming large oil revenues. Van der Ploeg (2011) claims that incumbent governments borrow recklessly against future oil revenues when they are projected to lose an impending election. This, he claims, is often an attempt to make the next government's work more difficult thus allowing the defeated party to score political points after an election. In the case of Ghana, there was a change of government in 2008, and the data on government spending, as reported by Bawumia and Halland (2017), is consistent with the Van der Ploeg's explanation. The lack of fiscal discipline following

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[5] Figure 3, from Bawumia and Halland (2017) shows deterioration of the fiscal deficit in all election years after discovery in 2007 and when production began in 2010. In contrast 2004, the immediate election year before oil discovery had a generally sound fiscal deficit level. The promise of oil revenue trickling in was therefore a factor in the abnormal increase in the fiscal deficit.

the oil discovery led to the deterioration of many economic indicators such as fiscal deficit, public debt, external payments position, investment in capital expenditure and so on. However, fiscal indicators may not be the best measure of the overall impact of the oil discovery on Ghana's economy. Economic growth may be a better measure because economic growth reflects an interplay of a variety of economic, fiscal, and political variables.

1.3   Literature Review

The relationship between natural resource and economic growth literature has seen a considerable amount of work from both developed and developing countries with varying proportions. Developing countries have a relatively poor track record when it comes to the availability of data which makes research on them infeasible to a large extent. That notwithstanding, the findings of these works vary from positive, negative to mixed. As stated above, the effects depend on certain factors such as the quality of institutions. Frankel (2012) contends that rent-seeking behavior in resource rich countries may weaken institutions, such as property rights, and political accountability. Mehlum et. al (2002) argue that the reason for the diverging outcomes in development across resource-rich countries is the quality of institutions. Botswana saw the highest average growth in the world since 1965 following the discovery of diamonds. Acemoglu et al. (2001) attribute this good performance to good and effective institutions. In contrast, Lane and Tornell (1996) and Tornell and Lane (1999) attribute the poor economic performance of Mexico, Nigeria, and Venezuela following oil windfalls to the dysfunctional institutions in those countries.

Auty and Warhust (1993) first coined the term 'resource curse' to describe the paradox that countries rich in natural resource do not perform as well economically as resource-scarce

countries. Indeed, there is a large literature on whether natural resource abundance is good for economic growth. Sachs and Warner (1995) investigate the relationship between natural resources and economic growth using cross-country data, and they find that economies with a high ratio of natural resource exports to GDP in the baseline year tend to have low growth rate in subsequent years. There is a phenomenon of a resource discovery crowding-out other sectors of the economy which, in turn, inhibits production spillovers and reduces economic growth. This phenomenon is referred to as the 'Dutch Disease'.[6] The level of employment in a sector of the economy is an indicator of the level of economic activity in that sector. This informs our decision to investigate the employment trajectories of other sectors of the economy following the discovery of oil.

Using cross-country data, Harding and Venables (2013) and Ismail (2010) find that natural resources exports crowd-out manufacturing exports. Sachs and Warner (2001) attributes these empirical findings to the Dutch Disease. Leite and Weidmann (1999) also examine the impact of natural resource abundance on economic growth, and they find no evidence of a direct impact of resource abundance on economic growth. They do report evidence of an indirect channel through corruption which negatively effects economic growth. Collier and Hoffler (2000) report evidence that natural resources increase the probability of armed conflicts in resource abundant countries. Conflicts, they argue, affects institutional quality which measures the ability of institutions to minimize or eliminate rent seeking. Sometimes, the conflict is between countries. An example of this is the Ghana-Ivory Coast maritime border dispute in 2010

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[6] The term 'Dutch disease' was first coined by The Economist in 1977 to describe the decline of the manufacturing sector in the Netherlands after the discovery of the Groningen natural gas field in 1959. This phenomenon results from the appreciation of the country's real exchange due to the increase in demand for the country's currency induced by oil exports. The resulting appreciation in the nominal exchange rate makes the non-oil sectors of the economy uncompetitive.

over the ownership of parts of the TEN oil field.[7] Arezki et al. (2016) report evidence of a decrease in employment following a resource discovery using a large panel of countries.

Cotet and Tsui (2013b) exploit cross-country variation in the size of oil endowments to investigate the effects of a resource endowment on a country's economic growth rate and health outcomes. They find that the size of oil endowments does not impede a country's economic growth rate and is positively correlated with health improvements. Michaels (2010) examines the long-run effects of oil abundance in the southern United States, using cross-sectional data to compare counties that have major oil fields to nearby counties that do not have oil fields. He finds that oil-abundant counties specialize in oil production, but this specialization does not reduce growth in non-oil sectors. Furthermore, the population of oil-rich counties increase as result of higher wages, and the resulting growth in household incomes increase the provision of local public goods which, in turn, increases employment in both agriculture and manufacturing. Similarly, Aragon and Rud (2013) find that the expansion of Peru's gold mines has a positive effect on income, household consumption, and poverty reduction.

It is clear from the literature that natural resources management differs among countries; consequently, the impacts of the discovery and extraction of a natural resource are likely to differ among countries, as well. We investigate the impact of Ghana's oil discovery and production on its economic growth rate and unemployment rate.

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[7] The dispute started with the discovery of oil in Ghana in 2007 which the Ivory Coast laid claims to. Series of failed negotiations led Ghana to file a case at the ITLOS in 2014 to rule on the delimitation of the maritime boundary between the two countries which she convincingly won.

1.4 Empirical Methodology

Following Abadie et al. (2010, 2015), we use the synthetic-control method for comparative case studies. The synthetic control method is well-suited for investigating the effect of an exogeneous shock or treatment when there are very few treated units. In our case, the treated unit is Ghana, and the treatment is the 2007 discovery and production of oil. In this methodology, a linear combination of untreated units is used to construct a synthetic control which serves as a counterfactual to gauge the effect of the treatment on the treated unit. More specifically, we gauge the impact of the discovery and production of oil on Ghana's economy by comparing the outcomes between Ghana and our synthetic Ghana, which is constructed using a linear combination of sub-Saharan African countries without an oil discovery in 2007. We proceed below by describing the construction of our synthetic Ghana.

Suppose that there are J countries in the 'donor pool' of countries which we use to construct our synthetic Ghana. The synthetic control literature suggests restricting the donor pool to units with outcomes that are driven by the same structural process as the treated unit and are not subject to the same structural shock, in our case the 2007 oil discovery, as the treated unit. These restrictions on candidates for the donor pool are required because the comparison units are meant to mimic, mirror, or approximate the counterfactual of the treated unit. The control unit (synthetic Ghana) is constructed using a linear combination of the countries in the donor pool.

The paper uses data covering the period 1998-2018 which straddles the 2007 discovery of oil in Ghana. To capture both the anticipation and production effects of the oil discovery, we assume the treatment period begins in 2009; a year before the beginning of actual production and two years after the discovery. Abadie et al. (2010, 2015) contend that the pre-treatment period is much more accurately approximated by a linear combination of untreated units as opposed to a

single untreated unit. Accordingly, we construct our synthetic Ghana using a weighted average of some of the countries in the donor pool. The assigned weights are between zero and one and must sum to one (1.0).

The synthetic control estimator captures the effect of the treatment, which is Ghana's 2007 oil discovery, by comparing the post-treatment outcomes between the treated unit and the synthetic control, which is not exposed to the treatment. A review of the economic growth and unemployment literature suggests that there are certain factors that affect our chosen outcome variables: the growth in real GDP per capita and the unemployment rate. These factors are referred to in the literature as 'typical predictors' of the outcome variables.

Now, we proceed by describing the criteria applied for including units, which in our case are countries, in the donor pool. As a rule, the synthetic control method excludes units (countries) from the donor that experience a similar treatment (oil discovery) as the treated unit (Ghana) during or after the sample period, which in our case is the period from 1998 to 2018. However, the rule does not prohibit the inclusion of units (countries) that received a similar treatment as the treated unit (country) in the period before treatment; the intuition being that countries with similar treatments before the treatment period do not confound the true effect of the post-treatment effect on the treated unit. Only countries with similar treatments in the treatment period or post-treatment period must be excluded from the donor pool. This means countries like Equatorial Guinea and Nigeria which had similar discoveries many years before the discovery in Ghana in 2007 are eligible for inclusion in the donor pool. Countries like Mozambique that experienced a similar treatment in the treatment period of our study must be excluded from the donor pool. Our analysis is robust to these dynamics.

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1.4.1 The Synthetic Control Estimator

Denote the outcome variable as Y_{it}, where the subscript i is the country and t denotes the year, and the outcomes of interest are the growth rate in real GDP per capita and the unemployment rate. Let D_{it} denote the treatment (oil discovery and production). The synthetic control approach assumes a data generating process where the observed outcome Y_{it} is the sum of the effect of the treatment, denoted by $\alpha_{it}D_{it}$, and the counterfactual outcome, denoted by Y_{it}^N. The sum of these effects is described by the following expression:

$$Y_{it} = \alpha_{it}D_{it} + Y_{it}^N = \alpha_{it}D_{it} + \theta_t Z_i + \lambda_t \mu_i + \delta_t + \varepsilon_{it}$$

where δ_t is an unknown common factor with constant factor loadings across units; Z_i is a (1xr) vector of observed covariates (unaffected by the treatment); θ_t is a vector of unknown parameters; λ_t is a vector of unobserved common factors; μ_i is a vector of unknown factor loadings; and ε_{it} is a vector of unobserved transitory shocks at the regional level with a mean equal to zero. Since the factor loadings are unobservable, the synthetic control procedure constructs a vector of weights W over the J donor countries such that the weighted combination of donor states closely matches the treated country in terms of the pre-treatment outcomes. This weighted combination of donors is the synthetic control. By constructing a synthetic control in this manner, Abadie et al. (2010) show that the average factor loadings of the synthetic control should closely match the factor loadings of the treated country (Ghana).

Now, let X_0 denote the vector of the pre-treatment characteristics of the units in the donor pool and X_1 denote the corresponding pre-treatment characteristics of treated unit (Ghana). According to the synthetic control procedure, the donor weights W minimize the distance between the pre-treatment characteristics X_0 and X_1 of the untreated countries and the treated countries, respectively, where distance is equal to the mean-square prediction error (MSPE) over

k pre-treatment characteristics, and v_m measures the relative importance of the m-th predictor, or

$\sum_{m=1}^{k} v_m (X_{1m} - X_{0m}W)^2$. With the optimal weights generated by the synthetic control method

w_j^* described above for each of the donor states $j = 2, \ldots, J$, and j=1 is the treated country, the

synthetic control is a linear combination of donor-country outcomes or $\sum_{j=2}^{J} w_j^* Y_{jt}$., and $j = 1$ is

the treated country (Ghana). The impact of the oil discovery on the outcome variable is given by

α_{1t}, where $\alpha_{1t} = Y_{1t} - \sum_{j=2}^{J} w_j^* Y_{jt}$,

where Y_{1t} is the value of the outcome variable for the treated country (Ghana) and $\sum_{j=2}^{J} w_j^* Y_{jt}$ is

the value of the outcome variable for the synthetic country[8].

1.5   Data

The data used in this analysis come from the World Bank Development Indicators

database and the Penn World tables. We use data that are aggregated at the country level for the

period 1998-2018. The beginning period of these data is 1980, but many of the countries in the

donor pool have missing values for the years preceding 1998. Therefore, synthetic Ghana is

constructed as a weighted average of the potential control countries. The weights are chosen so

that synthetic Ghana mimics the values of the set of predictors of the outcome variable before the

oil discovery (treatment). To ensure that the results are not biased, we do not include any sub-

Saharan African countries in the donor pool that received a similar treatment (oil or any huge

resource discovery) during the period of this study. In the case of real GDP per capita outcome,

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[8] The synthetic control method facilitates comparative case studies in instances when no single untreated unit
provides a good comparison for the unit affected by the treatment or event of interest. This is often the case when
the treatment affects large aggregates like regions or countries, so a limited number of untreated units are available
(Abadie et al. 2015).

we control for the predictors identified in the literature on economic growth, namely, government (aggregate) final consumption expenditure, growth rate in population growth, openness to trade, the rate of inflation, and inbound foreign direct investment.[9] We augment these with the lagged values of GDP per capita in current U.S dollars for 2007, 2004, and 2001.[10] For the other outcome variable – the unemployment rate, we use the same augmentation technique as before in addition to its predictors which are the labor force participation rate, inflation rate, openness to trade, growth rate of real aggregate GDP, and the population growth rate. The predictors are averaged over the period 1998-2006. We further perform placebo tests that confirm the robustness and significance of the results. Now, we turn to a discussion of our findings.

1.6   Results

Using the techniques described above, we construct a synthetic Ghana with weights chosen so that the resulting synthetic Ghana reproduces to its best ability the values of the predictors of real GDP per capita in Ghana in the pre-discovery period. Table A.1 (see Appendix A) shows the distribution of weights used in constructing synthetic Ghana.

We argue that Ghana and its synthetic counterpart would have followed the same evolution path as in the pre-discovery and production period but for the discovery and production of oil. The divergence and gap after 2009, is therefore attributable to the discovery of oil. We find that over the period 2009-2018, GDP per capita increased by 501.11 USD per year on

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[9] Following Warner and Sachs and other works in the literature, we control for those covariates that have been shown in the literature to affect growth significantly: trade openness, spending on consumption goods, price volatility, investment have all been shown to affect economic growth.

[10] Past values of GDP per capita are likely to influence the current level of GDP and thus must be controlled for. Over the pre-treatment period, we control for the beginning, middle and later GDP per Capita levels in accordance with the synthetic control literature. Same is done with the unemployment variable.

average. This amounts to approximately 45.5 percent of the 2009 baseline level. During the end period of the analysis, which is 2018, the GDP per capita gap between Ghana and synthetic Ghana was about US $950. This implies that GDP per capita was 76 percent higher in the real Ghana relative to the synthetic Ghana.

The results also suggest (see Table A.2, Appendix A) that the synthetic Ghana provides a much better match for Ghana than the mere average of the sub-Saharan countries. Synthetic Ghana produces almost the same pre-discovery values for population growth rate, inbound foreign direct investment, GDP growth rate and trade openness. Inflation fluctuates more rapidly over the business cycle with so much instability. Even with that, the synthetic Ghana matches it better than the average of the countries in the donor pool. The lagged values of the GDP per capita are also better matched by the synthetic Ghana relative to the average measure.

1.6.1 The Other Side of the Conundrum: The Unemployment Rate

Standard economic theory predicts that economies could benefit from the discovery of a natural resource such as oil through increased demand for labor not only in the oil sector but also in the non-oil sector through a spillover effect (Black, McKinnish, and Sanders 2005, Marchand 2011). The effect could be a spiraling down one to all other industries both related and unrelated. This is what informs this further analysis on the impact of Ghana's oil discovery. If this is the case, then the boom in the oil industry should have an impact on the overall unemployment rate. Creation of more job opportunities across all sectors of the economy will ensure this is realized. The employment/unemployment situation is an indicator of the level of economic activity. However, a comparison of the unemployment rate of Ghana to its synthetic control shows an increase in the unemployment rate following oil discovery as seen in Figure A.9 (see Appendix

A). The average unemployment surge in Ghana between 2009-2018 following oil discovery was about 1.85 percent.

This translates to 36.96 percent relative to the 2009 baseline unemployment level. An important question that this finding answer is also whether if an increase in economic growth measured by GDP per capita translates to a reduction in unemployment or creation of jobs. This analysis suggests the answer is an emphatic no.

But what could be driving this worsening in the unemployment rate? We conduct a sub-analysis of the employment evolution in the three sectors of the economy: the agricultural, industrial and services sector. As can be seen from figures A.10, A.11, and A.12 in Appendix A, oil discovery and its subsequent production increases employment in both the industrial and services sectors as shown by figures A.11 and A.12 respectively. However, there is a huge and sharp decline in employment in the agricultural sector depicted by figure A.10. This is a plausible explanation for the deterioration in the overall unemployment rate (Figure A.9, Appendix A) because like most developing countries, agriculture is the largest employer of people in Ghana. The fall in the employment percentage of the largest employer is bound to have a telling effect: the negative effect on the agricultural sector employment more than offsets the positive effects in the industrial and services sectors. The increase in the industrial and services sectors could be attributed to movement from agriculture to these other sectors.

1.6.2 *Placebo Study and Test of Significance*

A concern with synthetic control studies is the potential existence of spillover effects and if the results are truly because of the impact of oil discovery and not a lack of predictive power of the model to fit the synthetic Ghana to Ghana post 2009. To evaluate this, we run a placebo

study where one of Ghana's neighbors whose economy was similar to Ghana pre-oil discovery is chosen; Cote d'ivoire is the country used in this placebo study. Ghana's largest contributor to GDP before 2009 was cocoa just like the Ivory Coast. The manufacturing and services as well as the agricultural sectors of both economies were also similar[11]. Figure A.5 (Appendix A) displays the trajectory of GDP per capita for Cote d'ivoire and synthetic Cote d'ivoire over the same time frame. Reassigning the treatment to Cote d'ivoire without keeping Ghana in the pool offers a test of the credibility of the results as well as the spillover effects. If the results were not driven by oil discovery, then reassigning treatment to Cote d'ivoire should have seen a significant change in the evolution of the GDP per capita for Cote d'ivoire. In the same vein, a spillover of the oil discovery in Ghana on Ivory coast should have shown an impact on the trajectory of the GDP per capita of the Cote d'ivoire. Again, we fail to find a significant effect as seen in figure A.5. There is no significant and clear divergence between Cote d'ivoire and synthetic Cote d'ivoire. This proves that our results are driven by the exogenous shock of oil discovery and production and not a lack of predictive power of our model.

The synthetic control method does not provide classical standard errors to infer statistical significance. Abadie et al. (2010) and Abadie et al. (2015) suggest that running placebo tests is the viable way to test the significance of results. Another placebo test to this effect is captured in figure A.8 (see Appendix A). Treatment is iteratively re-assigned to the countries in the donor pool. Here, again, we see that the gap in Ghana post-treatment is substantially large relative to

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[11] The maritime border dispute between Ghana and the Ivory Coast was a disagreement between the two nations about the direction of the azimuth line that divides the exclusive economic zones, territorial waters, and parts of the continental shelves of the two neighboring countries. The TEN fields are in Ghana's Western Basin on the border with Ivorian area that Ivory Coast claimed as part of its exclusive economic zone in September 2011. The Internal Tribunal of the Law of the Sea ruled in Ghana's favor and Ghana has continued to drill those fields up until today. This lends more support to using the Ivory Coast as a placebo test.

the other countries except some two countries. These two countries had unusually large GDP per capita values in the pre-treatment period relative to all the other countries. These countries therefore had the worst fit by the synthetic control method because no combination of units could therefore reproduce the evolution of their GDP per capita level in the pre-treatment level. Bar these outliers, the diagram shows a substantial difference between Ghana and the donor pool countries which shows the significance of our results. A relatively newer school of thought by Firpo and Possebom (2018) propose a sensitivity analysis procedure that considers deviations from the uniform benchmark. Our paper undertakes several sensitivity analyses which further support our results. A more nascent approach to testing the significance of intervention effects is the Fisher Exact Hypothesis Test. This methodology tests a null hypothesis of no effect whatsoever of the treatment. It calculates a p-value using the root mean-squared prediction error of the treatment and control groups. The p-value calculated is valid and known as Fisher's Exact p-Value, after Fisher (1971). The null hypothesis of no effect whatsoever is rejected if p is less than some pre-specified significance level, such as the traditional levels of significance. Rejecting the null hypothesis implies that there is some region with a non-zero effect for some time period (Firpo and Possebom, 2018). The focus of this section is to test the significance of the treatment effect on the treated unit and not the presence of some effect in at least one of the units. We therefore argue that falsification or placebo studies as proposed by Abadie et al. (2010, 2015) are more appropriate in testing the significance of our results.

1.6.3   Test of Robustness

In this section, we conduct diagnostic tests of the sensitivity of the results to changes in the country weights for countries receiving a positive weight. From Table A.1, six countries

receive positive weights. They include Ethiopia, Lesotho, Liberia, Malawi, Democratic Republic of Congo and Equatorial Guinea in decreasing order of weights. To do this, we iteratively leave one of these countries out at a time and re-construct a synthetic Ghana with the rest of the positive-weighted countries while re-estimating the baseline model. By leaving out a country, we sacrifice some goodness of fit. However, this check is very important to ascertain to what extent the results are driven by a single country. The trend and the magnitude of the values do not change significantly as seen from Figure A.6 (see Appendix A). This figure incorporates the leave-one-out estimates. It shows that the results are robust to the exclusion of any particular country.

Comparative researchers, however, typically choose a very small number of cases, with the aim of meticulously describing and analyzing the characteristics and outcomes of each of those cases. As a result, in many instances, comparative researchers may favor sparse synthetic controls, that is, synthetic controls that involve a small number of comparison countries. Reducing the number of units in the synthetic control may, nonetheless, impact the extent to which the synthetic control is able to fit the characteristics of the unit of interest (Abadie et al. 2015). This is basically a trade-off between goodness of fit and sparsity. In this same light, we investigate how our results are sensitive to reducing the size of the donor pool. Of the six countries that receive positive weights, we drop the country with the largest weight which is Ethiopia. we re-estimate the baseline results using the remaining five (5) countries in the donor pool that received positive weights to construct a synthetic Ghana. We consecutively drop the next country with the largest weight from the baseline model. This is done for several iterations. The results of how well the synthetic Ghana matches the real Ghana pre-discovery predictor values using various sizes of the donor pool are shown in Table A.3. Figure A.6 shows the GDP

per Capita trajectory paths for **m** = 5, 4, 3, 2, respectively, where **m** denotes the number of

countries in the donor pool that receive positive weights in the baseline model. Although there is

a little reduction in goodness of fit, the decline is almost insignificant as to change the results

significantly. This further emphasizes the benefits of using a combination of different countries

as a comparison group.

