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The Impact of Peace: Evidence from Nigeria

Tillman Hönig*

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Abstract: This paper studies the consequences of peace – or conversely, conflict – on four outcomes of fundamental economic relevance: Education, health, self-employment income and household expenditures. While the empirical literature on the consequences of conflict involving cross-country regression studies may deliver suggestive big picture evidence on links between conflict and economic outcomes, establishing causation remains problematic. By contrast, my study builds on the rather recent micro-empirical literature and exploits a natural experiment in Nigeria to evaluate the consequences of a reduction of conflict. The amnesty policy implemented by the Nigerian government in the Niger Delta Region in 2009 is used as a policy shock to assess the effect of a conflict reduction on the outcomes of interest. My first finding is that this policy indeed established a period of peace. To evaluate the benefits of this peace, I then construct a synthetic control region from the states that are not part of the Niger Delta region and therefore unaffected by the policy as a within-country counterfactual to the Niger Delta region. I find that peace through the amnesty policy generated an increase in education by 0.5 years of schooling, a 67% increase in self-employment income and a 19% increase in household expenditures four years later. I do not find an effect on health.

JEL Codes: I25, D74, I15, I25, J31, O12

* London School of Economics & Political Science, Email: t.hoenig@lse.ac.uk

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1. Introduction

Pax Europaea – the period of relative peace in Europe since World War II – is considered one of the most fundamental drivers of economic prosperity on the continent for the last 70 years or so. By contrast, many developing countries have experienced periods of war and civil conflict since the second half of the 20th century began. Although conflict seems to have such a destructive power for many key economic characteristics of the people involved and affected, economists have only started to study it towards the very end of the 20th century. Blattman & Miguel (2010) provide an excellent review of the literature. Early leading theories on the causes of conflict distinguished between roots around antagonisms, ethnic divisions and dissatisfaction (“grievances”) and those around the opportunity for rebellion or insurgency and benefits linked to that (“greed”). More support is found for the latter in cross-country regression analyses (Collier & Hoeffler, 2004; Fearon & Laitin, 2003). On the consequences of conflict, the early literature has focused on the links between conflict and economic performance or growth that can be observed across countries (Alesina & Perotti, 1996; Barro, 1991; Collier, 1999). Much more recently, authors have made use of micro-data that has increasingly become available for many countries to perform within-country micro-empirical studies of the consequences of conflict, involving a broader range of outcomes. Such studies are more suitable to find and disentangle various causal channels. I contribute to this literature with evidence from Nigeria.

After independence from the British in 1960, a civil war in the late 1960s and almost thirty years of military rule following the civil war, Nigeria has been under the rule of democratically elected governments and presidents since 1999. However, different parts of Nigeria have still experienced various degrees of conflict after the democratisation. In particular, following tensions that date back a long time, resistance activism turned violent in the south-eastern Niger Delta region in 2006 and quickly escalated to higher levels of conflict. As a response, the Nigerian government implemented the so-called ‘Presidential Amnesty Program’ (PAP) in 2009, in the context of which ex-militants were granted pardon, received cash and joined a ‘Disarmament, Demobilisation and Reintegration’ (DDR) programme in return for surrendering their weapons. My first notable result is that the policy was effective in reducing violence in the region and establishing a period of peace. While conflict fatalities spiked up until 2009, there is a sharp drop after the introduction to the policy and low levels prevail through 2013. Along with the fact

that other parts of Nigeria experience conflict between 2009 and 2013, this provides a unique quasi-experimental setting for estimating the benefits of peace resulting from the amnesty policy. For this analysis, I employ the synthetic control method developed by Abadie & Gardeazabal (2003). In my context, by matching key characteristics of the Niger Delta region and states outside it in an optimisation procedure, this method generates a synthetic control region made up of a weighted average of six Nigerian states outside the Niger Delta region that are closely comparable to the Niger Delta region. Serving as a counterfactual, this allows me to estimate the peace dividend¹ that the amnesty policy generated by simply comparing the Niger Delta region and its synthetic control region four years later.