1.7   Conclusion

The synthetic control method offers a guide for the selection of comparative units in

qualitative studies allowing for qualitative inference in a quantitative environment (Tarrow

1995). Exploiting this method, we set out to find the impact that oil discovery in Ghana has had

on economic growth as well as the unemployment-employment situation of the country. These

are intended to measure economic progress and the incidence of the Dutch disease. Oil extraction

is a high-value-added activity and as such is expected to increase GDP mechanically discounting

any incidence of the "Dutch disease". There have been numerous cases of natural resource

discoveries culminating in a reduction in economic growth in many countries. It is therefore not

straightforward to tell the impact of any natural resource discovery. The analysis presented in

this paper suggests that oil discovery in Ghana in 2007 and its subsequent production increased

the country's GDP Per Capita by 45.5 percent while increasing the unemployment rate by 36.96

percent relative to the 2009 baseline level. This is a particularly worrying finding because

although economic growth over the period was positive, it was not fast and inclusive enough to

reduce the unemployment rate. In macroeconomics parlance, this was a 'growth recession' – that

is a period where the economy is growing but the unemployment rate is rising. A plausible

explanation for these outcomes could be the redistribution and transfers of oil windfalls by

governments following oil revenue which can increase the GDP per capita, causing a growth in the economy. In the case of unemployment, this could be a classic case of the Dutch disease in action; the discovery and production of oil has a crowding out effect on other sectors of the economy. This observation also answers the question whether economic growth automatically translates into employment generation or unemployment reduction to a large extent.

A sub analysis shows that employment in agriculture fell dramatically following oil discovery. Although there is a positive increase in employment in the industrial and services sector, this increase is more than offset by the negative increase in the agricultural and industrial sectors which employ the largest fraction of people. This answers an important economic question as to whether if economic growth always translates to more jobs for people. Though there is an increase in GDP per capita, it does not have the desired impact on employment generation. The decrease in employment in agriculture could be attributed to the desire by young people to work in white collar services jobs. Jobs in agriculture is therefore thought of as being the preserve of "illiterates" or school dropouts. These two problems seem to have worsened following oil discovery and economic progress has not translated into jobs. This could pose serious problems in the long run. As a recommendation from this paper, the government should wage some serious form of economic warfare in making agriculture attractive to the youth. An increase in employment in agriculture has the potential to reduce the unemployment rate drastically.

Chapter 2

The Impact of Natural Resource Rents on Ethnic and Tribal Tensions: A Tale of African Countries

2.1   Introduction

Conflicts and tensions are part of the very fabric that makes up human existence. The problem of ethnic tensions and the risk of conflicts has saddled humanity since the beginning of time. Ethnic tension is the root cause of most of the numerous conflicts and wars that have bewildered the African continent over the years. In this paper, we analyze the impact that natural resource rents have on ethnic and tribal tensions. Ethnic tensions have the potential of threatening the peace of entire countries. Recent waves of secessionist movements and heightened irredentism in countries such as Ghana, Cameroon, Armenia are clearly products of ethnic tensions. As a result, we extend the study to investigate if various forms of decentralization have the potency of mitigating some of the potential negative effects of natural resource rents on ethnic tensions and conflicts in Africa. Ethnic tension is the degree of tension within a country attributable to racial, nationality, or language divisions. The commonest and most consistent trait around the world is conflict fueled by ethnic tension. The literature tends to use ethnic tensions and ethnic conflicts interchangeably. However, these two are entirely different. Ethnic tension is the inherent discord between different ethnicities which could cause a myriad of other problems including ethnic conflicts, ethnic violence, internal conflict and so on. Stated differently, ethnic tension is the fuel for all these problems. A study on ethnic tension could therefore be seen as a study of the root cause of many other potential problems. To our knowledge, this is the first study that examines the causal effect of natural resource rents on

ethnic tensions in Africa. It also offers an additional contribution by suggesting potential solutions to ethnic tension exacerbated by the quest to capture natural resource rents.

Consider two people living together. Regardless of initial good intentions for harmony, situations arise that accentuate the differences in their perceptions and needs. The friction in this two-person society may be manageable. However, the problem is more convoluted at a societal level. With a larger population comes a larger set of preferences and differences. This paper considers ethnic tensions and conflicts at the national level. 'There is no smoke without fire' goes the adage. To this end, ethnic tensions and conflicts seem to be the equilibrium outcomes of people living together and sharing resources. Competition for natural-resource rents could fuel internal conflicts (Ross 2004). On ethnic tensions, Farzanegan et al. (2013) surmises that inequality in the distribution of natural resources among different groups (example, political factions or ethnic groups) fuels tensions and destructive competition for such rents. This paper focuses on the role played by natural resource rents on ethnic tensions and conflicts in Africa.

In most societies with historically high incidences of inequality, there is the tendency of some groups to claim superiority over other groups and end up exclusively extracting the rents from natural resources. This could be a recipe for tensions and subsequent conflicts. This battle for supremacy is particularly rife in Africa. Africa suffers most of the conflicts, strive and civil wars the world experiences. This is due to the high degree of heterogeneity present within African countries. Ethnic tensions measure the degree of tension attributable to racial, national, or language divisions. This is an important phenomenon since it captures the degree of dissatisfaction, discord and the risk of escalation of dissatisfaction into full-blown conflicts. It is a potentially direct recipe for conflict. The degree of ethnic tensions and conflicts may depend on how fractionalized a country is in terms of ethnicity, religion and language. Consider a country

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like Nigeria that has 520 regional languages and dialects. This is a reason for division based on language with more heterogeneity in the taste and preferences for public goods.

Africa, historically, has been home to the most and fiercest tribal conflicts. Most of these conflicts have been as a result of some form of dissatisfaction by one or two tribal groups. Africans always tend to have that sense of allegiance to their tribal group. The incidence of ethnic tensions and conflicts in Africa are mostly because some group of people or ethnicities feel cheated of their fair share of natural resource rents (Nigeria, Sudan, South Sudan, DR-Congo, and Somalia). With Africa being home to the highest abundance of natural resources and historically large levels of inequality and corruption which are recipes for tensions, it is interesting to find out the relationship between natural resource rents and ethnic tensions in the continent.

The literature has quite a good amount of work on resource rents and conflicts but not on the relationship between natural resource rents and ethnic tensions. Ethnic divisions and fractionalizations are believed to be correlated with violence and conflicts. Therefore, a study on ethnic tensions is seen as a tackling of a root cause of a mammoth problem. Another contribution of this paper is that it provides additional evidence of the existence or not of the resource curse hypothesis. It captures an important part of this hypothesis in that it focuses on Africa which has the most abundance of natural resources and ethnic fractionalization worldwide.

Africa is also home to some of the poorest countries in the world. With reeling levels of inequality and poverty, proper investment is a prerequisite for growth and poverty reduction. However, investors are always circumspect with the destinations of their investments. Investors are disinclined to investing in economies with high levels of ethnic tensions. The reason is that such economies are conflict potentials ready to explode. Bohn and Deacon (2000) contend that

countries with undemocratic institutions and endemic conflict tend to be poor investment risks for extractive firms; hence these countries tend to have both less exploration and slower extraction rates. This finding was later re-echoed by other studies (Cotet and Tsui 2013, Cust and Harding 2013, Poelhekke and van der Ploeg 2013, Metcalf and Wolfram 2015).

Another thing that makes this study on Africa particularly interesting is the fact that Africa is the most ethnically and linguistically diverse continent in the world. Alesina et al. (2003) posits that the most ethnically diverse country in the world is Uganda with a fractionalization index of 0.93. Of the top 21 most ethnically diverse countries in the world, 20 are in Sub-Saharan Africa and the top 18 most linguistically fractionalized countries are all in Sub-Saharan Africa. With so much diversity, abundant endowment of natural resources and historical incidents of ethnic tensions and conflicts, it bodes well to explore what exactly the relationship between these various concepts is.

Easterly and Levine (1997) hypothesized that much of Africa's growth failure is because of ethnic conflict. A study on this subject is therefore fundamental to growth. Using a combination of dynamic panel data estimation techniques and the system GMM, we investigate the impact that natural resource rents have on ethnic tensions and conflicts in Africa. Empirical evidence suggests that political decentralization could help mitigate some of the negative effects of ethnic differences and conflicts (Farzanegan et al. 2013). In the context of ethnic tensions and violence, we further investigate if various forms of decentralization could help mitigate the negative effects of resource rent on ethnic tensions.

2.2   Literature Review

Abundance of natural resource endowment comes with its own challenges. From indirect effects such as deterioration of good governance to conflicts resulting in physical loss of lives, natural resources have the potential of turning a hitherto peaceful country into a nightmare of violence, chaos and death. In this paper, we narrow the focus down to one particular problem: ethnic tensions. Ethnic tensions measure the degree of tension attributable to racial, national, or language divisions. With already high incidences of ethnic divisions in Africa, the scuffle for natural resource rents could only exacerbate this phenomenon which could in turn metamorphose into conflicts. Alesina et al. (2003) estimate Africa to be the most ethnically diverse continent in the world. The degree of fractionalization likely influences the gravity of ethnic tensions in a country. Sub-Saharan Africa, on average, has the highest ethnic[12] and linguistic[13] fractionalization indexes of 0.658 and 0.625 respectively. How does this compare to other parts of the world? Latin America and the Carribean has ethnic and linguistic indexes of 0.405 and 0.179 respectively; Western and Southern Europe 0.177 and 0.196 respectively; East and Southeast Asia 0.306 and 0.352 respectively. These statistics clearly show that Africa is at risk of ethnic disparity and tensions. Turning the attention to natural resource endowment, Sawe (2018) argues that Africa has the most abundant of it. In fact, he asserts that 30% of the earth's resources are in Africa. The dependent and independent variables both have the highest incidences in Africa. Ethnicity[14] remains one of the biggest problems in Africa. When some ethnicities feel marginalized, it even further worsens ethnic strains and potential ethnic conflicts.

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[12] Ethnic fractionalization measures the probability that two people randomly selected from a country belong to different tribal or ethnic groups

[13] Linguistic fractionalization on the other hand is a measure of the pr0bability that two people randomly selected from a country speak different languages

[14] Ethnicity encompasses tribal, ethnic, linguistic and religious fractionalization and differences

A 2003 article by the World Bank authored by Bannon and Collier notes that all ethnically differentiated societies have a few romantics who dream of creating an ethnically "pure" political entity, but the discovery of resources has the potential to transform such movements from the romantic fringe into an effective and violent secessionist movement. The aim of such a group will be to capture resource rents from the natural resource discovery. The greed and grievance (Collier and Hoeffler, 1998) school of thought is particularly problematic in Africa where weak institutions are prevalent. This causes grief among certain ethnic factions who think they do not get their share of natural resource rents. Fox and Swamy (2008) in their report from a workshop on natural resources and ethnic conflicts in Hawaii held in 2005 posit that all scholars at the workshop agreed that ethnic and resource grievances occur not so much out of objective deprivation but out of 'relative deprivation' when groups compare their situation with others, to the past, or to future expectations. This buttresses the point of some ethnic groups feeling fleeced which creates a lot of inter-tribal tensions and the subsequent risk of conflicts.

Farzanegan et al. (2013) chronicles conflicts in countries like Peru, Bosnia-Herzegovina and Sri Lanka that were caused by ethnic tensions and those in countries such as Algeria (1990s), Republic of Congo (1998-2004), Chad (2005-2006) that were because of natural resource endowments. They suggested that in the case of the wars on resource endowment conflicts, ethnicity had a role to play in them as well. This presents a clear interplay between ethnic tensions and natural resource rents.

Economic rents from primary commodity exports have been shown to generate conflicts (De Soysa, 2000). But the nature of the conflicts varies across regions and continents. In Africa, a large level of ethnic fractionalization means there is an increased tendency of tensions and conflicts on tribal lines. The protracted war in the Democratic Republic of Congo has been over

resource rents, and that too among different ethnic groups. Angola, Nigeria, Sierra Leone, Liberia, Sudan, Eritrea and Ethiopia have all experienced ethnic tensions that escalated into internal conflicts over resource contestation. Some of these conflicts are ongoing even until today. Recent political economy literature tends to explain ethnic conflicts as the equilibrium outcome of elite efforts to control revenues from natural resources.

The causal effect of resources on conflicts is not straightforward. For example, the discovery of a natural resource could be harnessed efficiently and the rents from the resource distributed equitably. In such a situation, the risk of ethnic dissatisfaction or grievance is reduced which will invariably mean fewer ethnic tensions and conflicts (Besley and Persso, 2010). A country like Botswana has been able to realize this. The political economy literature therefore segregates resource-based explanations of ethnic tensions and conflicts into two broad categories: resource abundance and resource scarcity. By the resource abundance school of thought, countries are at the risk of conflicts from a contestation for rents from resource exports. The resource scarcity strand argues that population growth and resource scarcity and degradation have the potential of exacerbating ethnic tensions and igniting conflicts (Homer-Dixon, 1999). Although abundance and scarcity of natural resources affect the risk of tensions and conflicts differently, abundance has been shown to be more associated with violence (Peluso, 1993; Schroeder, 1996). This makes the study of the impact of resource rents on ethnic tensions slightly earnest.

Ethnic tensions are particularly detrimental to unity and peacebuilding. Conflicts arising from ethnic tensions (ethnic conflicts) last longer and are more difficult to settle than other civil wars (Wucherpfennig et al., 2012). Conflicts of any form are inimical to growth. Internal conflicts can decrease per capita income and increase external debt burden (Stewart et. al, 2001).

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Oil resources could have a destructive role for peace (Fearon, 2004). More recently, Wegenast and Basedau (2013) show that salience-based fractionalization indices are associated with a higher risk of ethnic conflict onset. They further find evidence that oil further increases the conflict potential within fractionalized countries. Ethnic tension is therefore proven to be a root cause of conflict in the peace and conflict literature.

From the theoretical predictions of Oates (1972) to the current trend of incessant advocacy for decentralization by the world Bank, decentralization is seen as a potential panacea to the disconnect between people and their government. Decentralization refers to the devolution of autonomy to sub-national governments. This is viewed as a way of bringing governance to the people and thus reducing the risk of ethnic tensions and conflicts. The World Bank has on numerous occasions asked aid recipients to implement an increase in either political or fiscal decentralization. The theoretical arguments include the potency of decentralization to facilitate participation and co-determination by minorities and to ensure effective redistribution between the different regions of a country (Schou and Haug; 2005, GTZ; 2006). These could go directly into ameliorating the grievances from some minority groups of relative deprivation of their own share of natural resource rents thereby reducing ethnic tensions. Decentralization affords ethnic minorities the opportunity to control their own affairs and in so doing helps maintain the geographical integrity of the country (Brancati; 2006a). Moreover, this could be viewed as building the entire country from the bottom all the way up. Subnational governments are believed to have more information about the distribution of needs of locals. This could help reduce the level of strain and general discontent between and within different ethnic groups.

However, this is not the only direction decentralization could go. To devolve authority to subnational governments, the central government could lose the balance of power that is needed

to keep the whole country in sync. Devolution of excessive power could lead to abuse of those powers by subnational executives. There is the realistic risk of subnational leaders putting the interest of local economies above national interest. This conflict of interest and the general lack of homogeneity could end up exacerbating tensions (Tranchant; 2010). Decentralization could encourage the growth of regional parties (Kymlicka, 2006) and might strengthen local ethnic elites (Bardhan, 2002). Decentralization could therefore produce positive, negative, or even insignificant effects in reducing ethnic tensions exacerbated by natural resource rents. Farzanegan et al. (2013) finds that political decentralization can reduce the risk of internal conflict. Given the unpredictable trajectory of decentralization in mitigating natural resource rents induced ethnic tensions, we extend this paper to test the hypothesis empirically.

2.3   Basic Hypotheses

We propose two hypotheses that could explain our results. They include the following:

2.3.1   *Natural-resource Rents Increase the Risk of Ethnic Tensions in Africa*

The link between natural-resource rents and ethnic tensions has not been studied in the literature and as the first of such a study, the paper makes this informed guess. Africa has grave levels of inequality. It is likely that these levels of inequality across the continent coupled with the potential of capturing resource rents will further exacerbate the problem of ethnic tensions that have engulfed the continent. As to whether this is the case remains the question which the paper seeks to answer empirically. This hypothesis is inspired by the greed and grievance theory of Collier and Hoeffler (2004) given the astronomical levels of inequality and marginalization of various low-income groups and ethnicities in Africa.

2.3.2 Exacerbation of Ethnic Tension Could be Mitigated Through Decentralization

In the presence of natural-resource rents, ethnic tensions exacerbation could be mitigated through some form of decentralization. Esteban et. Al (2012a) posits that the suppression of ethnic minorities increases the risk of terrorist attacks and civil war. Ethnic tensions in the presence of natural-resource rents could be thought of as capable of worsening all these elements of internal conflict. Political decentralization has been argued to help mitigate the risks of ethnic conflicts. Extending this argument to ethnic tensions, various forms of decentralization may be able to give more autonomy to ethnic groups and subnational governments and thereby reduce the magnitude of ethnic tensions generated by natural resource rents. It remains to be seen empirically if this is the case and that is what the test of this hypothesis will help answer. Sharing resource revenue with subnational governments has been used as a mechanism to tackle tensions and conflicts in resource-producing areas. These sharing systems could be direct or through transfers from the national governments. How much is transferred to which local area varies greatly from country to country. Some countries provide resource-rich areas with a percentage of the revenues that are paid to the national government from extraction in the territory. Other countries use a statutory formula to distribute resource revenues, with a calculation of each area's share based on several characteristics, such as population size, per capita income, or revenue collection effort.

The sharing of resource revenue could also be based on principles: derivation-based or indicator-based. This is the point that is germane to this paper. In a derivation-based approach, revenues are allocated predominantly by origin while indicator-based revenue sharing allocates revenue typically by the equalization principle (Bauer and Gankhuyag, 2020). Derivation-based systems aim to compensate producing regions for the costs of resource extraction (social and

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environmental costs) more directly, but they also bring significant equity challenges, volatility and public financial management challenges at the subnational level. They also may encourage accelerated resource exploitation. In contrast, indicator-based systems aim for greater equalization but may suffer from excessive complexity. They are largely used to counterbalance the downsides of derivation-based systems and may not be politically acceptable to resource-producing regions. In most resource-rich countries, the resource revenue transfer method is adopted with the 'derivation-based' as the basis.

Conflicts and tensions sometimes arise in situations where resource-rich regions think they are not getting a fair share of resource revenue. To combat this, subnational governments may be given increased access to resource revenue. A typical example is Indonesia where after years of dictatorship many of the resource-rich regions continued to remain the poorest in the country. In response, the government established multiple means of sharing resource revenues with the districts and provinces. Two regions, Aceh and West Papua, with large natural-resource wealth and a history of conflict were given 70 percent of all oil revenues in their regions (Keating and Brown, 2015). Whichever one of these principles is considered and/or used, it remains to be seen empirically if decentralization in general has the desired effect on tension and conflict management.

2.4 Empirical Analysis

We conduct empirical analysis for our hypotheses above.

2.4.1 *Data*

The source of the data for the dependent variable, ethnic tensions is PRS Group's International Country Risk Guide. The data covers several countries worldwide, but the focus of this paper is on African countries. They define ethnic tensions as an assessment of the degree of tension within a country attributable to racial, nationality, or language divisions. Lower ratings are given to countries where racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise. Higher ratings are given to countries where tensions are minimal, even though such differences may still exist. The index ranges from a score of 0 to a score of 6 where 0 corresponds to countries with the highest level of ethnic tensions and 6 to countries with the lowest level of ethnic tensions. This definition is exhaustive and covers the best of what could cause ethnic disharmony.

The primary aim of this analysis is to find out the impact that natural resource rents have on ethnic tensions. Ethnic tensions are inherent in most countries. However, in a quest to capture the financial benefits of natural resource rents, these tensions may further be deteriorated. To this end, using natural resource rents as a measure of the financial benefit of natural resources could be viewed as more appropriate compared to using data on resource revenue or the amount of natural resources in total exports. Data on total natural resource rent is from the World Development Indicators database of the World Bank. Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. Rent is calculated as production volume of the resource multiplied by the difference between the international market unit price and the average unit production cost. This is the main measure of resource rents of interest but for robustness checks, we use oil and natural gas rents separately to see how much of the results they drive. Alexeev and Conrad (2009) and Bhattacharyya and

Hodler (2010) argue that using the resource rent measure as opposed to the abundance of resources in GDP or exports could reduce the problem of endogeneity.

In a utopian society, the rents from natural resources will be distributed equitably. However, the nature of resource distribution itself and the rents is hugely unequal especially in developing countries. Natural resources within a country are not uniformly distributed and the endowed regions may tend to seek independence and sometimes even give rise to secessionism. The literature believes decentralization could help solve this problem. We define various measures of decentralization namely political, fiscal, and administrative decentralization. These various forms of decentralization capture different measures of the attempt to bring governance to subnational units. While political decentralization could induce a participation of grassroots in the political process and making their voices heard, fiscal decentralization could impact their economic welfare. Administrative decentralization on the other hand could induce employment and infrastructural growth at the grassroots. We use the measures of decentralization by Maksym and Anwar (2014). This data is detailed and approximates the closeness of government to the people. The political decentralization measure is a weighted average of local government election for the legislature, local government election for the executive and the degree of direct democracy. These various elements capture different aspects of the political process. The fiscal decentralization measure combines the subnational degree of tax autonomy, intergovernmental transfers, local government vertical gap, and borrowing whereas administrative decentralization considers local government employment and hiring practices. The analysis of how these various forms of decentralization interact with resource rents and ethnic tensions could have important policy implications for African countries as well as other developing countries.

2.4.2 Empirical Strategy and Endogeneity Issues

The threat of endogeneity in most empirical studies is a major point of discussion in the literature. The sources of the endogeneity may include unobserved heterogeneity, omitted-variable bias, and reverse causality. The empirical strategy considers endogeneity issues. We define two main models which capture both the between and within variations in the countries in our sample. The first model as shown in equation one (1) is a cross-sectional model. It analyzes the intensity and risk of ethnic tensions between countries.

$$ET_i = \beta_0 + \sum_{j=1}^{k} \beta_j X_{j,i} + \gamma NRR_i + \eta DEC_i + \tau NRR_i \times DEC_i + \varepsilon_i \;\ldots\ldots\ldots (1)$$

In the above model, ET_i represents the ethnic tensions measure from the ICRG database for country i, X_i is a vector of k exogenous variables that affect ethnic tensions, NRR_i represents the total natural resource rents measure for country i, DEC_i represents the different measures of decentralization namely political, fiscal and administrative decentralization for country i, $NRR_i \times DEC_i$ is the interaction term between the natural resource rents and the measures of fiscal decentralization and ε_i is the idiosyncratic error term.

The second model as shown by equation two (2) incorporates dynamism. It is a fixed effect dynamic panel data model which captures the within-country variation over time. This second model is not too different from the basic regression model in equation one. It incorporates country fixed effects as well as time fixed effects. Country fixed effects help to focus on within-country variation. The within-country analysis is particularly more advantageous over the between country analysis for this study. The fixed effects in this model can help eliminate unobserved heterogeneity between the countries (Baltagi, 2005). As outlined above, this is a possible cause of endogeneity. The analysis is on countries in the same continent, but there are unobserved factors (for example geographic factors) in each country that affect ethnic tensions

that are not controlled for. Controlling for country fixed effects therefore eliminates unobserved heterogeneity and the risk of omitted variable bias. Time fixed effects help to control for global cycles in crude prices which could affect resource rents and changing trends. Ross (2004) and Brunnschweiler and Bulte (2009) argue that the direction of causality between resource rents and the risk of conflict is not very clear due to potential reverse causality. The same could be extended to ethnic tensions.

$$ET_{it} = \sum_{j=1}^{k} \beta_j X_{j,it} + \gamma NRR_{it} + \eta DEC_{it} + \tau NRR_{it} \times DEC_{it} + \alpha_i + \mu_t + \varepsilon_{it} \ldots\ldots\ldots (2)$$

α_i captures the country specific fixed effect whereas μ_t captures the time fixed effects. To our knowledge, this study is the first on the impact of resource rents on ethnic tensions. The set of controls that are argued to affect ethnic tensions are inspired by various empirical works. They include the level of democracy measured by the polity 2 index, the effectiveness of the government obtained from the World Governance Index database, GDP per capita, population, the unemployment rate, and the rate of urban growth. We also include the various measures of ethnic diversity namely ethnic, language and religious fractionalization. The set of controls from various sources also assumes that the factors that influence ethnic tensions could likely be factors that tend to increase ethnic conflicts and violence. GDP per capita is a proxy for a country's overall financial, administrative, and military capabilities, and as a proxy for higher development with less disadvantages from inaccessible terrain and better integrated rural societies (Farzanegan et al. 2013). Theoretically, as countries become more urbanized, the degree of ethnic ties and tensions tend to take a downward tumble.

However, since the dependent variable, ethnic tensions, is persistent over time, we consider the lag of the dependent variable. This is consistent with works in the literature such as Fearon and Laitin (2003) and Collier and Hoeffler (2004). Although the fixed effects model

accounts for some potential causes of endogeneity, the main identification strategy around the endogeneity issue is the use of the system GMM estimator in dynamic panel data models proposed by Arellano and Bond (1991). This incorporates potential endogeneity. The model is shown below:

$$ET_{it} = ET_{i,t-1} + \sum_{j=1}^{k} \beta_j X_{j,it} + \gamma NRR_{it} + \eta DEC_{it} + \tau NRR_{it} \times DEC_{it} + \alpha_i + \mu_t + \varepsilon_{it} \dots (3)$$

2.5 Results and Interpretation

In this paper, we set out to find the impact that natural resource rents have on ethnic tensions and subsequent conflicts in Africa. In addition, we follow the literature and make inferences on what could be effective policies to help mitigate the challenge of ethnic tensions and its inherent disharmony and conflicts. The analysis is therefore done in two stages with two different models. The first model, which is a cross-sectional static model captures between-country variation of the impact of natural resource rents on ethnic tensions. In addition to the total natural resource rents, we use oil rents as well as natural gas rents for robustness checks and to make the results comparable with other works in the resource curse and Dutch disease literature such as Sachs and Warner (1995).

2.5.1 Cross-sectional Estimates

Table 2 reports the results of the cross-sectional estimates as estimated by equation one. As seen from all the columns of table 1, the impact of all the various kinds of resource rents on ethnic tensions is positive and significant. This implies that higher natural resource rents are associated with higher ethnic tensions. This is in the same spirit as Fearon and Laitin (2003), and Sachs and Warner (1995) who find that natural resource abundance could be a curse. The results

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show that a percentage increase in the total natural resource rent increases ethnic tensions by 0.014 index points. This increase is highly significant. The impact is highest in natural gas rents where a percentage increase is estimated to increase ethnic tensions by 0.225 index points. This is also highly significant. 43bleit at a much lesser level of significance, a percentage increase in oil rents is estimated to increase ethnic tensions by 0.007 index points. Although the main variable of interest is total natural resource rents, the robustness of the results is seen in the other measures of natural resource rents. In general, natural resource rents increases ethnic tensions in Africa. Intuitively, this corroborates the conjecture that ceteris paribus, higher natural resource rents make capturing states more profitable. In a quest to capture the pecuniary benefits of resource abundance, various ethnic groups launch genuine attempts in this ordeal. As outlined in the theoretical underpinnings of the resource rent battles above, resources are not uniformly distributed across countries. The efforts by different ethnic groups to capture the rents might therefore lead to further ethnic tensions and subsequent conflicts.

The African continent, home to the most abundance of natural resources is also home to the most incidence of ethnic diversity. Management of resource rents is therefore of utmost importance for national unity, cohesion and harmony are to prevail. This paper, with inferences from the literature proposes and tests various measures of decentralization as potential solutions to ethnic tensions exacerbated by resource rents. The net effect of decentralization of social problems such as conflicts, ethnic tensions is not exactly known from the review of the literature above. As can be seen from Table 3, we restrict the analysis now to total natural resource rents instead of the other measures of resource rents considered in Table 2. In addition, we consider the interactive impact of decentralization and resource rents on ethnic tensions. As can be seen from table 3, the coefficients of total resource rents remain positive and highly significant for all

measures of decentralization considered. This is necessary to be able to interpret any impact that any of the measures of decentralization will have on ethnic tensions caused by natural resource rents.

For all the coefficients of the interactive effect of decentralization, the signs are negative, which is the opposite of the signs obtained for total natural resource rents. This implies that, while total resource rents increase ethnic tensions, decentralization could decrease or mitigate this increase in ethnic tensions caused by natural resource rents. The directional consistency is important for the interpretation. However, although all the different kinds of decentralization have a negative interactive effect, only administrative decentralization is statistically significant. Therefore, only administrative decentralization has a significant impact on the reduction of ethnic tensions generated by resource rents per our cross-section estimation. A percentage increase in total natural resource rents increases ethnic tensions by 0.019 index points but administrative decentralization could decrease this increase in ethnic tensions by 0.083 index points relative to the baseline. This is a significant decrease in ethnic tensions just by increasing the degree of administrative decentralization.

The cross-sectional analysis, however, does not allow for time variation of variables and fixed effects that are particularly apropos for this type of analysis. The second part of the analysis therefore considers these factors introducing a fixed effects model. Beyond the fixed effects model, the paper tackles the issue of endogeneity by estimating a system Generalized Method of Moments model in the spirit of Arrelano and Bond (1991). This is considered the main identification strategy of this paper.

2.5.2   Panel Estimation

As mentioned above, this is the second part of the analysis where we control for time effects and country-specific fixed effects. This is particularly important when doing cross-country analysis since there are potentially some factors specific to each country over time. We therefore estimate a fixed effect model and a system GMM model.

2.5.2.1 Fixed Effects Estimation. Table B.4 presents the results of the fixed effects model. The empirical literature suggests that fixed effect models could eliminate endogeneity caused by unobserved heterogeneity. This is therefore achieved by estimating equation (2), the fixed effect model. We drop the variables that are time-invariant; ethnic, language and religious fractionalization due to potential collinearity with the fixed effects. Table B.4 estimates the impact of total natural resource rents as well as the other two resource rents variables namely oil rents and natural gas rents as in the cross-section model. The results are consistent with the cross-section estimates except the coefficient for natural gas rents which switches to negative. However, it is not statistically significant. A percentage increase in total natural resource rents increases ethnic tensions by 0.007 index points whereas a percentage increase in oil rents increases ethnic tensions by 0.006 index points. These increases are significant. The fixed effect model may not be completely resourceful at eliminating endogeneity. This informs the decision to employ the system GMM which forms the main identification strategy of this analysis. This is also a dynamic panel data method that tackles the endogeneity problem. The results from the system GMM are presented below. Both the one-step and two-step system GMM are estimated.

2.5.2.2 System GMM. Ethnic tensions are persistent over time. The degree of ethnic tensions in the previous period will likely be correlated with ethnic tensions in the following period. As a result, we control for this persistence by adding the lag of the dependent variable, ethnic tensions. This is consistent with Fearon and Laitin (2003) as well as some others. But the lagged value of the dependent variable is equally likely endogenous hence the introduction of the system GMM methodology. This methodology employs instrumental variables in its execution. The results of this approach are therefore interpreted as the causal impact of resource rents on ethnic tensions.

2.5.2.2.1 One-Step System GMM. As can be seen from table B.5 which reports the estimates from the one-step system GMM, the impact of all the different types of resource rents is positive and significant at conventional levels of significance. A percentage increase in total resource rents increases ethnic tensions by 0.02 index points. Oil rent tends to have a positive and insignificant effect on ethnic tensions while natural gas rents switches sign to a negative and significant coefficient. The directional consistency of the total resource rent is what is of utmost importance here. There is therefore the need to think of policies that could reduce the tensions generated by natural resource rent. The next table (table B.6) therefore contains the results of the possible mediation policies which we identified as the different types of decentralization. From table B.6, the introduction of the decentralization interaction tools do not affect the directional consistency of the total resource variable. Significance and consistency are observed in total resource rents on ethnic tension for all forms of decentralization except political decentralization. The interaction of political decentralization with total resource rent is not significant. Political decentralization according to this paper is not effective at reducing ethnic tensions generated by

resource rents. A percentage increase in total resource rents increase ethnic tensions by 0.05 index points. This is significant, but fiscal decentralization has a significant impact in reducing these tensions generated by resource rents. Fiscal decentralization could reduce these tensions by 0.25 points relative to the baseline level. Administrative decentralization on the other hand could reduce the 0.02 index points increment in the baseline level risk of tensions by 0.08 points (Table B.6, Appendix B). Giving subnational governments more fiscal and administrative autonomy could therefore foster more ethnic harmony and help reduce ethnic tensions.

2.5.2.2.2 Two-Step System GMM. We also estimate the two-step system GMM. In general, the two-step system GMM has the advantage of a smaller asymptotic variance relative to the one-step system GMM. In addition to that, statistical tests based on the two-step estimator are also asymptotically more powerful than those based on the one-step estimator (Hwang and Sun, 2015). The impact of total resource rent on ethnic tensions is still positive: a percentage increase in total resource rents also increase the risk of ethnic tensions by 0.02 index points just as in the one-step case. This effect is highly significant. The effect of oil rent is also positive and significant as can be seen from table B.7 in appendix B. The coefficient for natural gas however tends to be negative. The focus of the study, however, is on total resource rents so we proceed to investigate to what extent some form of decentralization could help mitigate ethnic tensions generated by resource rents. The results are presented in table 8. Fiscal decentralization again proves to be an effective policy tool at reducing ethnic tensions. For the model with political decentralization, the effect of total resource rent on ethnic tension loses its significance and therefore further analysis of whether political decentralization is effective at reducing such tensions is not necessary. Albeit positive, the effect is not significant. The final model from the

table is the one with administrative decentralization. The effect of resource rent on ethnic tension in that model is highly significant: a percentage increase in the total resource rent increases the risk of ethnic tension by 0.023 index points. Administration decentralization can reduce these tensions by 0.073 index points relative to the baseline.

2.6   Conclusion

Natural resources have undoubted potential in spearheading economic growth and development. Economic literature over the years has studied this topic extensively. The potential of natural resources is not always realized, and a myriad of factors could be responsible. These factors could range from political, social, economic, and even human factors. In this paper, we delve into a factor which we argue could thwart the efforts of natural resources for development: the scuffle over natural resource rent. Africa is home to the most abundant of natural resources but is unfortunately saddled with relatively weaker institutions. The economic implication of this is lack of a clear governance over natural resource revenue. As a result, certain people or groups of people tend to channel all their efforts into capturing these rents. This does not often go down well with other people because of perceived relative deprivation. The outcome of this situation is always tension and conflict of some sort.

The problem of disgruntlement and dissatisfaction over the distribution of natural resource rents is particularly problematic in Africa. High degree of ethnic fractionalization in the continent is argued to be responsible for this. When resources are in the territory of some particular ethnic group, they feel some form of entitlement to the resource. They expect to have some direct benefit from the resource which is often not the case. This may result in tensions and conflicts. A typical example is in Mozambique's Cabo Delgado region where gas fields have made the area inhabited mostly by northerners, a resource-rich war zone. The complexity of

ethnic disturbances in the resource-rich continent of Africa makes this study a very interesting one.

From the study, total resource rents have a positive and significant effect on the degree of ethnic tensions between and within countries. Although ethnic tensions and conflicts are closely related and often used interchangeably, the paper studies ethnic tension in its right while drawing attention to conflict as the result of heightened tensions. Since the grapple over resource rents has proven to be a potential wrecker of the inter-ethnic peace and harmony in African countries, the paper goes a step further to explore the potency of certain policies at quelling these tensions. Devolution of fiscal, administrative, or political autonomy has been argued in the decentralization literature to give grassroots a sense of inclusiveness in the governance process and to a large extent reduce uprisings and upheavals. Decentralization of various forms is therefore investigated as potential tools of mitigating ethnic tensions generated by resource rents. We find out that fiscal and administrative decentralization could reduce these tensions significantly in a within-country framework while only administrative decentralization is effective at reducing ethnic tensions from natural resource rent in a between-country setting.

With the scuffle over natural resource rent being a major threat to ethnic peace and harmony in Africa, policymakers should explore the possibility of giving more fiscal and administrative autonomy to subnational governments who have a closer presence with the numerous tribes that fall under their jurisdictions. This, as argued by this paper, could be one panacea to these tensions and subsequent conflicts that erupt across countries as a result of a grapple over resource rents and a perceived sense of relative deprivation by certain ethnic groups, especially those inhabiting territories where these resources are located.

Chapter 3

Fiscal Decentralization and the Unemployment Level

3.1   Introduction

The literature on fiscal federalism has long debated whether fiscally decentralized countries are inherently more economically and fiscally unstable. One viewpoint has been that fiscal decentralization weakens the ability of central authorities to maintain macro stability directly because they have less leverage on traditional fiscal tools such as expansionary spending, or indirectly because decentralized systems may be more exposed to soft budget constraints and debt bailouts (Prud'homme, 1995). A different view is that well designed fiscally decentralized systems that incorporate budgetary features such as low vertical imbalances and fiscal rules can contribute to the fiscal stability of a country (Baskaran, 2010; Neyapti, 2010, 2013; and Lago-Peñas et al. 2020). This paper contributes to this literature by analyzing the impact of fiscal decentralization on one of the most important dimensions of macroeconomic stability, the unemployment level, which is defined as the total level of unemployment in the country (all sectors and industries inclusive).

The potential impact of fiscal decentralization has gained wider recognition due to a continuing global trend towards decentralization among both developing and developed countries; while less decentralized countries have been leaning more towards fiscal decentralization, countries that are already decentralized embark on even further decentralization. Garman et al. (2001) found that of the 75 developing countries analyzed, more than 80 percent were undergoing some decentralization of authority by the beginning of the millennium. In the case of developed countries, the index of regional authority computed by Hooghe et al. (2010) for 42 democracies and semi-democracies reveals that 70 percent of the

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countries have decentralized since 1950. Countries decentralize for diverse reasons. However, the question remains as to whether decentralization can lead to heightened macroeconomic instability or not.

This overall question is still far from settled. For example, several recent studies find different outcomes about the impact of fiscal decentralization on macroeconomic stability. Feltenstein and Iwata (2005), Shah (2006) and Thornton (2007) found either a negative or insignificant relationship between fiscal decentralization and price stability which is one of the measures of macroeconomic stability. Price stability is captured by the level of inflation and thus a negative relationship of fiscal decentralization on price stability implies a reduction in the level of inflation. Martinez-Vazquez and McNab (2006) further reinforced this result finding a benign effect of fiscal decentralization on inflation reduction. In a country study for Pakistan, Iqbal and Nawaz (2010) found mixed effects of the impact of fiscal decentralization on macroeconomic stability, which they measured as a combination of the inflation and unemployment rate, depending on whether it was revenue basis or expenditure basis decentralization. Both within-country and cross-country studies in the literature have not produced conclusive and directionally consistent results.

This paper narrows down its focus to investigating its impact in the face of unemployment, which continues to be a very big problem in most countries. In fact, high levels of unemployment tend to be a significant feature of many economies, especially developing ones. We also make a sub-analysis where we decompose unemployment into its structural and cyclical components and investigate how fiscal decentralization tends to impact them differently.

Figure 3.1: Incidence of Unemployment Rates Across the World

Unemployment rate, 2017
Unemployment refers to the share of the labor force that is without work but available for and seeking employment.

No data 0% 2.5% 5% 7.5% 10% 12.5% 15% 20% 25% >30%
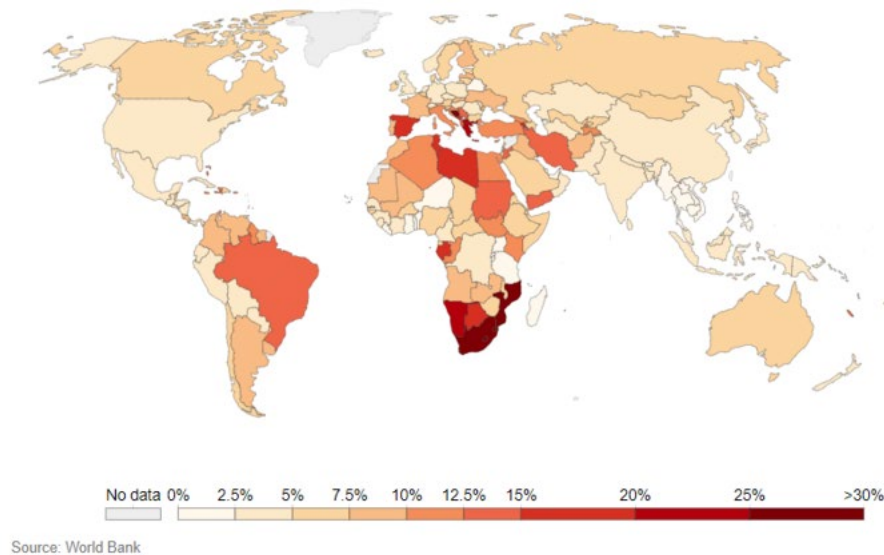
Source: World Bank

   Source: World Bank

   Although the ILO in a recent publication (World Employment and Social Outlook; 2020) suggests that overall global unemployment rates have seen a reduction in recent years, they do acknowledge the challenge in the definition and measurement of unemployment statistics across countries. For example, regionally, the ILO reports that only 4.5 percent of Sub-Saharan Africa's working age population is unemployed, with 60 percent employed. This impressive statistic may be attributable to the high level of informality in Sub-Saharan Africa and the strict definition of unemployment used by the organization (a person who has worked at least 10 hours in the past week is considered employed). The magnitude of the problem is therefore likely wider in the real world than is captured by the statistics.

   One difficulty in analyzing the impact of fiscal decentralization on unemployment is the potential presence of endogeneity because of reverse causation or omitted variables. For example, countries may decentralize, among other reasons, to develop their economies and

reduce unemployment.[15] Reverse causality is possible if the desire to tackle unemployment issues could impact fiscal decentralization in the model. While there is no evidence in the literature on the direct impact of unemployment on fiscal decentralization, unemployment might cause higher decentralization through other factors such as conflict and regional tension, especially if the unemployment is different across regions in the country (Berman et al., 2011; Cramer and Richards, 2011).

To address the issue of potential endogeneity we use an instrumental variable approach based on the geographic complexity index in Canavire et al. (2012). The rationale is that geographic complexity represents an exogenous factor varying across countries affecting the level of decentralization, while this geographic feature should not affect unemployment levels or vice versa. Using a panel dataset for the years 1991-2012 for some 51 countries and applying both fixed effects and instrumental estimation strategies, we find a consistent negative and significant relationship between the unemployment level and fiscal decentralization. Both revenue-based and expenditure-based decentralizations coefficients are negative and significant at the 5% level and a 10% increase in expenditure decentralization is expected to decrease the unemployment level by 0.64% whereas a 10% percentage increase in revenue decentralization should see unemployment fall by 0.55%.

The rest of the paper is organized as follows. Section 2 briefly discusses the choice of the unemployment level as the main dimension of macroeconomic stability to study. Section 3 reviews the previous literature and summarizes the theoretical arguments on the potential impact of fiscal decentralization on unemployment and derives the baseline hypotheses for the empirical

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[15] Most of the existing empirical papers on the impact of fiscal decentralization on macroeconomic stability have failed to address the potential endogeneity of fiscal decentralization or have done so in an unsatisfactory manner.

tests. Section 4 discusses the measurements of key variables, the data the empirical methodology. Section 5 presents the main empirical results and robustness checks, and Section 6 concludes.