I consider four outcomes of fundamental economic relevance: Education, health, self-employment income and household expenditures, where the latter serves as a measure for overall economic performance. While the micro-empirical literature includes some studies estimating the consequences of conflict for different measures of education, health and economic performance, there is – to my knowledge – only one such study (in Mexico) for self-employment income as an additional measure of economic activity. Considering this outcome in addition to overall economic performance, however, allows me to observe the consequences on economic activity in a richer way that will be further elaborated on in this paper. In addition to this contribution, on the methodological side, I employ the synthetic control method as opposed to the commonly used difference-in-differences (DID) approach and can specifically test for some potential pitfalls. One result is that the pre-2009 trend can be matched by the synthetic control region while it is not parallel for *all* non-Niger Delta states in general, a key assumption which the DID method would require. While some studies employing the synthetic control method have been carried out to evaluate the consequences on economic performance, none have examined health, education or self-employment income as an outcome variable – again, to my knowledge. Therefore, in particular for these outcomes, providing an additional method gives us further confidence that emerging patterns in various studies may have some degree of general validity.

My main findings on developmental outcomes are that peace generates 0.5 more years of schooling on average and increases household expenditure at the median by 19% as well as self-employment income at the median by 67% four year later. My estimate

¹The term ‘peace dividend’ is used in the literature to refer either generally to benefits of newly established peace or, in a different and much more specific context, the potential gains generated by shifting government resources from military expenditure to other uses. Throughout this paper, I refer to the first notion when using the expression.

on health is small and insignificant. These results are robust to the alternative DID specification for education where the parallel trend assumption holds and deviate from the alternative specification exactly in the direction of the parallel trend deviation where said assumption is violated. Further robustness to my results is provided in two pieces of analysis concerning potential spillover effects and a placebo study. As a general caveat, however, it is worth noting that my standard errors and other measures imply that there is a substantial degree of uncertainty around my average effects, so that none of my findings should be taken as very precise point estimates.

This work relates to two strands of the literature. The first is concerned with the success of demobilisation programmes. Some papers on such programmes in particular (D'Aoust et al., 2018; Gilligan et al., 2012; Humphreys & Weinstein, 2007) or the link between development programmes and conflict more generally (Beath et al., 2011; Berman et al., 2013, 2011; Crost et al., 2014, 2016) deliver ambiguous results. Both for repeat violence and economic outcomes, positive, zero and negative effects are found in the literature. The only common theme, elaborated on both theoretically and empirically particularly in Berman et al. (2011) that seems to emerge to some extent is that locally specific programmes tend to have a higher probability of success. As opposed to the national DDR programmes discussed in the literature, the one I consider is carried out only in the Niger Delta region and in this sense somewhat more local. My finding of conflict reduction in Nigeria adds to this literature with evidence from a new country and broadly fits within the emerging theme of local success.

The second strand of the literature is about the economic consequences of conflict and quite sizeable.² Early cross-country studies showing a negative correlation between conflict and GDP or GDP growth suffer from obvious endogeneity problems when trying to make causal claims. In the literature that is trying to get at a causal effect using micro-level data and within-country identification strategies, the studies employing the synthetic control method are closest to my analysis (Abadie & Gardeazabal, 2003; Dorsett, 2013; Gong & Rao, 2016; Matta et al., 2016). These authors find substantial effects in the first couple of years following the onset of conflict that range between -5% and -20% per year.³

²In this review, I will focus on the empirical literature that is related to estimating the consequences of conflict on the four outcomes that I am estimating in this study: health, education, self-employment activity and household expenditures. Of course, this is not a comprehensive overview of the vast theoretical and empirical literature on the consequences of conflict in general.

³To what extent such effects persist in the long run or whether there is convergence in line with the logic of the Solow model is not clear. While some estimates suggest there is convergence, other studies find evidence for the opposite. In particular, some direct evidence on GDP (Chen et al., 2008; Gates et al., 2012; Miguel & Roland, 2011) and on city size (Brakman et al., 2004; Davis & Weinstein, 2002) suggest convergence. By contrast, other direct evidence on GDP (Akbulut-Yuksel, 2014; Galdo, 2013;

With regards to the effect of conflict on education, the majority of papers employs a DID approach that exploits school age (cohort) variation and geographic conflict variation within a country (Akbulut-Yuksel, 2014; Akresh & De Walque, 2011; Chamarbagwala & Morán, 2011; Islam et al., 2016; Kesternich et al., 2014; Leon, 2012; Márquez-Padilla et al., 2015; Merrouche, 2011; Pivovarov & Swee, 2015; Saing et al., 2017; Shemyakina, 2011; Swee, 2015; Valente, 2014).⁴ Those authors who estimate life-time accumulation effects find results ranging between a reduction by 0.2 and 1 year of schooling. In terms of the methodology, most studies analysing health effects are equivalent. Based on the idea that health shocks to children in utero or in early childhood have long-term consequences,⁵ they use variation in birth cohorts during conflict and location of conflict for a DID approach (Akbulut-Yuksel, 2014; Akresh et al., 2012a,b, 2011; Bundervoet et al., 2009; Galdo, 2013; Islam et al., 2016; Kesternich et al., 2014; Minoiu & Shemyakina, 2014; Saing et al., 2017). Although the differential choice of outcome variables makes these studies quantitatively hard to compare, almost all find a significantly negative impact on health.⁶