3.1.1 Why Unemployment?

There are various ways to measure macroeconomic stability, including fluctuations in inflation, business cycles, unemployment and so on. While the impact of fiscal decentralization on inflation has been covered extensively, almost as much as for the impact on economic growth, the same cannot be said about unemployment. One main argument for the focus of this paper is that unemployment has direr consequences than high inflation or even slow economic growth, especially in developing countries where high levels of structural unemployment are prevalent. In many of these countries, population growth continues to outpace economic and job growth; even if some form of economic growth is recorded, it does not necessarily translate into the needed job creation. Thus, if fiscal decentralization could potentially help reduce structural unemployment, then it might be an effective policy that developing countries could give more consideration.

Unemployment is becoming a serious global threat especially in developing countries. The International Labor Organization (ILO) through its 2019 World Economic Outlook posits that the level of unemployment in a country depends on the level of informality and the income level. Countries with high levels of informality and low income tend to have low unemployment rates. The reason is that these countries lack 'social safety net programs and thus workers cannot afford to be unemployed for a long time. Therefore, people in these countries tend to accept low-paying jobs with little to no job security. The average level of unemployment in Africa at the end of 2019 was about 6.8%, with North Africa having a higher percentage of 11.8% compared

to the Sub-Saharan Africa rate of 5.9%. The level of informality is lower and income higher in North Africa relative to Sub-Sahara Africa. The unemployment rate in Latin America and the Caribbean stood at 8.0% at the end of 2019. Brazil had the highest challenge of the incidence of unemployment with a 12.2% rate which is about 50% higher than the regional average. The rate of unemployment in Asia and the Pacific at the end of 2019 was much lower at 3.6%.

This is consistent with the level of informality and income group argument by the International Labor Organization (ILO) through its 2019 World Economic Outlook. Therefore, any policy that targets reduction of formal sector unemployment or creation of jobs in the formal sector should be effective at lowering the general level of unemployment.

The question we investigate in this paper is whether fiscal decentralization is one of such policies. Given the simultaneous combination of the rapidly increasing population in many of these developing countries which threatens to exacerbate this problem of high unemployment even further, and the increasing trend towards adopting a more fiscally decentralized system of government, it becomes more relevant to investigate the relationship between fiscal decentralization and the unemployment level. Africa, which has some of the poorest countries in the world has been saddled with the issue of unemployment for decades.[16] There are other developing countries from other continents that face alarming rates of unemployment as well. Thus, if there is any policy that can help reduce the incidence of unemployment then that policy is worthy of pursuance and implementation.

The focus on unemployment is also justified because unlike inflation, which works through various indirect mechanisms to affect people's welfare, unemployment affects the citizenry directly. A person may not feel the direct impact of increasing inflation depending on

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[16] As can be seen from figure 1 above, the World Bank in 2017 estimated Africa to have the worst and most widespread problem of unemployment among all continents with some countries with rates in excess of 30%.

their personal consumption basket, while anyone unemployed faces its scourge directly no matter what they consume. That would explain why the subject of unemployment benefits has been the biggest topic of discourse in the United States and across the world ever since the coronavirus pandemic and its associated job losses started. From a macroeconomic point of view, a change in the consumption level of people who have lost their jobs can have dire consequences on economic growth. Governments of most developed countries have some form of unemployment insurance benefits to somewhat insulate workers from the direct effects of job losses and to smooth consumption expenditures, which is usually the largest component of GDP. Oreopoulos et al. (2008), Nicols et al. (2012) and Latsou and Geitona (2018) all argue that there are other effects of unemployment which might be more debilitating than lack of income. These may include health issues such as depression, low self-esteem, anxiety, and other mental health issues (Linn et al., 1985; Farré et al. 2018; Norström et al. 2019). In addition, many crimes are committed by individuals who are unemployed and living in poverty (Steven and WinterâEbmer, 2001; Chang, J. and Wu, C., 2012; Bausman and Goe, 2004). One thing that stands out from all these effects is that unlike inflation or slow economic growth, the consequences of unemployment do not necessarily need any indirect medium to take effect. They affect unemployed persons directly. The long-term impact of unemployment on consumption and the economy could be serious regardless of whether the unemployment is caused by cyclical, structural or even frictional forces.

3.2   Literature Review

As mentioned already above, the empirical evidence on the impact of fiscal decentralization on macroeconomic stability, and particularly on the unemployment level is

mixed. Although this paper focuses on the impact of fiscal decentralization on unemployment in its own rights, the scarcity of fiscal-decentralization-unemployment studies in the literature informs the scope of the literature review.

We first look at studies that have investigated the impact of fiscal decentralization on some form of employment creation or unemployment reduction. We then proceed to examine other studies on other areas of macroeconomic stability in the face of fiscal decentralization.

Fiscal decentralization, like most policies could yield benign, negative or no effects depending on the nature and system of implementation of the policy. The outcome of the policy could also depend on the outcome of interest. Muhammed et al. (2012) find that fiscal decentralization created more employment opportunities at the grassroots level, which helped to reduce unemployment in Pakistan. Besides this instance of a within country analysis, there have not been cross-country studies of fiscal decentralization and the overall unemployment rates in the literature to the best of our knowledge. However, Martinez-Vazquez and Yao (2009) examine the relationship between decentralization and public sector employment, a narrower concept than the overall unemployment level. They used panel data covering the time series period 1985 – 2005 and concluded that general government employment increases with fiscal decentralization. This is mostly because fiscal decentralization is associated with an expansion of aggregate public expenditures in social services, such as education and health, which are labor intensive. Public sector employment is an integral part of the total employment of a country. Creation of more such jobs could therefore lower the aggregate unemployment level. On top of that, one feature of public sector employment is that it is stable not moving much along with usual business cycles. Thus, public employment becomes an important avenue through which fiscal decentralization may affect the overall employment level. All other things the same, a

country that is more decentralized will tend to have a large share of the population in public employment, and which would also make overall employment less sensitive to business fluctuations. Despite the lack of literature on the direct impact of fiscal decentralization on general unemployment, there is a rich literature on the impact on other macroeconomic variables, which may often be thought as being correlated with unemployment.

Beyond the traditionally raised concerns about the macroeconomic stability dangers posed by fiscal decentralization (Tanzi, 1995; Prud'homme, 1995) and the counterarguments allaying those concerns (McLure, 1995; Sewell, 1996) more recent studies have empirically investigated these positions and have produced generally mixed results. And as already stated above, the results have not always been consistent. In a country case study for Pakistan, Iqbal and Nawaz (2010) find variable effects of fiscal decentralization on macroeconomic stability, this latter measured using the "Misery index" (the sum of the unemployment and inflation rate, as first proposed by Arthur Okun in the 1970s). They find that in Pakistan, the decentralization of revenue turned out to be more effective as a stabilizer than expenditure decentralization, albeit both displaying a positive impact. In the same vein, Martinez-Vazquez and McNab (2006) employ a panel data set for 52 developed and developing countries for the period 1972-1997 and find that decentralization might positively affect price stability in developing countries. Also, Baskaran (2012) finds that revenue decentralization is conducive to lower inflation. To measure revenue decentralization, this latter author uses a modified index of fiscal resources controlled by sub-national governments that accounts for inter-temporal variation of level of revenue autonomy. These studies strongly suggest that the nature of fiscal decentralization (revenue

versus expenditure) can be quite relevant.[17] In this regard, Eyraud and Lusinyan (2014),

analyzing the impact of vertical fiscal imbalances on overall fiscal performance in 20 OECD

countries find that that reducing fiscal imbalances—that is, closing the gap between sub-national

expenditure and own- revenues--, is associated with better fiscal outcomes for the general

government.[18] Rodden (2002) provides cross-country evidence that revenue autonomy and limits

on sub-national borrowing lead to smaller budget deficits.

Different types of decentralization tend to produce different outcomes. Fiscal

decentralization when it is poorly designed, for example with large vertical fiscal imbalances,

can naturally lead to negative effects on macroeconomic stability. The early experiences of

Argentina and Brazil with decentralization in the 1970s and 80s (Dillinger et al. 1999, Dillinger

and Webb 1999) clearly demonstrate that where each state or provincial government had its own

"central bank" from which they could borrow funds can lead to unstable macroeconomic

environments at the national level. There are also some empirical studies that have found that

general decentralization is associated with higher inflation. For example, Treisman (2000) set to

examine the effect of decentralization on the average inflation rate using a panel of 87 countries

for four-five years' periods in the 1970s and 1980s found an inverse (negative) relationship

between inflation and decentralization among developed and developing countries. De Mello

(2000) finds that that the degree of tax autonomy of sub-national governments might cause

intergovernmental coordination failures, increasing public deficit at the central and local

government levels.

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[17] Different authors have highlighted the virtuous circle implied by more revenue decentralization and a more symmetric system with low vertical fiscal imbalances (see Brennan and Buchanan (1980) and more recently Neyapti (2010), Ivanyna and Shah (2012) and, Martinez-Vazquez (2015)).

[18] Fiscal decentralization also has the potential of impacting fiscal discipline; for example, Rodden (2002) provides cross-country evidence that revenue autonomy and limits on sub-national borrowing lead to smaller budget deficit.

Overall, decentralization could help reduce structural unemployment directly through the creation of public sector employment and indirectly through the stimulation of economic growth (Martinez-Vazquez and Yao, 2009). A well-designed decentralization system may also be capable of indirectly reducing cyclical unemployment (Lago-Peñas et al., 2020).

3.3   Underlying Mechanisms and Hypotheses

The measured unemployment level in any country reflects both the long-term or structural unemployment component, and the shorter term, or cyclical unemployment component. Although the overall unemployment level comprises these different components, statistical data on unemployment levels are not separated into these components. The reaction of policies to these different components are empirically different. Mocan (1999) decomposes the overall unemployment level into its structural and cyclical components and finds evidence that those two components may have distinct patterns of movement and statistical properties. Structural unemployment can change over time due to changes in the demand for labor or due to changes in returns to nonwork. It can also change if the composition of the labor force changes. For example, if the share of teenagers in the labor force rises, this increases the structural rate because teenagers tend to have a higher unemployment rate than the prime-aged workers. An increase in worker mobility between sectors may also generate an increase in structural unemployment (Black, 1982; Lilien, 1982). The cyclical component on the other hand is influenced more by up and down turns in the business cycle.

The labor economics literature recognizes this reality and has over the years attempted to decompose unemployment levels into these components (Harvey; 1985, Baxter and King; 1999). Assessing whether unemployment is mostly cyclical or structural has implications for the policy

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response needed to address the unemployment problem (Arpaia et al., 2014). That literature informs our decision for how to explore the potential impact of decentralization on the different components of the aggregate unemployment level. Higher levels of fiscal decentralization may work through different mechanisms and channels affecting those two different types of unemployment. In the case of structural unemployment, higher levels of fiscal decentralization may work via two main effects: an expenditure composition effect and an expenditure level effect. The potential effect on cyclical unemployment is not too clear which we seek to unravel by this sub-analysis.

In terms of the expenditure composition effect, Martinez-Vazquez and Yao (2009) find, as mentioned above, that fiscal decentralization is associated with higher levels of public employment, and that this is mainly due to the fact that the more decentralized a country is the more the composition of expenditures shifts toward social services, including education and health, which in turn tend to be much more labor intensive than other areas of public spending.[19] There is additional evidence of fiscal decentralization leading to higher public sector employment in a within-country setting (Marques-Sevillano and Rossello-Villallonga, 2004 for the case of Spain, and Rajaman and Saha, 2008 for the case of India).

In terms of the level effect, it has been argued that the larger the public sector is in the economy (and that includes both decentralized government and the central government), the higher the overall level of employment. It is obvious that decentralization should increase the size of sub-national governments while generally we would expect some shrinking in the size of the national government; services and functions now provided by the decentralized governments were previously provided by the central government. But the net effect of fiscal decentralization

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[19] For evidence on the shifting composition of public expenditures under decentralization see Arze del Granado et al. (2016).

on aggregate government size cannot be automatically determined because it depends on the relative magnitude of its effects on the sizes of subnational and national governments (Jin and Zhou, 2002). Since individuals generally have more control over public decisions at the subnational levels than at the national level, they may empower the local public sector with an even wider range of functions and responsibilities when they are carried out by local levels of government. Thereby, the size of subnational (state and local) governments and the public sector can be larger, the more decentralized the fiscal decision-making system is (Oates and Wallis, 1988). In this regard, Jin and Zhou (2002) find that higher expenditure decentralization leads to larger aggregate and subnational government sizes. Stein (1999) also finds evidence that fiscal decentralization yields larger governments and public sector. These outcomes may be explained in the context of the theoretical model developed by Battaglini and Coate (2016). In their unemployment model, unemployment has an inverse relationship with the level of the public good produced in an economy, because no matter the level, the public sector is more service oriented and therefore more labor intensive (Poutvaara and Wagener, 2004, 2008; Alesina et al., 2000; Gordon, 2001; Pirttila and Tuomala, 2005).

In the case of the shorter term, or cyclical unemployment component, the role of fiscal decentralization may also be significant, although possibly more complex and controversial. The traditional orthodoxy in fiscal federalism is that subnational governments should not be involved in active macro-stabilization policies and that should be an exclusive function of the central government (Musgrave, 1959; Oates, 1972). Nevertheless, that has been challenged over the years, with numerous researchers arguing that subnational governments' direct involvement could promote and enhance macroeconomic stability (e.g., Gramlich, 1993; Rodden and Wibbels, 2002; Shah, 1994). And subnational governments do in fact often get actively involved

in countercyclical policies so leveraging central government actions in times of recessions, and there is evidence that well-designed fiscal decentralization systems can work to support the macro-stabilization objectives of the central government (Lago-Peñas et al., 2020).

3.4   Key Variables, Data, and Estimation

We define the key variables, data, and estimation techniques we employ in our analysis in this section.

3.4.1   Unemployment Level

Our main variable of interest, the unemployment rate, measures the share of the labor force who want to work but are not doing so, even though they are available for employment and actively seeking work. It is thus seen as an indicator of the efficiency and effectiveness of an economy to absorb its labor force and of the performance of the labor market (ILO, 2013).[20] Of course, another useful purpose served by the unemployment rate in a country, when available on at least an annual basis, is the tracking of business cycles.[21]

3.4.2   Availability of Unemployment Benefits or Assistance

In countries without a safety net with unemployment insurance and welfare benefits, the unemployed often must eke out a living as best as they can, often in the informal economy or in

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[20] Future starters, that is, persons who did not look for work but have a future labor market stake (made arrangements for a future job start) are also counted as unemployed, as well as participants in skills training or retraining schemes within employment promotion programs, who on that basis, were "not in employment", not "currently available" and did not "seek employment" because they had a job offer to start within a short subsequent period generally not greater than three months and persons "not in employment" who carried out activities to migrate abroad in order to work for pay or profit but who were still waiting for the opportunity to leave (ILO, 2013)

[21] When the unemployment rate is high, the country may be in recession (cyclical unemployment), and/or the country somehow may be unable to provide jobs for the available workers (structural unemployment).

informal work arrangements. In countries with well-developed social protection schemes or when savings or other means of support are available, workers can better afford to take the time to find more desirable jobs (ILO, 2018). This buttresses the view that the availability or lack thereof unemployment insurance or benefits is a determinant of the unemployment level.

That is, the presence of unemployment benefits (insurance) and social assistance programs affects the rate of unemployment; however, the direction of the impact is not completely clear. The existence of a support system may make the unemployed less inclined to look for job matches. Moreover, unemployed persons might refuse certain job offers and wages they would naturally have accepted in the absence of this support system. In this regard, Barro (2010) found that unemployment benefits raised the unemployment rate by 2%; however, this finding has been criticized (Rothstein, 2011). It is more generally agreed that unemployment insurance may allow for improving the quality of matches between workers and firms (Marimon and Zilibotti, 2001), and thus even if unemployment benefits increase unemployment duration, the duration of subsequent employment tends to be longer (suggesting better job match quality). Nonetheless, there is no consensus on the impact of unemployment benefits on the level of unemployment; it could be either positive or negative according to empirical studies (Card and Levine, 2000; Nekoei and Weber, 2017; Farooq et al., 2020). In the empirical analysis we use a dummy variable to control for the availability or unavailability of unemployment benefits or insurance in each country.

3.4.3   *Fiscal Decentralization*

Fiscal decentralization is the process of delegation of fiscal responsibilities to the sub-national governments, involving devolution of powers to tax and spend along with arrangements

for correcting the imbalances between resources and obligations (Malik et al. 2006). To measure the extent of decentralization we use two conventional and frequently utilized measures from the Government Financial Statistics (GFS) database of the International Monetary Fund: (1) the ratio of total subnational expenditures to general government expenditures, and (2) the ratio of total subnational revenues to general government revenues. The potential flaws associated with these two measures have been frequently discussed in the literature (level of actual autonomy, missing values, etc.), but as Letelier (2005) notes, there is no evidence of a systematic measurement error across countries in the GFS data.

The reason to use expenditure and revenue decentralization measures is that they capture different dimensions of fiscal decentralization, and their impact is therefore potentially different (Martinez-Vazquez and Timofeev 2010). While both measures of decentralization often go hand in hand, using both measures in one equation is likely to lead to multicollinearity issues. Besides our main independent variable, we also control for the inflation rate, because of its potential effect on the aggregate demand level and thus the unemployment rate. Other control variables include the availability of unemployment benefits or social insurance systems, discussed above, and trade openness, computed as the sum of imports and exports as a percentage of GDP. This follows from work in the literature such as Muhammed et al. (2012) and Martinez-Vazquez and Yao (2009).

3.4.4   *Potential Endogeneity Issues*

The primary interest of this paper is to find the exogenous causal effect of fiscal decentralization on unemployment. However, there is a possibility that there exists some form of endogeneity caused by unobserved heterogeneity (omitted variable bias) or reverse causality.

The latter is possible if the desire to tackle unemployment issues could impact the level of fiscal decentralization adopted in each country; for example, conflict and regional tensions may lead to higher decentralization especially if the unemployment is different across regions in the country (Berman et al., 2011, Cramer and Richards, 2011).

Canavire-Bacarreza et al. (2017) explore the empirical relevance of geography (measured along several dimensions including elevation, land area, and climate) as an instrument for fiscal decentralization; the attraction is that geography is truly exogenous, while there is a logic that more geographically diverse countries tend to have greater heterogeneity in their populations, including their preferences and needs for public goods and services provision. They find a positive and strong correlation between geographical factors and fiscal decentralization and that the interaction of geography with the development of infrastructure in transportation, communications, etc. tends to reduce, but only slightly, the effect of geography on decentralization. We therefore use Canavire-Bacarreza et al. (2017) Geographical Fragmentation Index (GFI) together with country size as instrumental variables for fiscal decentralization.[22] The data for the GFI are from NASA's Earth Observing System Data and Information System (EOSDIS) hosted by The Center for International Earth Science Information Network (CIESIN) at Columbia University. The data are available for years 1990, 1995, 2000 and 2010. Due to very low variation of GFI over time, we use the 1990 value as the value for years 1990-1994, 1995 value for years 1995-1999, 2000 value for years 2000-2009 and finally, the 2010 value is used for the years from 2010-2012.

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[22] Other studies have used a variety of instrumental variables to address the issue of the endogeneity of fiscal decentralization in the context of economic growth. For example, Akai and Sakata, (2002) and Bodman et al.(2009) use initial value of the independent variable while other studies have used lagged independent variables as IVs (Iimi, 2005; Enikopolov and Zhuravskaya, 2007; Gemmel, Kneller and Sanz, 2013). It would be possible to borrow such approaches in this work as well. However, fiscal decentralization institutions tend to be quite stable over time and therefore susceptible to auto-correlation, which means that initial or lagged values are likely to be just as endogenous.

Finally, we note that there is no apparent mechanism through which physical geography directly affects unemployment, nor there is empirical evidence in the literature that might point to such a relationship.

3.4.5 Data

The other data for the empirical analysis were collected from diverse sources. Appendix A1 shows the definition and the source of each variable. As already pointed out, the data for the main regressor, fiscal decentralization, were obtained from the International Monetary Fund GFS database. If a country had missing data for most of the years in the covered period, it was dropped from the analysis. For those countries that had a few missing values throughout the period, imputed values, using the method of the average of immediate non-missing years, were added. The World Development Indicators of the World Bank Group were used for control variables such as trade openness and inflation, with the full list of them discussed below. Data for the unemployment rate were collected from the International Labor Organization (ILO).[23]

3.5 Empirical Approach

As previously discussed, we use an instrumental variable approach. Therefore, the estimation of the impact of fiscal decentralization on unemployment proceeds in two stages:

First Stage: $\quad FD_{it} = \beta_0 + \theta\, X_{it} + \gamma Z_{it} + \varepsilon_{it}$ ....(1)

Second Stage: $U_{it} = \rho_0 + \sigma\, X_{it} + \eta F\ddot{D}_{it} + \mu_{it}$ ....(2)

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[23] While WDI has similar measures on unemployment and both sources had the same values for all years that had available data, however, the ILO dataset had fewer missing values over the covered period.

Where FD_{it} is the original measure of fiscal decentralization and $\ddot{FD}_{it}$ is the predicted value from the first stage, U_{it}, is the unemployment rate, X_{it} is a vector of control variables, including the education rate to capture the impact that education has on unemployment.[24] Since the various levels of education may have different impacts on the ability to find and maintain employment, we identify the education rates into basic, intermediate and advanced.

The vector Z_{it} in equation (1) contain the geographic IVs, also discussed above. The coefficient of interest of the study is η. It measures the causal relationship between fiscal decentralization and unemployment rate. It captures the percentage point change in unemployment associated with one percentage point change in the fiscal decentralization rate (either revenue or expenditure). It is therefore the elasticity of the unemployment rate with respect to fiscal decentralization.

3.6   Results

We present the results from our model estimation in this section. We compare results from the simple OLS with the instrumental variable (IV) results.

3.6.1   *Simple OLS and IV Results*

The baseline results for the estimation of the impact of fiscal decentralization on unemployment using OLS and an IV approach are presented in Table 3.1. The naïve OLS results we argue are biased due to potential endogeneity of fiscal decentralization. We therefore present the results from the IV model vis-à-vis the OLS estimates to ascertain how the results change

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[24] Empirically studies have shown that education increases the chance of an unemployed person finding a job, other things equal. Research has also shown it to reduce the time required to find new employment. Craig and Xueda (2011) find that education significantly increases the re-employment rate of the unemployed, particularly large impacts are found in the neighborhoods of 12 and 16 years of schooling.

after tackling endogeneity. As reported in the first two columns of table 3.1, for the OLS approach, we find a negative and insignificant impact of both measures of fiscal decentralization on the unemployment rate. The last two columns in the table show that using an IV approach the results for decentralization are strengthened and become statistically significant. There is the directional consistency from the naïve OLS model, but significance is only gained after tackling endogeneity using instrumental variables. Thus, our results support those in Muhammad et al. (2012) and Iqbal and Nawaz (2010) for the case of Pakistan. For the other control variables, the positive and significant coefficient for inflation is similar to those previous findings in the unemployment literature (Phillips, 1958). The positive coefficient of the dummy variable indicating the availability of unemployment benefits and/or social assistance lends support to those in Barro (2010). The relationship between unemployment and the level of education attainment across people in the labor force appears to be positive; this is a counterintuitive result per a large part of the labor economics literature (Applegate et al., 2014; Cutler et al., 2015) however, several previous studies have found this positive relationship (Li et al., 2014; Bairagya, 2015). This could be due to the confounding effect of education being endogenous (Riddel and Song, 2011).

Table 3.1: Estimation of the Impact of Fiscal Decentralization on Unemployment

VARIABLES	OLS		IV	
	Expenditure	Revenue	Expenditure	Revenue
Expenditure Decentralization	-0.005		-0.070**	
	(0.007)		(0.028)	
Revenue Decentralization		-0.009		-0.058**
		(0.009)		(0.026)
Inflation	0.029*	0.029*	0.018	0.024

	(0.016)	(0.016)	(0.026)	(0.025)
Trade Openness	-0.004	-0.005	-0.020*	-0.016*
	(0.006)	(0.006)	(0.011)	(0.009)
Labor force with Basic Education	0.267***	0.271***	0.315***	0.315***
	(0.082)	(0.082)	(0.102)	(0.102)
Labor force with Intermediate Education	0.428***	0.427***	0.380**	0.401***
	(0.129)	(0.129)	(0.152)	(0.148)
Labor force with Advanced Education	0.124	0.121	0.082	0.091
	(0.081)	(0.082)	(0.090)	(0.083)
Dummy for Unemployment benefit	0.996*	1.000*	1.397**	1.091*
	(0.572)	(0.557)	(0.692)	(0.561)
Dummy for OECD	0.071	0.076	0.742	0.488
	(0.471)	(0.463)	(0.533)	(0.501)
Constant	-0.248	-0.159	1.409	0.914
	(0.824)	(0.814)	(1.299)	(1.225)
Observations	550	550	507	507
R-squared	0.874	0.875	0.820	0.852

Robust standard errors in parentheses

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

The results from using the IV approach are reported in the last two columns of Table 3.1. Having controlled for potential endogeneity, we discuss the effects of fiscal decentralization on unemployment. A more detailed table with first-stage regressions can be found in the Appendix (able C.5). We find yet again a negative and now significant impact of fiscal decentralization on the rate of unemployment for both measures of fiscal decentralization. In fact, the coefficients are larger than those under the simple OLS. With the IVs, a 10% increase in expenditure decentralization is expected to decrease the unemployment level by 0.70 percent whereas a 10% increase in revenue decentralization should see unemployment fall by 0.58 percent. After correcting for the endogeneity issue, the impact is much more economically profound, and more importantly, statistically significant. Since IV results are arguably less biased, OLS results show

that the endogeneity issues lead to downward biased estimates in absolute terms and can be to some degree considered a lower bound of the effect.

A look at the first stage results for the IV estimation (see table A.3 in the Appendix) shows that the instruments are positive for both measures of fiscal decentralization. They are also significant which is consistent with Canavire-Bacarreza et al. (2016). A confirmation of the adequate strength of these instruments is through an econometric statistical criterion. Since we use country clustered standard errors, we refer to the Kleibergen-Paap Wald rk F statistic of both measures of fiscal decentralization. The Kleibergen-Paap Wald rk F statistic in the case of expenditure decentralization is 12.024 and 10.57 under the revenue basis decentralization. Both values are higher than F test value at the 5 percent level of significance. Therefore, based on the Stock and Yogo rule of thumb, we can reject the claim that the instruments are weak in both the expenditure and revenue-basis decentralization (Stock and Yogo, 2005). The Cragg-Donald Wald F statistic is also 43.38 for the expenditure-basis decentralization and 60.63 for the revenue-basis decentralization. This further reinforces the justification of the instruments as strong instruments from an econometric point of view.

3.7   Potential Heterogeneity of the Impact of Fiscal Decentralization

Fiscal decentralization is more efficient and effective in the presence of well-functioning institutions. These institutions ensure that the interests of political agents are aligned with those of the public (Enikolopov and Zhuravskaya, 2007). The institutions ensure accountability of local public officials whose responsibilities likely increase with increased levels of fiscal autonomy. In the absence of accountability, the presence of strong economic incentives at the local level may result in corruption, provincial protectionism, and capture by vested interests

(Tanzi and Davoodi, 1998; Sonin, 2003, Bardhan and Dilip, 2000). The strength of decentralized institutions at both the national and sub-national level varies across countries. If indeed the findings in the literature of institutions being a sufficient condition for effective fiscal decentralization is anything to go by, it is enough justification for the tendency of less developed countries to have lower levels of fiscal decentralization compared to developed countries. Developed countries tend to have better and well-functioning institutions in their subnational governments.

OECD member countries most of whom are developed have well organized unemployment benefit schemes and social assistance programs. Apart from these obligatory government assistance programs, these countries also have unemployment insurance schemes (Esser et al., 2013). During the 1980s, it was often argued that unemployment benefits in some European countries were one of the causes of *Eurosclerosis,* referring to the persistently high unemployment that afflicted several European economies. As we have seen in the review of the literature section, the extent of unemployment benefit system has been shown empirically to affect the rate of unemployment, be it negative or positive (Barro, 2010; Rothstein, 2011; Marimon and Zilibotti, 2001 and Tatsiramos and Ours, 2014). Informed by these dynamics, we include a dummy for OECD countries in our regression estimation. However, this differentiation proves to be statistically insignificant (see Table 3.1).

3.8   Robustness Checks

We provide several robustness checks of the main results. To address any potential nonlinear relationship between fiscal decentralization and unemployment rates, we introduce the log form for the unemployment rates (the dependent variable). We do not find any plausible

evidence of non-linearity. Again, here, we find that the instruments are valid and non-weak in the first stage. Fiscal decentralization still has considerable impact on the reduction of unemployment rates of countries (see Table C.3).

Also, we use another measure of decentralization, the regional authority index (RAI) produced by Hooghe et al (2016). This is a test of the strength of our results to alternative measures of decentralization. Our results are robust to this specification. The impact of decentralization on unemployment remains significant and directionally consistency as can be seen from table C.7 in the appendix.

Additionally, we explore the potential of a joint impact of revenue and expenditure decentralization. Although expenditure and revenue decentralization frequently go hand in hand, they address and measure fundamentally different aspects of fiscal decentralization and capture different mechanisms of the impact of fiscal decentralization on economic growth (Martinez-Vazquez and Timofeev, 2010). We run IV regressions using the alternative decentralization measures as one of the controls. From the results (table A4), when we include the other fiscal decentralization variable in the first and second stages, we find out that that fiscal decentralization variable is highly significant in the first stage while none of the decentralization variables is significant in the second stage. Following the argument of Canavire-Bacarreze et al. (2020), this result suggests that overall, fiscal decentralization efforts go hand in hand, and when a country decides to decentralize, it decentralizes both expenditure and revenue components of the budget, although most often there is more expenditure than revenue decentralization. At the same time, because of the high correlation between the two measures of decentralization, the second stage results suffer from multicollinearity and do not yield any meaningful results. In

other words, while they are highly correlated, it makes sense to study them separately to identify the separate mechanism through which fiscal decentralization affects unemployment.

Last, we run checks on how sensitive our baseline results are to the inclusion of new covariates. Specifically, we introduce the exchange rate and gross domestic product as covariates and re-estimate our baseline model. The results are reported in table A6 in the appendix. Both revenue and expenditure decentralizations still have a significant effect on unemployment reduction.

We use another measure of decentralization, the regional authority index (RAI) produced by Hooghe et al (2016). This is a test of the strength of our results to alternative measures of decentralization. Our results are robust to this specification. The impact of decentralization on unemployment remains significant and directionally consistency as can be seen from table C.7 in the appendix.

3.9   Structural Versus Cyclical Unemployment

The long-term impact of unemployment on consumption and an economy can be different whether the unemployment is caused by cyclical or by structural reasons. In our empirical analysis we try to disentangle cyclical unemployment from structural unemployment. Cyclical unemployment has to do with unemployment due to deficiency of effective demand. This is the type of unemployment experienced during recessions or depressions. In contrast, structural unemployment occurs as a result of a mismatch between the skillset of unemployed persons and the demand for workers with specific qualities. Stated differently, this type of unemployment may occur if the demand for one kind of labor is expanding while that of another kind is declining. This could be due to changes in industrial composition or advancement in

technology. Workers are not able to switch across industries seamlessly because of lack of the requisite skills.

The impact of fiscal decentralization on the different types of unemployment is bound to differ since subnational governments are constrained to some extent especially in the conduct of countercyclical policies. Following Mocan (1999), we decompose our aggregate level unemployment into its structural and cyclical components. We use both a Baxter-King (BK) and a Hodrick-Prescott (HP) decomposition. From table C.8 and C.9, although there is directional consistency (negative relationship between unemployment types and fiscal decentralization), the impact on cyclical unemployment is not statistically significant. Fiscal decentralization, however, has a statistically significant impact on structural unemployment across both decomposition techniques except in the revenue basis decentralization under the BK method. These results reflect the fact that subnational governments generally do not have control over countercyclical policy to impact cyclical unemployment. More control over their revenue and expenditure levels is therefore likely to impact the trend and long-term structural component of aggregate unemployment.

3.10 Conclusion

Unemployment is one of the major macroeconomic issues that is prevalent in both developed and developing countries. Structural unemployment has been argued to be more prevalent in developing countries and thus, the governments of these countries try to implement various policies that could create avenues to decrease it. Therefore, any policy that results in the reduction of the unemployment level tends to be considered seriously. There have been arguments in the literature that fiscal decentralization can act as a mechanism to improve

macroeconomic stability. On the other hand, there is an argument that it may impede the ability of central governments to intervene in the economy with stabilization policies while subnational governments may tend to act recklessly in their monetary policy. The long-standing issue is, therefore, finding the optimal level of monitoring and control from the central government without encroaching on the fiscal autonomy of subnational governments. The results obtained in this paper offer support to the side of the literature which finds that fiscal decentralization contributes to improved macroeconomic stability using unemployment rate measures. Subnational governments may not have enough control to effect countercyclical policies, but increased level of autonomy has shown to affect the structural component of aggregate unemployment. Our sub-analysis shows that fiscal decentralization has a significant effect on structural unemployment.

The focus of this paper is to research the presence of a causal relationship between fiscal decentralization and unemployment at the country level. Not much has been written in the literature on the relationship between fiscal decentralization and unemployment, and the few papers written on this subject are potentially flawed because they typically have ignored the issue of endogeneity.

As one potential solution, we use instrumental variables based on geography - geographic fragmentation index and country size whose validity are justified. We find that both measures of fiscal decentralization have a significant impact in reducing unemployment. The overall estimation shows a negative relationship between unemployment and fiscal decentralization. This further goes on to buttress the school of thought that higher levels of fiscal decentralization contribute to better macroeconomic stability (Martinez-Vazquez and McNab, 2006; Lago-Peñas et al., 2020).

What could be the mechanism through which fiscal decentralization impacts unemployment? We offer an explanation from a subnational point of view and link it to an aggregate perspective. The argument is that the increased level of fiscal autonomy is accompanied by increased level of economic activity within subnational regions. This increased activity calls for more hands and manpower. This means that hitherto unemployed people will have access to new job avenues and job openings. This is in line with the first underlying mechanism we discussed above. The increased autonomy could also mean that, with more fiscal autonomy subnational governments are able to target the right places where investments should go (in accordance with the second hypothesis). This is also likely to result in more job openings. More fiscal autonomy with regards revenue and expenditure means subnational governments can run specialized intervention programs such as help for struggling entrepreneurs within their locality to shore up their businesses. Again, this will likely result in more job avenues.

Such help arguably tends to be difficult to obtain in a centralized system where a series of red tapes and nepotism is the order of the day. All these happen to bring a reduction in the unemployment rate at an aggregate level. In fact, these new job openings can get the right supervision at a subnational level, which ensures their survival. Our study espouses fiscal decentralization as an effective policy tool for countries that seek to tackle the problem of unemployment. The fiscal decentralization literature is normally expanded to take into consideration the design and conditions under which it is effective. This study narrows down the focus and answers an important empirical question. Policymakers should therefore consider fiscal decentralization as one of the potential solutions to the problem of high unemployment rate.

Appendices

Appendix A. Appendix for Chapter 1

Figure A.1: Ghana's Annual Oil Production (in Millions of Barrels)
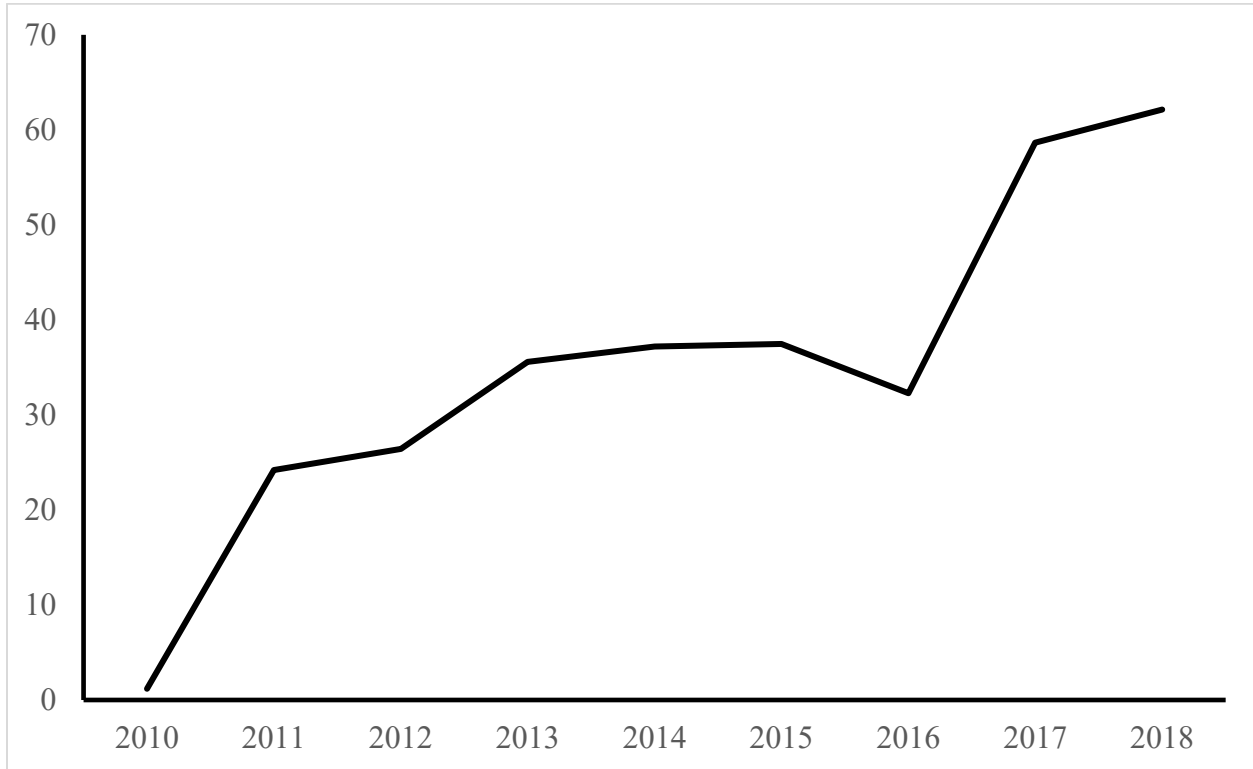
Note: The decline in oil production reflects the 34-day shutdown of the Jubilee Field, which is the largest oil field in Ghana, for maintenance from the 31st of March to the 3rd of May 2016. Data is compiled from the PIAC reports.

Figure A.2: Ghana's Oil Revenue in Current U.S. Dollars (2011-2018) in Millions
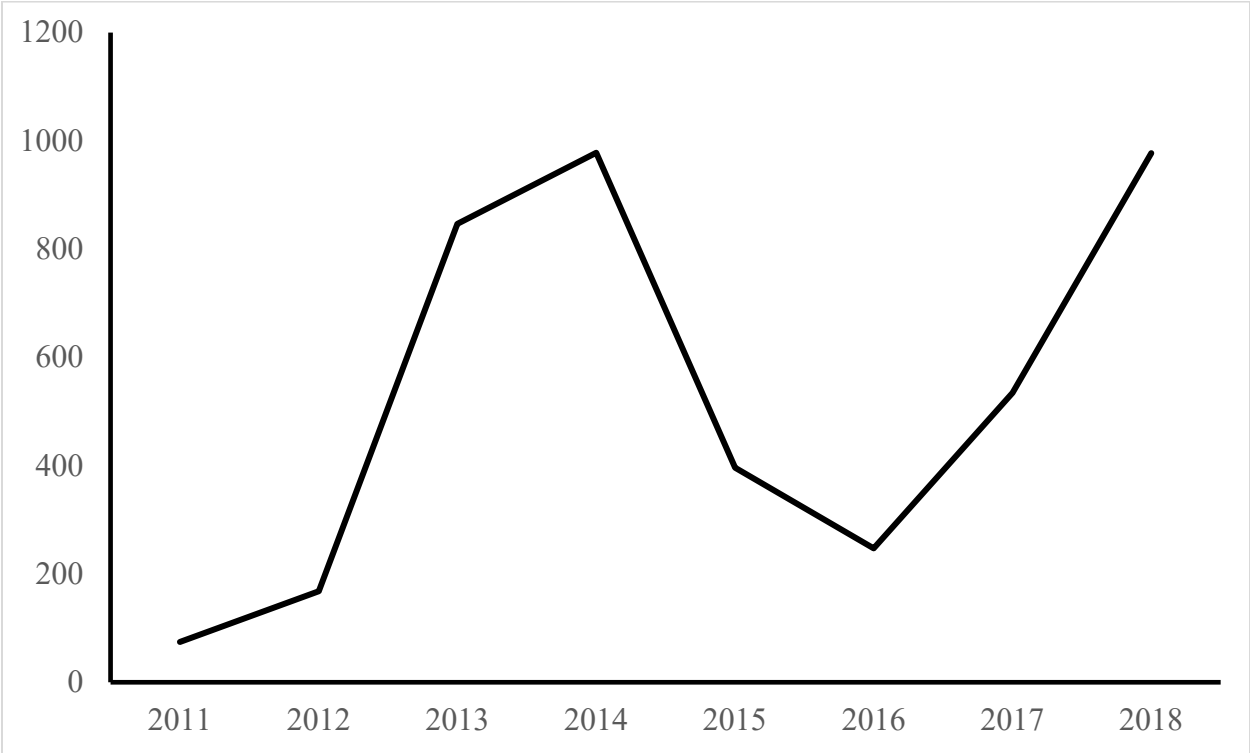
Note: Although production only significantly fell in 2016, the diagram above shows an entirely different trajectory in terms of oil revenues. Oil revenues continued to increase from 2011 until 2014. The explanation for the sharp decline in oil revenue from 2014 through to 2016 was due to the precipitous fall in oil prices that began in 2014. This is the problem of oil revenue volatility due to the instability of global oil prices. Data is compiled from the annual PIAC reports.