Taking all the findings on health and education together, they do seem to paint a fairly clear picture of the direction and in particular similar magnitude in various contexts. However, in light of the fact that the DID approach is predominantly used, it is not clear whether many of these studies suffer from systematic bias arising because of a potential violation of the parallel trend assumption or spillover effects.⁷ I address both issues by using the synthetic control method and delivering robustness checks against relevant spillover effects, in particular around migration. Unlike the cohort variation used in DID approaches, the synthetic control procedure in my setting exploits pre- and post-peace data for matching. The fact that I use the variation in actual time periods covering both conflict and peace enables me to much more clearly test the pre-trend on years before the peace-generating amnesty policy.⁸

Islam et al., 2016) find no convergence. The below mentioned range of studies on education and health outcomes that should affect economic performance according to standard theory would also suggest that there is at least no convergence in the lifetime of those affected by the war.

⁴A notable exception is Blattman & Miguel (2010) who can make use of a quasi-experimental setting with plausibly random ‘recruitment’ abductions by rebels in Uganda.

⁵This idea goes back to Barker (1998) who posited the fetal origins hypothesis. More recently, economists have found evidence for considerable long-run effects of various shocks while in utero or as an infant (see Almond, 2006; Almond & Currie, 2011a,b; Maccini & Yang, 2009, for some of this evidence and summaries).

⁶Most studies use height or height-for-age z scores as an outcome variable, but (birth) weight, (infant) mortality and diseases feature as outcomes as well.

⁷Using cohort variation, the parallel trend assumption would be violated if control cohorts in conflict areas (for education, the youngest cohort beyond school age is typically considered; for health, children above the age of five are considered in most specifications) are affected by conflict as well. In particular for health, it is not unreasonable to think that war exposure also affects older children. In fact, Domingues & Barre (2013) provides some evidence that this is the case when analysing older cohorts of children as well.

⁸Few DID studies can convincingly address parallel trend and spillover concerns, mainly because it is

Regarding the effects on employment activity or income, the DID method does not seem to hold the methodological monopoly. This is not necessarily surprising since health effects on newborns and infants as well as education effects provide by definition a cohort variation that can be exploited while any self-employment outcomes affect a broader range of people. Therefore, studies in this realm typically use pre- and post-conflict data⁹ in a variety of applications. Some studies exploit panel data and control for individual heterogeneity (Deininger, 2003; Velásquez, 2015) and/or IV approaches (Bozzoli et al., 2012; Camacho & Rodriguez, 2013; Collier & Duponchel, 2013; Kondylis, 2010). Blattman & Annan (2010) make use of a quasi-experimental setting and – closest to my empirical design – Guidolin & La Ferrara (2007) perform an event study. Apart from methodological differences, the studies also vary greatly in the outcomes considered. Few actually consider self-employment activity. Bozzoli et al. (2012) finds that an increase by 4 attacks (the interquartile range) decreased the rate of self-employment by 6.2 percentage points in Colombia while Deininger (2003) estimates the reduction in the propensity to start a business through exposure to conflict to be almost 10% in Uganda. Velásquez (2015) finds a reduction in self-employment earnings for men by 15% in Mexico. Other outcomes considered include labour supply, coffee farming, firm size and exit, investment as well as total earnings (discussed above). The effects found are in almost all cases significantly negative and substantial.¹⁰ In the context of self-employment, my paper contributes to the literature in two ways. Firstly, I use self-employment income as an outcome variable which sheds light on a slightly different aspect of employment activity than a measure indicating whether someone is engaged in a particular business or not. Average self-employment income captures both the extent to which more business owners induce more competition, crowd out low-productivity competitors and engender higher average income in more successful businesses and the extent to which already existing business owners put more time and effort into their business. Secondly and methodologically, I am the first to use the synthetic control method – to my knowledge and excluding the few studies on total earnings discussed above and for which my measure of expenditures is the more

simply much harder to address such concerns in a DID setting with cohort variation. For example, the typical placebo tests will fail to show an effect if control cohorts are indeed affected positively but in a similar way. Including linear trends will only successfully alleviate problems of bias if control cohorts are affected in a linear fashion. In addition, many studies do not seriously consider analysis around migration during times of conflict which could be a main driver of spillover effects.