Figure A.3: Comparison of Time Trends in Gross Domestic Product per Capita for Ghana and a Synthetic Ghana (1998-2018)
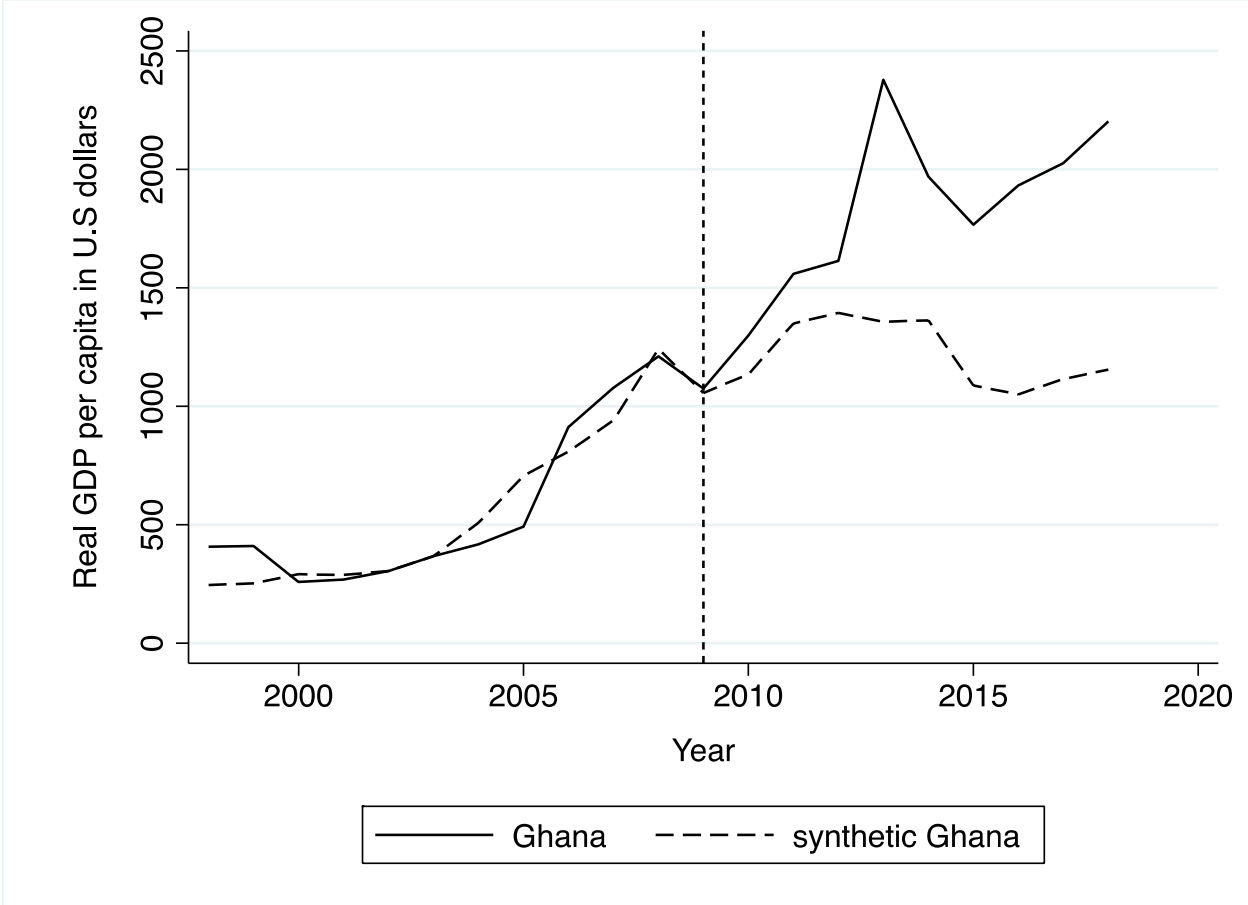
Notes: Figure 3 displays Ghana's Gross Domestic Product per capita and its synthetic unit for the period 1998-2018. The synthetic Ghana GDP per capita mimics the Ghana GDP per capita well for the pre-discovery period. This good fit demonstrates that we do not need to extrapolate outside the support of the data for the donor pool. Real Gross Domestic Product per capita is measured in current U.S dollars in purchasing power parity (PPP) terms

Figure A.4: Fiscal Deficit as a Percentage of GDP, 2000-2014
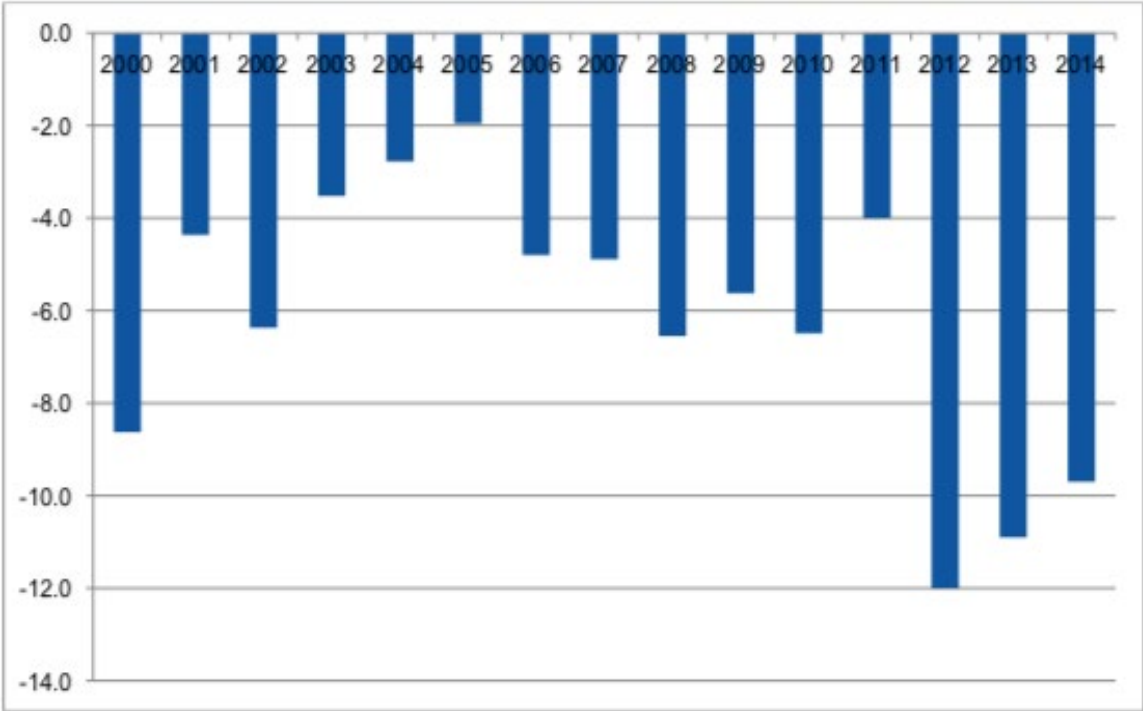
Source: Data from Ministry of Finance and Economic Planning, Ghana.

Diagram is from Bawumia and Halland (2017)

Figure A.5: Placebo Test: Trends in Gross Domestic Product per Capita for the Cote d'Ivoire and a Synthetic Cote d'ivoire
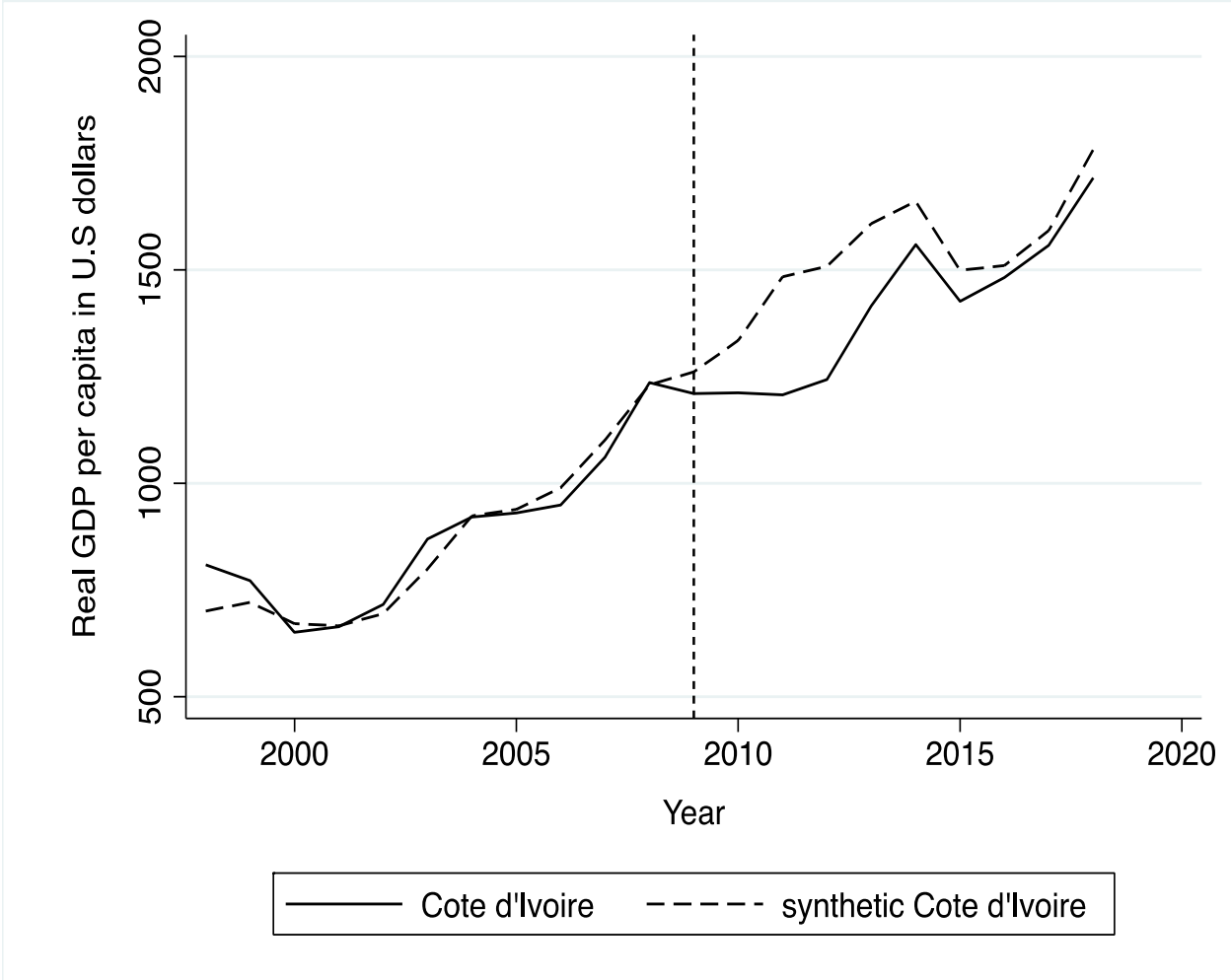
Note: The highest weight is assigned to Cameroon with Zimbabwe and Liberia following closely.

Figure A.6: Leave-one-out of the Distribution of Positive Synthetic Control Countries
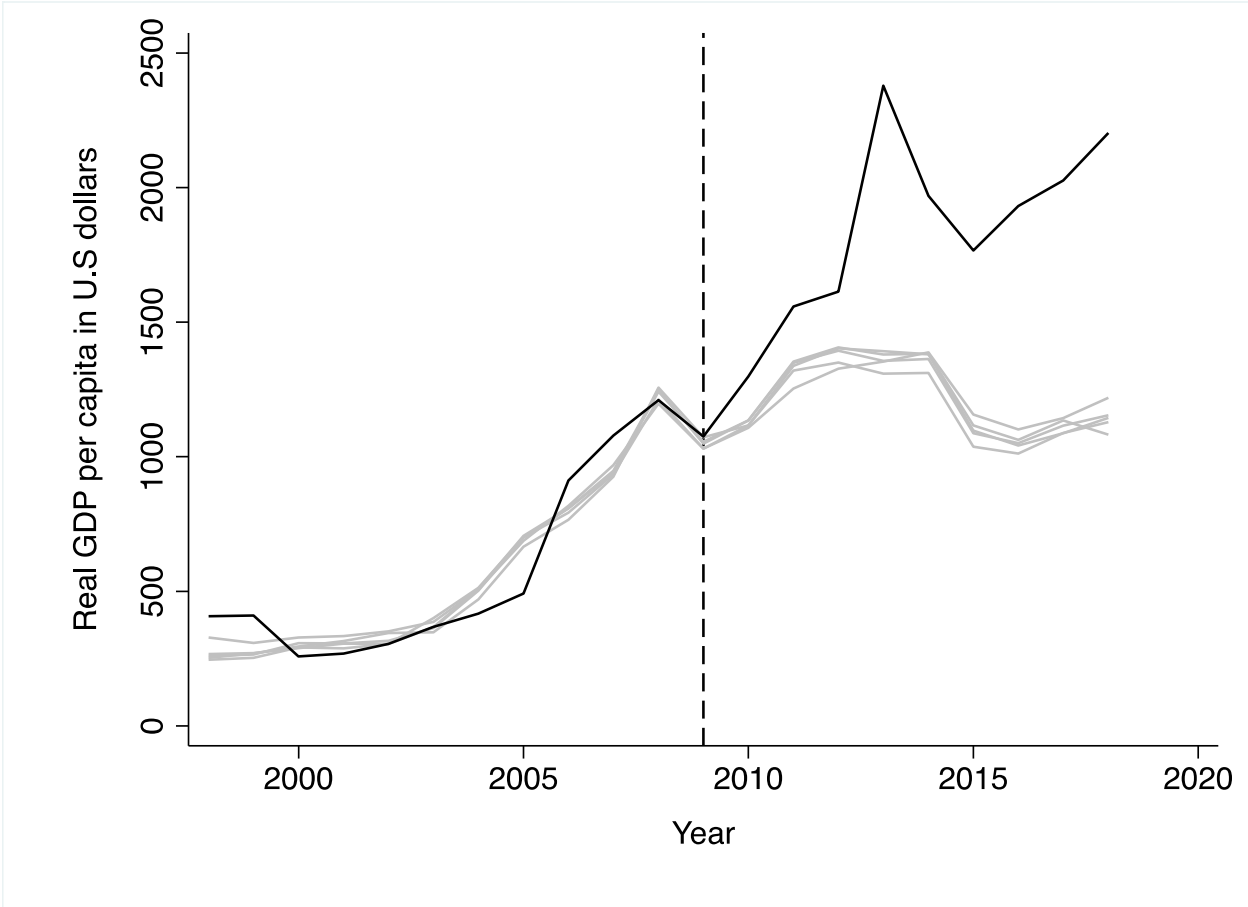
Note: This is a robustness test of how our results are driven by any single country in the list of countries that received positive weights in our baseline model. By iteratively leaving out a country, we sacrifice some goodness of fit. However, this check is very important to ascertain to what extent the results are driven by any single country. This graph shows that the results are robust to the exclusion of any single country.

Figure A.7: Sparse Synthetic Control of Positive Donor Countries
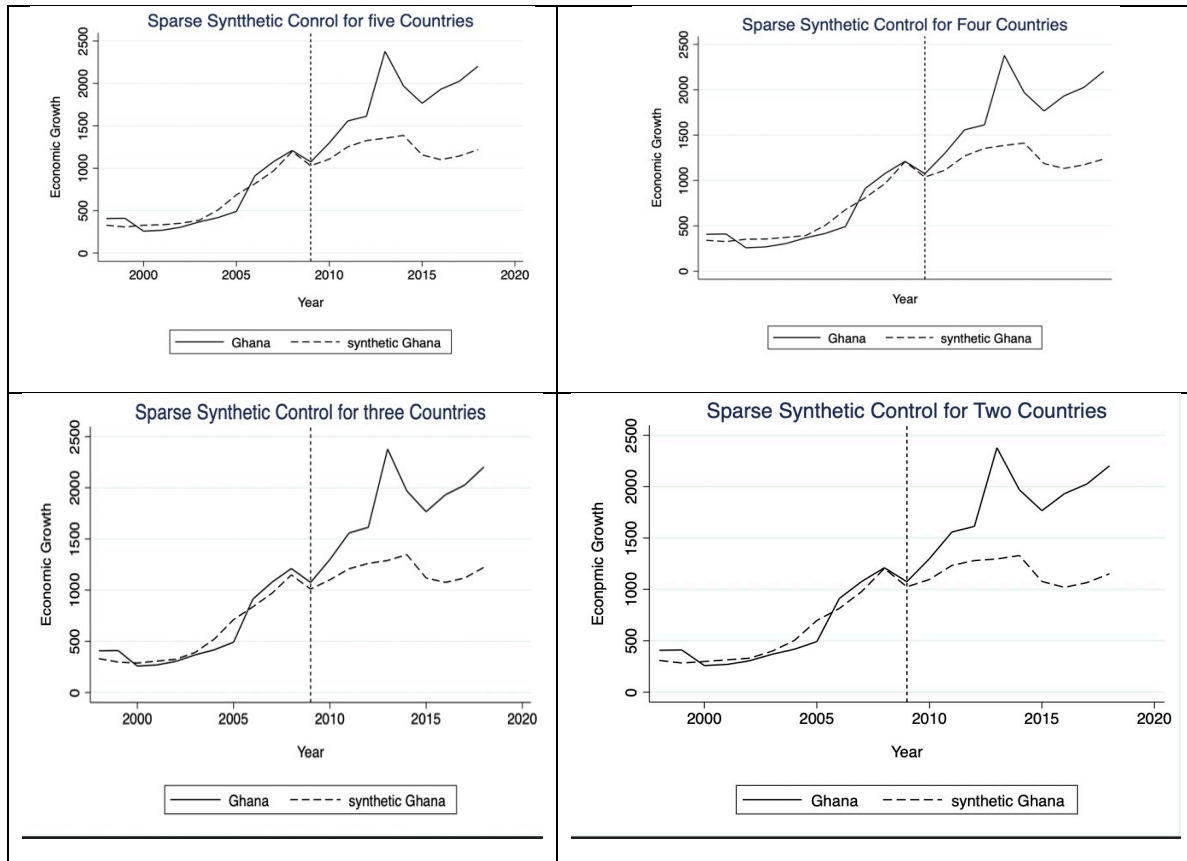
Note: These graphs attempt to test the argument of sparsity vs goodness of fit argument. Researchers have had diverse opinions about having a few or many units from the donor pool in the construction of the synthetic controls. Sparse synthetic controls, that is, synthetic controls that involve a small number of comparison countries have been argued to aid in the interpretation of findings. Reducing the number of units in the synthetic control may, nonetheless, impact the extent to which the synthetic control is able to fit the characteristics of the unit of interest (Abadie et al. 2015). This is basically a trade-off between goodness of fit and sparsity. This diagram performs that test and does not find evidence of significance loss of goodness of fit.

Figure A.8: Dynamic Effects of Oil Discovery on Ghana Compared to Placebo Studies on the Other 40 Countries in the Donor Pool.
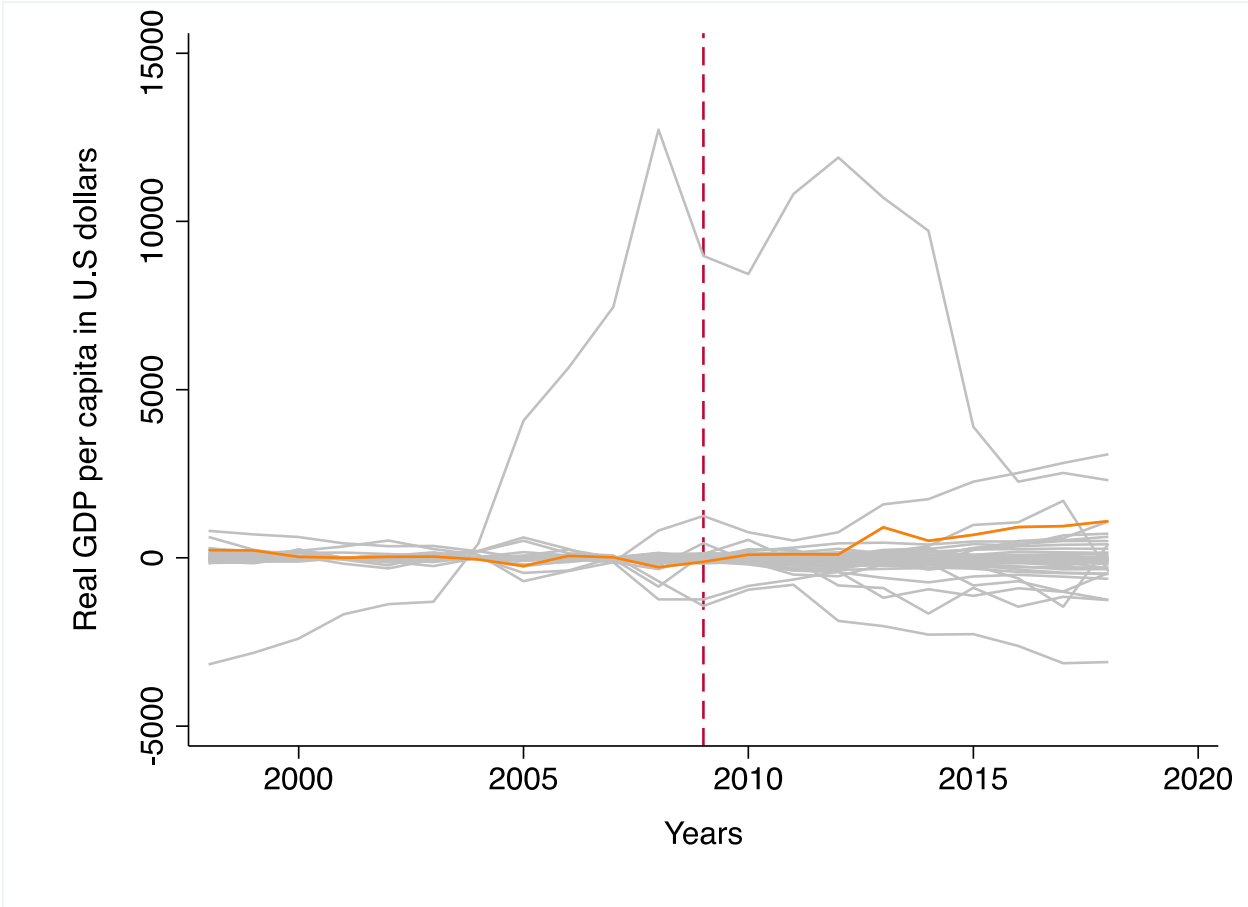
Figure A.9: Comparison in the Time Trend of the Unemployment Rates for Ghana and a Synthetic Ghana (1998-2018)
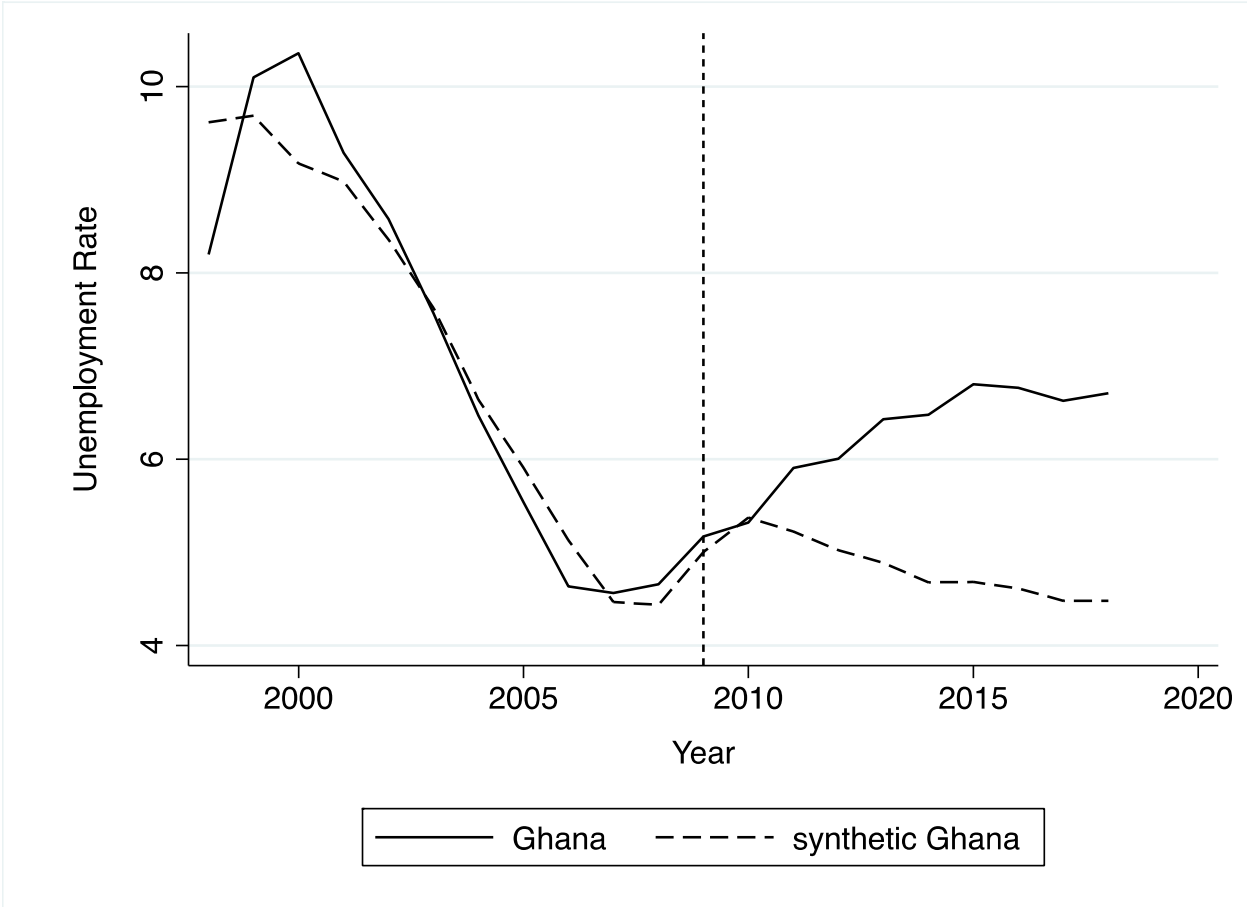
Note: Evolution of the unemployment rate in Ghana and its synthetic control. The dashed vertical line identifies represents the year of our treatment which is set to 2009.

Figure A.10: Comparisons of the Employment Rates in the Agricultural Sector of Ghana and the Synthetic Ghana
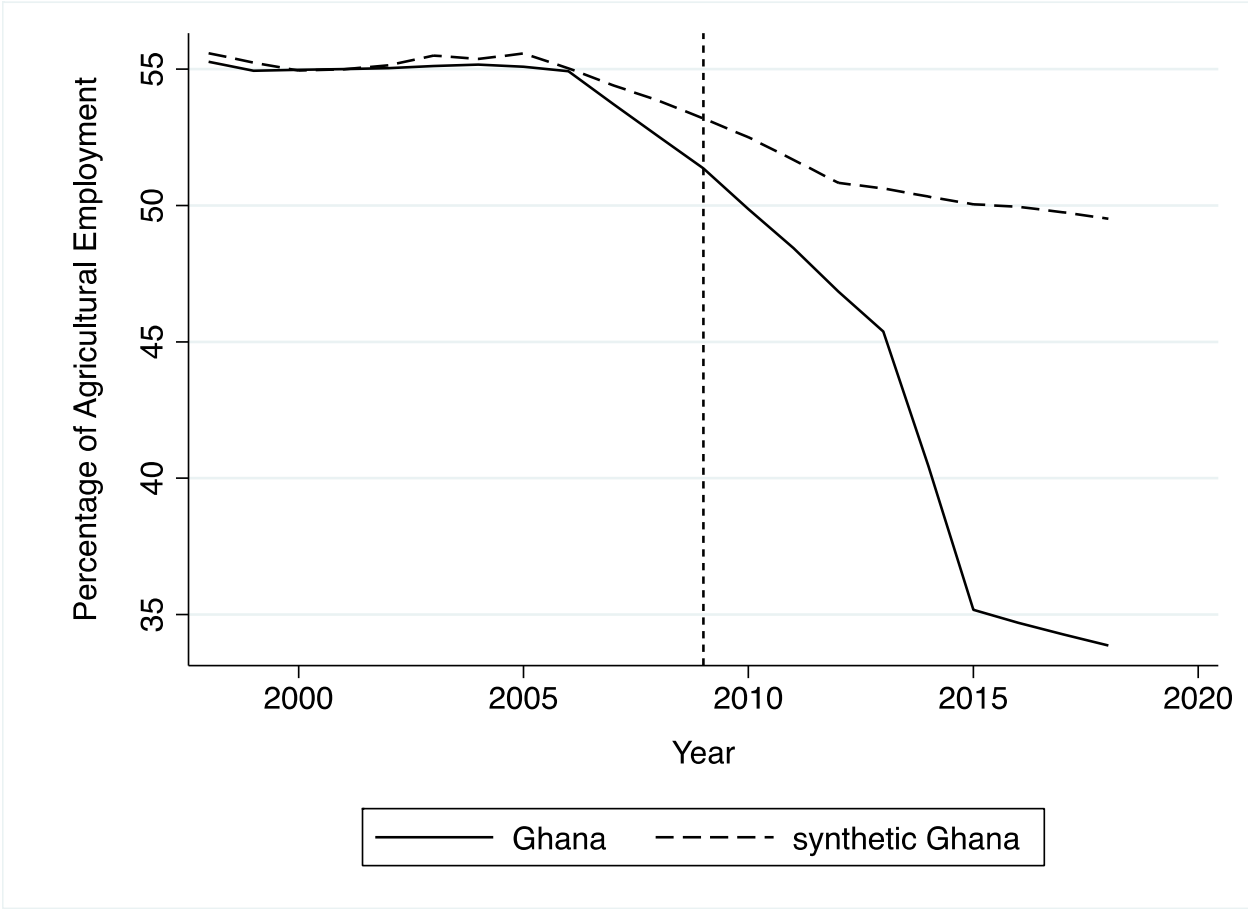
Notes: Evolution of employment in the agricultural sector before and after the discovery of oil in Ghana and synthetic Ghana. The dashed vertical line identifies represents the year of our treatment which is set to 2009.

Figure A.11: Employment in the Industrial Sector for Ghana and Synthetic Ghana
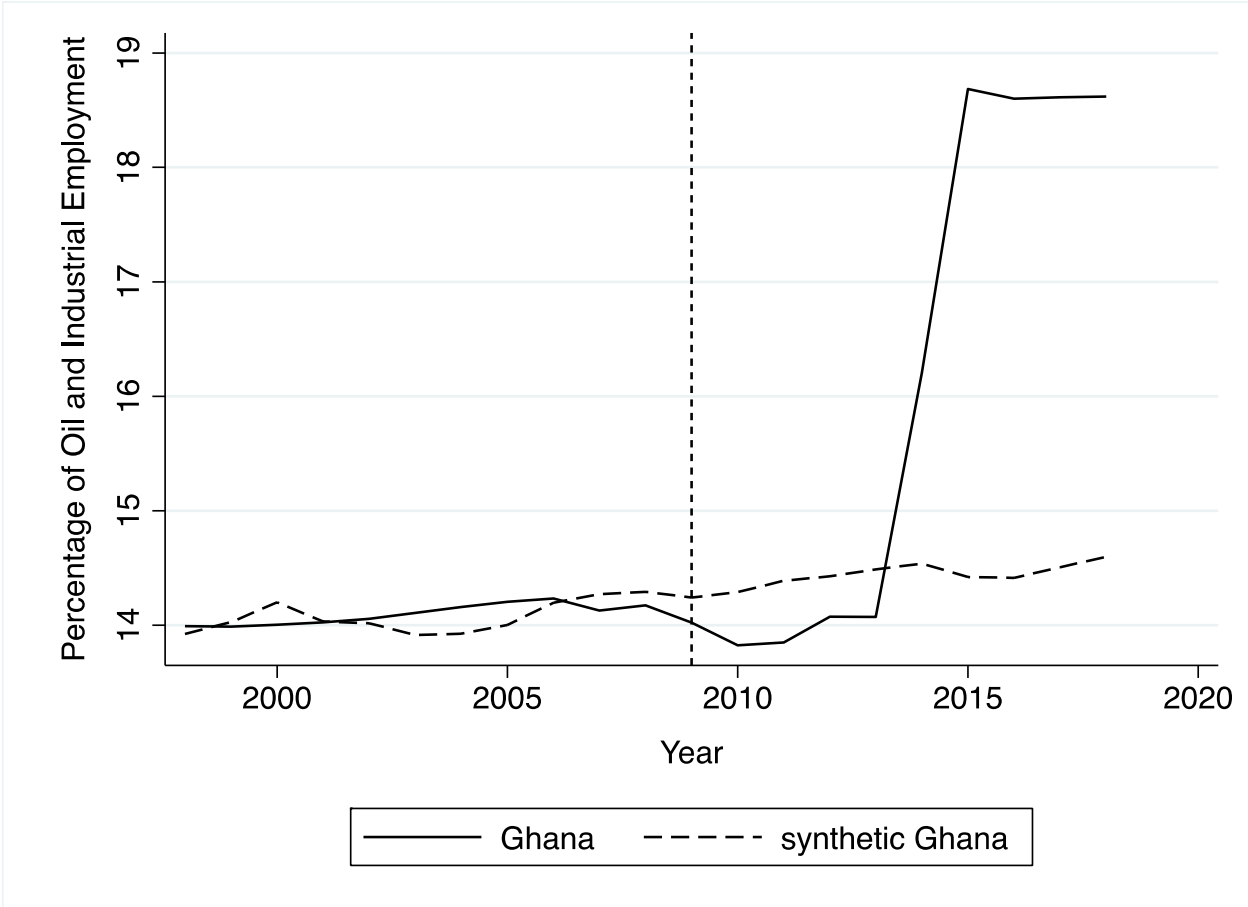
Notes: Evolution of employment in the industrial and oil sector before and after the discovery of oil in Ghana and synthetic Ghana. The dashed vertical line identifies represents the year of our treatment which is set to 2009.

Figure A.12: Comparison of the Employment Rates in the Services Sector for Ghana Versus a Synthetic Ghana
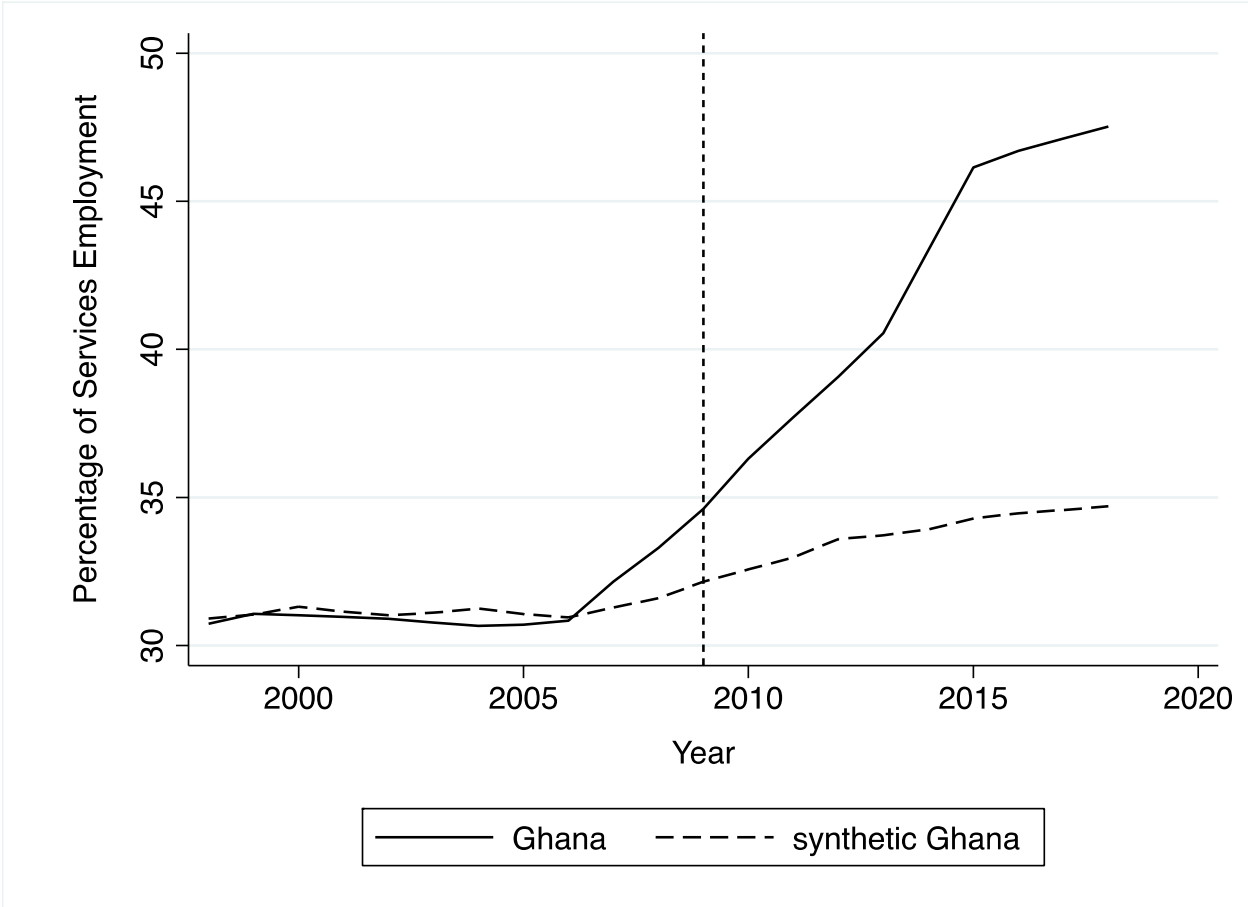
Note: Evolution of employment in the services sector before and after the discovery of oil in Ghana and synthetic Ghana. The dashed vertical line identifies represents the year of our treatment which is set to 2009.

Table A.1: Weights Used in Constructing Synthetic Ghana

Country	Weight	Country	Weight
Benin	0	Kenya	0
Botswana	0	Lesotho	0.212
Burkina Faso	0	Liberia	0.153
Burundi	0	Madagascar	0
Cabo Verde	0	Malawi	0.069
Cameroon	0	Mali	0
Central African Republic	0	Mauritania	0
Chad	0	Mauritius	0
Comoros	0	Namibia	0
Congo, Dem. Rep.	0.057	Niger	0
Congo, Rep.	0	Nigeria	0
Cote d'Ivoire	0	Rwanda	0
Equatorial Guinea	0.034	Senegal	0
Eritrea	0	Sierra Leone	0
Eswatini	0	South Africa	0
Ethiopia	0.476	Sudan	0
Gabon	0	Tanzania	0
The Gambia	0	Togo	0
Guinea	0	Uganda	0
Guinea-Bissau	0	Zimbabwe	0

Notes: Given the typical predictors of real GDP per capita we control for in this paper, the synthetic control estimator evaluates and distributes weights in accordance with similarity to Ghana. Ethiopia is the country that most resembles Ghana in terms of the evolution of the real GDP per capita. Lesotho and Liberia also have considerable resemblance while three other countries namely Equatorial Guinea, Democratic Republic of Congo and Malawi receive positive but almost insignificant weights.

Table A.2: Real Gross Domestic Product per Capita Predictor Means

Variables	Ghana	Synthetic Ghana	Avg. of Countries
Population growth rate	2.48	2.48	2.49
Consumption spending	8,230	11,500	19,200
Inbound Foreign Direct Investment	198	209	546
Rate of inflation	28.30	28.26	11.16
Openness to trade	94.1	94.2	70.60
GDP per capita (2001)	269.0	288.2	816.3
GDP per capita (2004)	417.5	508.2	1,291.5
GDP per capita (2007)	1078.2	940.2	1,912.7

Notes: Data from the World Bank Development Indicator Database and Penn World Tables. Table 2 compares the pre-discovery characteristics of Ghana to those of a synthetic Ghana. This table also compares these estimates to a population weighted average of sub-Saharan African countries in the donor pool. Both consumption spending and inbound foreign direct investment are in millions of U.S dollars in nominal purchasing power parity terms while lagged GDP per capita values are in millions of current U.S dollars in purchasing power parity terms

Table A.3: Gross Domestic Product per Capita Predictor Means When Reducing the Number of Countries in the Donor Pool (1998-2018)

	Ghana	Synthetic Ghana			
		Number of countries in synthetic control			
Variables		Six	Five	Four	Three
Population growth rate	2.48	2.5	3.3	3.4	3.3
Consumption spending in millions	8,230	11,500	8,240	8,200	8,180
Inbound foreign direct investment (in millions)	198	209	198	201	207
Rate of inflation	28.3	28.3	28.2	28.4	7.5
Openness to trade	94.1	94.2	82.4	94.0	70.5
GDP per capita (2007)	1,078.2	940.2	969.0	966.1	970.1
GDP per capita (2004)	417.5	508.2	506.6	507.3	522.3
GDP per capita (2001)	269.0	288.2	333.8	355.7	307.3

Notes: Both consumption spending and inbound foreign direct investment are in millions of current U.S dollars terms

Table A.4: Unemployment Rate Before the Discovery of Oil

Variables	Ghana	Synthetic Ghana	Avg. of Countries
Population growth rate	2.48	2.52	2.49
Real Gross Domestic Product growth rate	4.93	4.12	4.28
Labor force participation rate	74.30	82.33	68.66
Consumer price index	18.36	2.67	7.81
Openness to trade	94.1	55.03	70.60
Unemployment rate (2002)	8.58	8.36	8.00
Unemployment rate (2006)	4.64	5.13	8.41

Note: All variables except the unemployment rates are averaged for the period 1998-2006.

Table A.5: Weights Used in the Construction of Synthetic Ghana for the Counter-factual Unemployment Rate

Country	Weight	Country	Weight
Benin	0	Kenya	0
Botswana	0	Lesotho	0.053
Burkina Faso	0	Liberia	0
Burundi	0	Madagascar	0
Cabo Verde	0	Malawi	0
Cameroon	0.945	Mali	0
Central African Republic	0	Mauritania	0
Chad	0	Mauritius	0
Comoros	0	Namibia	0
Congo, Dem. Rep.	0	Niger	0
Congo, Rep.	0	Nigeria	0
Cote d'Ivoire	0	Rwanda	0
Equatorial Guinea	0	Senegal	0
Eritrea	0	Sierra Leone	0
Eswatini	0	South Africa	0.002
Ethiopia	0	Sudan	0
Gabon	0	Tanzania	0
The Gambia	0	Togo	0
Guinea	0	Uganda	0
Guinea-Bissau	0	Zimbabwe	0

Note: Distribution of weights in the construction of synthetic Ghana for the unemployment rates

Appendix B. Appendix for Chapter 2

Table B.1: List of Countries

Algeria	Angola	Benin	Botswana	Burkina Faso
Burundi	Cabo Verde	Cameroon	CAR	Chad
Comoros	Congo Democratic	Congo Republic	Cote d'Ivoire	Djibouti
Egypt	Equatorial Guinea	Eritrea	Eswatini	Ethiopia
Gabon	Ghana	Guinea	Guinea-Bissau	Kenya
Lesotho	Liberia	Libya	Madagascar	Malawi
Mali	Mauritania	Mauritius	Morocco	Mozambique
Namibia	Niger	Nigeria	Rwanda	Sao Tome
Senegal	Seychelles	Sierra Leone	Somalia	South Africa
South Sudan	Sudan	Tanzania	Togo	Tunisia
Uganda	Zambia	Zimbabwe		

Table B.2: Cross-Section Estimates I: Ethnic Tensions and Resource Rents

	Ethnic Tensions		
VARIABLES	(1)	(2)	(3)
Democracy	0.002	0.002	-0.001
	(0.007)	(0.007)	(0.007)
Ethnic Fractionalization	-1.159***	-1.059***	-0.882***
	(0.186)	(0.189)	(0.187)
Language Fractionalization	0.010	-0.056	-0.081
	(0.159)	(0.168)	(0.166)
Religious Fractionalization	-0.644***	-0.624***	-0.604***
	(0.145)	(0.146)	(0.145)
Government Effectiveness	0.721***	0.614***	0.624***
	(0.086)	(0.085)	(0.076)
Log GDP Per Capita	0.143***	0.153***	0.127***
	(0.038)	(0.045)	(0.043)
Log Population	-0.079**	-0.076**	-0.094***
	(0.031)	(0.032)	(0.032)
Unemployment Rate	-0.001	0.002	0.006
	(0.008)	(0.008)	(0.008)
Urbanization	0.008	0.032	0.030
	(0.025)	(0.025)	(0.025)
Total Natural Resource Rent	0.014***		
	(0.003)		
Oil Rents		0.007*	
		(0.004)	
Natural Gas rents			0.225***
			(0.049)
Constant	5.106***	4.918***	5.244***
	(0.574)	(0.631)	(0.593)
Observations	786	786	784
R-squared	0.336	0.323	0.336

Robust standard errors in parentheses

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

Table B.3: Cross-Section Estimates I: Ethnic Tensions, Decentralization and Resource Rents