⁹Note that this may be a non-trivial requirement for longer conflicts. While the cohort variation in the context of a DID approach only requires data in one post-conflict period – and the massive recent increase in micro-level data has guaranteed availability for many countries – and data on geographical conflict intensity, pre-conflict data on outcome variables does not exist in many contexts.

¹⁰Guidolin & La Ferrara (2007) are the only exception who actually find negative effects of *peace* on an Angolian portfolio holding diamond assets. This paper shows that for specific industries, conflict may have positive income effects.

appropriate equivalent.

In pursuing the analysis of peace effects on these economic outcomes, the remainder of the paper proceeds as follows. Section 2 will give some more contextual background to the Niger Delta amnesty policy, section 3 informally explores potential theoretical channels involved in the consequences of conflict for health, education, self-employment income and household expenditures while section 4 describes the data I use for these variables. In the main part of this paper, section 5 explains and discusses the empirical design of my study in more detail, section 6 presents the results and section 7 delivers some relevant robustness checks. Finally, section 8 concludes.

2. Context

The Niger Delta region is an oil rich region in the south eastern part of Nigeria. Since oil revenues account for a large part of the government's fiscal budget, it has traditionally been a very important region for policymakers (Abazie-Humphrey, 2014; Obi, 2014). As Obi (2014) explains, the government has taken over federal control over oil in the 1960s and since then sharply decreased revenue derivation, that is, the share flowing into regional budgets. This has created tensions in the Niger Delta region and resistance activists have become a key actor since the late 1990s. In particular, the 'Movement for the Emancipation of the Niger Delta' (MEND) has emerged and became violent from 2006, marking "an escalation from uncoordinated protests and conflicts into a trans-Delta insurgency." Their violent activities were characterised by oil worker abductions, attacks of government forces and oil installation sabotages which led to a conflict involving a rapid decrease in oil production and increase in fatalities.¹¹

By the time Umaru Yar'Adua got elected as president in April 2007, the Niger Delta conflict has become a pressing issue for the government to solve due to its dependency on oil revenues. He announced an amnesty programme on 25 June 2009 and established the 'Niger Delta Peace and Conflict Resolution Committee' (NDPCRC) in July. The amnesty programme targeted ex-militants and granted "unconditional pardon to all persons who have directly participated in the commission of offences associated with militant activities in the Niger Delta" in return for surrendering their weapons, renouncing the use of violence and taking part in a government-sponsored 'Disarmament, Demobilisation and

¹¹In fact, as can be seen below, the number of reported fatalities drastically escalates only in 2009. From 2006 to 2008, therefore, the conflict seems to have manifested itself rather in great uncertainty, pipeline explosions, and threat of terror.

Reintegration' (DDR) programme. In fact, the DDR programme was a key and hugely expensive element of the programme.¹² Ex-militants participating in the programme received a monthly stipend of 65,000 NGN (approx. 440 USD in 2009), support and vocational training to facilitate their reintegration into society. The amnesty programme took effect on 6 August 2009 (The Guardian, 2009), from which point militants had a period of 60 days to sign up. 20,192 rebels signed up during this period; however, further militants were still approved after the deadline which accumulated the total number of participants to 30,000 after all (Oluduro & Oluduro, 2012; Premium Times, 2012).

The statistics on post-2009 fatalities show and analysts generally agree that the programme was effective in establishing peace in the region, at least for a couple of years (Abazie-Humphrey, 2014; Obi, 2014; Oluduro & Oluduro, 2012; Oluwaniyi, 2011).¹³ Abazie-Humphrey (2014) argues that peace in the region served as a condition for development and growth through a more stable business environment and the completion of infrastructure project. In a very simple analysis comparing mean outcomes for the artisan fishing industry, Achoja et al. (2013) find some suggestive evidence of an improved business situation. Therefore, it seems worthwhile to exploit the amnesty programme as a policy shock generating peace to investigate its effect on a range of outcomes.

3. Theoretical Considerations

For each of the outcomes I consider, there are multiple channels how peace may affect them. Since the direction of the effect is usually clear, I will resort to a brief verbal discussion of the possible mechanisms involved without a formal model. After all, the empirical exercise is mainly about the quantification of these effects. In addition, I will focus on a discussion of the converse effect, namely the channels how conflict affects my outcomes of interest, in order to stay in line with the vast majority of the literature regarding and estimating the issue from this perspective. The effect of peace then obviously just operates in the opposite direction.