VARIABLES	Ethnic Tensions		
	(1)	(2)	(3)
Democracy	0.001	0.003	0.000
	(0.007)	(0.007)	(0.007)
Ethnic Fractionalization	-1.120***	-1.232***	-1.179***
	(0.181)	(0.188)	(0.187)
Language Fractionalization	-0.033	0.095	0.070
	(0.163)	(0.160)	(0.152)
Religious Fractionalization	-0.646***	-0.624***	-0.696***
	(0.146)	(0.145)	(0.137)
Government Effectiveness	0.723***	0.741***	0.760***
	(0.086)	(0.087)	(0.084)
Log GDP Per Capita	0.146***	0.134***	0.106***
	(0.038)	(0.039)	(0.039)
Log Population	-0.075**	-0.070**	-0.018
	(0.032)	(0.032)	(0.033)
Unemployment Rate	-0.000	0.000	0.002
	(0.008)	(0.008)	(0.008)
Urbanization	0.010	0.003	0.002
	(0.026)	(0.026)	(0.025)
Total Natural Resource Rent	0.016***	0.019***	0.019***
	(0.003)	(0.005)	(0.003)
Resource x Political Decentralization	-0.006		
	(0.007)		
Resource x Fiscal Decentralization		-0.030	
		(0.022)	
Resource x Administrative Decentralization			-0.083***
			(0.019)
Constant	5.033***	5.052***	4.491***
	(0.585)	(0.575)	(0.573)
Observations	786	786	786
R-squared	0.337	0.338	0.353

Robust standard errors in parentheses

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

Table B.4: Fixed Effect Estimates I: Ethnic Tensions and Resource Rents

VARIABLES	Ethnic Tensions		
	(1)	(2)	(3)
Democracy	0.012	0.014	0.014
	(0.018)	(0.018)	(0.018)
Government Effectiveness	0.217	0.194	0.176
	(0.216)	(0.215)	(0.207)
Log GDP Per Capita	0.176	0.167	0.198
	(0.142)	(0.147)	(0.145)
Log Population	-0.464	-0.439	-0.512
	(0.418)	(0.436)	(0.433)
Unemployment Rate	-0.010	-0.012	-0.012
	(0.021)	(0.021)	(0.022)
Urbanization	-0.050**	-0.049**	-0.048**
	(0.021)	(0.022)	(0.021)
Total Natural Resource Rent	0.007**		
	(0.003)		
Oil Rents		0.006*	
		(0.003)	
Natural Gas Rents			-0.016
			(0.075)
Constant	9.921	9.651	10.620*
	(5.971)	(6.216)	(6.227)
Observations	819	819	817
Number of country_id	47	47	47
R-squared	0.039	0.035	0.032

Robust standard errors in parentheses

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

Table B.5: One-step System GMM Estimates I: Ethnic Tensions and Resource Rents

VARIABLES	Ethnic Tensions		
	(1)	(2)	(3)
Ethnic Tensions(t-1)	0.785***	0.776***	0.814***
	(0.119)	(0.0893)	(0.141)
Democracy	0.0111	0.0137	-0.00307
	(0.0133)	(0.0209)	(0.0121)
Government Effectiveness	-0.161	-0.326	-0.244
	(0.268)	(0.418)	(0.245)
Log GDP Per Capita	0.00768	0.00749	0.267***
	(0.0627)	(0.0835)	(0.0912)
Log Population	0.0145	0.0208	0.0409
	(0.0401)	(0.0643)	(0.0422)
Unemployment Rate	0.0147	0.0347	0.00205
	(0.0202)	(0.0265)	(0.0308)
Urbanization	-0.0234	0.212	0.0526
	(0.158)	(0.183)	(0.267)
Total Natural Resource Rent	0.0196**		
	(0.00889)		
Oil Rents		0.0147	
		(0.0125)	
Natural Gas Rents			-0.573*
			(0.287)
Constant	0.0219	-1.017	-2.115
	(1.117)	(1.415)	(1.521)
Observations	818	818	816
Number of country_id	47	47	47
Sargan	0.00	0.00	0.00
Hansen J p.	0.201	0.22	0.124
AR1 p.	0.008	0.011	0.017
AR2 p.	0.116	0.335	0.373
No. of instruments	26	26	26

Robust standard errors in parentheses

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

Table B.6: One-step System GMM Estimates II: Ethnic Tensions, Decentralization and Resource Rents

VARIABLES	Ethnic Tensions		
	(1)	(2)	(3)
Ethnic Tensions(t-1)	0.908***	0.919***	0.918***
	(0.0736)	(0.0856)	(0.0712)
Democracy	0.0297	-0.00207	0.0180
	(0.0212)	(0.0171)	(0.0169)
Government Effectiveness	-0.417	-0.218	-0.391
	(0.355)	(0.346)	(0.346)
Log GDP Per Capita	-0.0627	0.0572	-0.0453
	(0.0979)	(0.0855)	(0.0824)
Log Population	0.144	0.0637	0.104
	(0.0871)	(0.0694)	(0.0790)
Unemployment Rate	0.0451*	0.0300	0.0322
	(0.0240)	(0.0247)	(0.0211)
Urbanization	0.127	0.176	0.0994
	(0.147)	(0.147)	(0.127)
Total Natural Resource Rent	0.0512*	0.0516	0.0270*
	(0.0303)	(0.0314)	(0.0160)
Resource x Fiscal Decentralization	-0.253*		
	(0.131)		
Resource x Political Decentralization		-0.0932	
		(0.0574)	
Resource x Administrative Decentralization			-0.0862*
			(0.0445)
Constant	-2.816*	-2.413*	-2.236
	(1.477)	(1.373)	(1.392)
Observations	818	818	818
Number of country_id	47	47	47
Sargan	0.000	0.001	0.000
Hansen J p.	0.451	0.25	0.392
AR1 p.	0.009	0.006	0.009
AR2 p.	0.174	0.161	0.204
No. of instruments	31	31	31

Robust standard errors in parentheses

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

Table B.7: Two-step System GMM Estimates I: Ethnic Tensions and Resource Rents

VARIABLES	Ethnic Tension		
	(1)	(2)	(3)
Ethnic Tensions(t-1)	0.919***	0.900***	0.819***
	(0.0308)	(0.0299)	(0.0474)
Democracy	0.0128	0.00854	-0.00266
	(0.0103)	(0.0121)	(0.0130)
Government Effectiveness	-0.269	-0.312	-0.0794
	(0.175)	(0.207)	(0.219)
Log GDP Per Capita	0.0135	0.0127	0.167**
	(0.0342)	(0.0459)	(0.0679)
Log Population	0.00191	0.0255	-0.0116
	(0.0360)	(0.0359)	(0.0390)
Unemployment Rate	0.0300***	0.0273**	0.0263*
	(0.0109)	(0.0109)	(0.0155)
Urbanization	0.204***	0.192***	0.320***
	(0.0636)	(0.0577)	(0.0810)
Total Natural Resource Rent	0.0195***		
	(0.00531)		
Oil Rents		0.0167***	
		(0.00513)	
Natural Gas Rents			-0.391**
			(0.161)
Constant	-1.308*	-1.379**	-1.763**
	(0.681)	(0.634)	(0.815)
Observations	818	818	816
Number of country_id	47	47	47
Sargan	0.001	0.000	0.231
Hansen J p.	0.276	0.47	0.347
AR1 p.	0.008	0.009	0.013
AR2 p.	0.113	0.185	0.349
No. of instruments	30	30	30

Standard errors in parentheses

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

Table B.8: Two-step System GMM Estimates II: Ethnic Tensions, Decentralization and Resource Rents

VARIABLES	Ethnic Tensions		
	(1)	(2)	(3)
Ethnic Tensions(t-1)	0.883***	0.943***	0.908***
	(0.0377)	(0.0385)	(0.0316)
Democracy	0.00830	0.00938	0.00452
	(0.0114)	(0.0106)	(0.0108)
Government Effectiveness	-0.155	-0.300**	-0.183
	(0.184)	(0.145)	(0.181)
Log GDP Per Capita	-0.00527	0.0158	0.0153
	(0.0498)	(0.0354)	(0.0426)
Log Population	0.0849**	0.0182	0.0558
	(0.0406)	(0.0406)	(0.0368)
Unemployment Rate	0.0354***	0.0303**	0.0253**
	(0.0116)	(0.0132)	(0.0109)
Urbanization	0.198***	0.185**	0.163***
	(0.0634)	(0.0742)	(0.0587)
Total Natural Resource Rent	0.0355***	0.0228	0.0229***
	(0.00966)	(0.0143)	(0.00519)
Resource x Fiscal Decentralization	-0.155***		
	(0.0533)		
Resource x Political Decentralization		-0.0439*	
		(0.0255)	

Table B.8: Two-step System GMM Estimates II: Ethnic Tensions, Decentralization and Resource Rents

Resource x Administrative Decentralization			-0.0732***
			(0.0212)
Constant	-2.122***	-1.483*	-1.776**
	(0.681)	(0.796)	(0.712)
Observations	818	818	818
Number of country_id	47	47	47
Sargan	0.000	0.001	0.000
Hansen J p.	0.451	0.25	0.392
AR1 p.	0.009	0.009	0.008
AR2 p.	0.081	0.196	0.102
No. of instruments	31	31	31

Standard errors in parentheses

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

Appendix C. Appendix for Chapter 3

Table C.1: Description and Sources of Data of Variables

Variable	Description	Source
Expenditure Decentralization	Share of subnational expenditure in total government expenditure	IMF GFS
Revenue Decentralization	Share of subnational revenue in total government revenue	IMF GFS
Inflation	Change in general prices of goods relative to some base year	WDI
Trade Openness	Exports plus Imports divided by real GDP per capita in current prices	WDI
Labor force with Basic Education	Percentage of the labor force that have achieved basic education	WDI
Labor force with Intermediate Education	Percentage of the labor force that have achieved intermediate education	WDI
Labor force with Advanced Education	Percentage of the labor force that have achieved advanced education	WDI
Unemployment rate	Proportion of the labor force without employment	WDI
Dummy for the availability of unemployment benefits or social assistance	Indicates whether a particular country has unemployment benefits and social assistance programs. Some countries have it in the form of social assistance programs	Esser et al. (2013)
GFI	Geographic Fragmentation Index	Canavire-Bacarreza, Martinez-Vazquez and Yedgenov (2016)
Country size	Country area size (residual after regressing on GFI)	Canavire-Bacarreza, Martinez-Vazquez and Yedgenov (2016)

Table C.2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Unemployment rate	1,144	8.79932	6.332627	0.58	44.157
Expenditure Decentralization	1,144	18.09359	18.21921	0	66.4497
Revenue Decentralization	1,144	15.89561	15.83595	0	63.47304
Inflation	1,144	21.20755	153.6156	-29.17246	4107.297
Trade Openness	1,144	42.43531	27.29315	3.477151	153.2374
Gross Domestic Product (in billions)	1,144	6.53E+11	1.84E+12	32.7	1550
Exchange Rate	1,144	359.9777	1269.853	0.0004529	10389.94
Labor force with Basic Education	565	10.76739	6.874393	0.3069	39.2119
Labor force with Intermediate Educ	553	8.764057	5.536883	0.86	39.03
Labor force with Advanced Education	564	5.083873	3.703076	0.9386	30.28

Table C.3: IV Estimation of the Impact of Fiscal Decentralization on Unemployment Including First Stage - Log Unemployment

VARIABLES	(1) Expenditure First stage	(2) Decentralization Second stage	(3) Revenue First stage	(4) Decentralization Second stage
Expenditure Decentralization		-0.004*		
		(0.002)		
Revenue Decentralization				-0.003
				(0.002)
Geographic Fragmentation Index (GFI)	0.549		1.044**	
	(0.515)		(0.516)	
Country Size	3.486***		3.763***	
	(1.072)		(1.000)	
Inflation	-0.429***	0.002	-0.418***	0.002
	(0.147)	(0.002)	(0.155)	(0.002)
Trade Openness	-0.203***	-0.001*	-0.128**	-0.001*
	(0.047)	(0.001)	(0.052)	(0.001)
Labor Force with Basic Education	0.519	0.018***	0.591*	0.018***
	(0.382)	(0.004)	(0.329)	(0.004)
Labor Force with Intermediate Education	-0.665	0.014**	-0.508	0.015***
	(0.545)	(0.005)	(0.451)	(0.005)
Labor Force with Advanced Education	-0.525	0.011**	-0.602	0.011**
	(0.509)	(0.004)	(0.397)	(0.005)
Dummy for unemployment benefit	9.409**	0.069	8.129***	0.054
	(3.892)	(0.056)	(2.896)	(0.047)
Dummy for OECD	2.261	0.087**	-0.298	0.073**
	(3.009)	(0.036)	(2.830)	(0.034)
Constant	7.854	0.485***	-15.002	0.464***
	(22.721)	(0.082)	(23.793)	(0.077)
Observations	507	507	507	507
R-squared		0.730		0.764

Robust standard errors in parentheses

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

Table C.4: IV Estimation of the Impact of Fiscal Decentralization on Unemployment Using the Other FD Measure as Control

	(1)	(2)	(3)	(4)
	ALL COUNTRIES			
	Expenditure	Decentralization	Revenue	Decentralization
VARIABLES	First stage	Second stage	First stage	Second stage
Expenditure Decentralization		-0.142	0.584***	0.039
		(0.106)	(0.109)	(0.026)
Revenue Decentralization	0.827***	0.114		-0.066
	(0.070)	(0.094)		(0.043)
Geographic Fragmentation Index (GFI)	-0.315		0.724**	
	(0.290)		(0.342)	
Country Size	0.372		1.728**	
	(0.579)		(0.784)	
Inflation	-0.083	0.035	-0.168**	0.037*
	(0.076)	(0.024)	(0.084)	(0.021)
Trade Openness	-0.097***	-0.014	-0.009	-0.008
	(0.032)	(0.010)	(0.032)	(0.007)
Labor Force with Basic Education	0.030	0.273***	0.288	0.295***
	(0.239)	(0.091)	(0.220)	(0.094)
Labor Force with Intermediate Education	-0.245	0.389***	-0.120	0.428***
	(0.273)	(0.138)	(0.222)	(0.137)
Labor Force with Advanced Education	-0.026	0.115	-0.296**	0.115
	(0.213)	(0.089)	(0.137)	(0.079)
Dummy for unemployment benefit	2.683	1.416	2.635	0.780
	(2.696)	(0.924)	(2.127)	(0.536)
Dummy for OECD	2.508*	0.907	-1.619	0.301
	(1.461)	(0.620)	(1.605)	(0.518)
Constant	20.265*	0.444	-19.587	-0.048
	(12.110)	(1.111)	(13.718)	(0.998)
Observations	507	507	507	507
R-squared		0.756		0.864

Robust standard errors in parentheses

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

Table C.5: IV Estimation of the Impact of Fiscal Decentralization Including First Stage

VARIABLES	(1) Expenditure Decentralization First stage	(2) Decentralization Second stage	(3) Revenue Decentralization First stage	(4) Decentralization Second stage
Expenditure Decentralization		-0.070**		
		(0.028)		
Revenue Decentralization				-0.058**
				(0.026)
Geographic Fragmentation Index (GFI)	0.549		1.044**	
	(0.515)		(0.516)	
Country Size	3.486***		3.763***	
	(1.072)		(1.000)	
Inflation	-0.429***	0.018	-0.418***	0.024
	(0.147)	(0.026)	(0.155)	(0.025)
Trade Openness	-0.203***	-0.020*	-0.128**	-0.016*
	(0.047)	(0.011)	(0.052)	(0.009)
Labor Force with Basic Education	0.519	0.315***	0.591*	0.315***
	(0.382)	(0.102)	(0.329)	(0.102)
Labor Force with Intermediate Education	-0.665	0.380**	-0.508	0.401***
	(0.545)	(0.152)	(0.451)	(0.148)
Labor Force with Advanced Education	-0.525	0.082	-0.602	0.091
	(0.509)	(0.090)	(0.397)	(0.083)
Dummy for unemployment benefit	9.409**	1.397**	8.129***	1.091*
	(3.892)	(0.692)	(2.896)	(0.561)
Dummy for OECD	2.261	0.742	-0.298	0.488
	(3.009)	(0.533)	(2.830)	(0.501)
Constant	7.854	1.409	-15.002	0.914
	(22.721)	(1.299)	(23.793)	(1.225)
Observations	507	507	507	507
R-squared		0.820		0.852

Robust standard errors in parentheses

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

Table C.6: IV Estimation of the Impact of Fiscal Decentralization on Unemployment with Additional Covariates

VARIABLES	(1) Expenditure First stage	(2) Decentralization Second stage	(3) Revenue First stage	(4) Decentralization Second stage
Expenditure Decentralization		-0.046**		
		(0.020)		
Revenue Decentralization				-0.042**
				(0.021)
Geographic Fragmentation Index (GFI)	0.592		1.005*	
	(0.548)		(0.547)	
Country Size	4.035***		4.046***	
	(1.229)		(1.092)	
Inflation	-0.410***	0.031	-0.373**	0.034*
	(0.153)	(0.020)	(0.158)	(0.019)
Trade Openness	-0.198***	-0.014*	-0.117**	-0.012
	(0.048)	(0.008)	(0.052)	(0.007)
Labor Force with Basic Education	0.337	0.276***	0.431	0.278***
	(0.373)	(0.081)	(0.326)	(0.082)
Labor Force with Intermediate Education	-0.428	0.429***	-0.281	0.441***
	(0.557)	(0.126)	(0.463)	(0.124)
Labor Force with Advanced Education	-0.473	0.101	-0.529	0.105
	(0.457)	(0.095)	(0.357)	(0.093)
Gross Domestic Product	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Exchange Rate	-0.002***	-0.000**	-0.002***	-0.000**
	(0.001)	(0.000)	(0.000)	(0.000)
Dummy for unemployment benefit	7.933**	0.993	6.468**	0.808
	(4.031)	(0.606)	(2.977)	(0.521)
Dummy for OECD	1.420	0.578	-1.146	0.411
	(3.068)	(0.543)	(2.729)	(0.513)
Constant	8.190	0.979	-12.643	0.722
	(23.242)	(1.076)	(24.556)	(1.061)
Observations	507	507	507	507
R-squared		0.862		0.873

Robust standard errors in parentheses

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

Table C.7: IV Estimation of the Impact of an Alternative Measure of Decentralization on Unemployment

VARIABLES	(1) Unemployment
Regional Authority Index	-0.056**
	(-0.024)
Inflation	0.036
	(-0.027)
Trade Openness	-0.009
	(-0.007)
Labor Force with Basic Education	0.279***
	(-0.079)
Labor Force with Intermediate Education	0.308**
	(-0.145)
Labor Force with Advanced Education	0.383***
	(-0.095)
Dummy for unemployment benefit	0.448
	(-0.634)
Dummy for OECD	1.132*
	(-0.592)
Constant	-0.181
	(-1.035)
Observations	473
R-squared	0.851

Robust standard errors in parentheses

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

Table C.8: HP Decomposition: Structural versus Cyclical Unemployment

VARIABLES	Cyclical Unemployment		Structural Unemployment	
	Expenditure	Revenue	Expenditure	Revenue
Expenditure Decentralization	0.011		-0.081**	
	(0.015)		(0.034)	
Revenue Decentralization		-0.009		-0.049*
		(0.015)		(0.027)
Inflation	-0.003	-0.011	0.021	0.035
	(0.019)	(0.022)	(0.029)	(0.027)
Trade Openness	0.003	-0.001	-0.024**	-0.015
	(0.006)	(0.006)	(0.012)	(0.010)
Labor force with Basic Education	0.086***	0.101***	0.229**	0.214**
	(0.025)	(0.027)	(0.104)	(0.100)
Labor force with Intermediate Education	0.054	0.039	0.326*	0.362**
	(0.053)	(0.048)	(0.174)	(0.163)
Labor force with Advanced Education	0.052	0.037	0.030	0.054
	(0.072)	(0.064)	(0.132)	(0.113)
Dummy for Unemployment benefit	-1.044**	-0.891**	2.441***	1.982***
	(0.448)	(0.396)	(0.880)	(0.682)
Dummy for OECD	0.240	0.314	0.501	0.174
	(0.279)	(0.266)	(0.682)	(0.612)
Constant	-1.628**	-1.036	3.037**	1.950
	(0.727)	(0.668)	(1.444)	(1.243)
Observations	507	507	507	507
R-squared	0.179	0.204	0.614	0.728

Robust standard errors in parentheses

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

Table C.9: BK Decomposition: Structural Versus Cyclical Unemployment

VARIABLES	Cyclical Unemployment		Structural Unemployment	
	Expenditure	Revenue	Expenditure	Revenue
Expenditure Decentralization	-0.001		-0.047**	
	(0.005)		(0.022)	
Revenue Decentralization		-0.007		-0.034
		(0.006)		(0.023)
Inflation	0.007	0.004	0.018	0.030
	(0.008)	(0.010)	(0.031)	(0.027)
Trade Openness	-0.005**	-0.006**	-0.012	-0.010
	(0.002)	(0.002)	(0.009)	(0.009)
Labor force with Basic Education	0.034***	0.039***	0.296***	0.288***
	(0.010)	(0.011)	(0.107)	(0.104)
Labor force with Intermediate Education	-0.004	-0.008	0.345**	0.373**
	(0.018)	(0.018)	(0.155)	(0.148)
Labor force with Advanced Education	0.024	0.020	0.013	0.013
	(0.023)	(0.023)	(0.104)	(0.096)
Dummy for Unemployment benefit	-0.267*	-0.231	1.602**	1.252**
	(0.150)	(0.152)	(0.731)	(0.614)
Dummy for OECD	0.072	0.074		
	(0.115)	(0.121)		
Constant	-0.193	-0.024	1.824	1.288
	(0.204)	(0.243)	(1.230)	(1.099)
Observations	387	387	387	387
R-squared	0.121	0.100	0.813	0.832

Robust standard errors in parentheses

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

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Vita

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