As for GDP or general economic performance, Collier (1999) provides an overview of

¹²According to Abazie-Humphrey (2014) who refers to a press conference with Kingsley Kuku, the chairman of the amnesty programme, annual budgets for the programme up until 2014 amounted to more than 1.8 billion US dollar.

¹³These authors are, however, sceptical as to whether the policy is able to generate lasting peace. They generally criticise it for not addressing fundamental causes of the conflict in spite of the government's rhetoric viewing the policy as a pathway to sustainable peace. Indeed, some increases in conflict can be observed in the region from 2015, but in light of the Boko Haram insurgency affecting the whole country, it is difficult to causally link this back to a failed amnesty policy. In any case, my analysis focuses on outcomes in 2013 and the data shows a period of peace between 2009 and 2013.

potential channels in his seminal paper. Conflict leads to the destruction of resources, physical and human capital as well as infrastructure, disruption of order, diversion of public expenditure from output-enhancing activities, dissaving, increased uncertainty and decreased foreign investment. From this macro perspective, such effects should all lead to a reduction in economic performance. Conversely, peace as a reversion of these effects should lead to increased economic performance, especially in the medium and long run. However, related to the idea of a rapacity effect as a cause of conflict (Dube & Vargas, 2013), if there is conflict over a valuable resource (which is the case with oil in the Niger Delta), rebels benefit from resource theft and revenues. Therefore, for those households involved in conflict, peace may mean a drop in their economic performance, at least in the short run.¹⁴ Naturally, we may expect the reversion of the above effects as peace unfolds to operate on a larger scale, be relevant for all households and therefore dominate potential immediate economic losses from resource theft in the medium and long run.

The effect on self-employment activity or income is partly related to general economic performance effects. The obvious link is that any changes in households' income translate into demand changes. A demand reduction translates into contraction of businesses providing the goods demanded. Other than through this link, conflict also directly affects self-employment. Destruction of infrastructure and increased uncertainty mean higher cost of production.¹⁵ In the specific case of conflict over a natural resource, engaging in militant activity and resource theft also becomes an alternative supply of labour and some households may shift some labour into this activity which also reduces labour supplied to self-employment activity. Taken together, a contraction of self-employment businesses and higher cost of operation should lead to a reduction in self-employment income. Conversely, peace operates in the opposite direction of these effects and should lead to an increase in self-employment income.¹⁶

With regards to education, three channels are usually discussed in the literature. Firstly, demand side factors may reduce the amount of schooling obtained during conflict. If con-

¹⁴This is reflected in the findings by Guidolin & La Ferrara (2007).

¹⁵Seiermann (2012) and Ksoll et al. (2016) provide specific examples. The former explores the infrastructure channel explicitly in Peru. She argues that destroyed infrastructure, in particular roads, leads to higher cost of market access for self-employed people that need to get to the next market to sell their products. The latter consider flower exporters in Kenya during times of electoral violence. They find that firms had to face increased labour absenteeism and pay higher wages as a compensation for coming to work in times of conflict. Although they consider (larger) firms, the mechanism is clearly equivalent for self-employed businesses which employ labour.

¹⁶Note, in particular, that self-employment activity may increase both on the intensive and extensive margin as a response to peace which both lead to higher self-employment income. Clearly, business owners who invest more time and effort into their existing businesses generate more income in so doing. On the extensive margin, more businesses being set up result in more competition and crowding-out of the least productive businesses which would also result in higher income on average.

conflict reduces financial resources,¹⁷ an income effect would lead to a reduction in (the consumption of) education since schooling is costly. Furthermore, especially in the context of developing countries and poor communities, if the reduction in financial resources pushes households below or close to the subsistence level, a substitution between education and income-generating work may kick in. Apart from this chosen education-labour substitution, involuntary education-labour substitution also occurs in incidences of child soldiering through forced recruiting or military draft. Secondly, supply side factors may reduce schooling. This includes the destruction of schools or conflict-related deaths of teachers. Thirdly, a general situation of increased uncertainty and insecurity means that it is more dangerous to leave the house to attend public institutions.¹⁸ When peace starts, the reversion of all these effects should lead to an increase in education.

Apart from the mechanical effect of conflict-related deaths, there are several ways in which conflict typically impacts on health. Conflict may have a direct effect on food security through the destruction of livestock and burning of crops which clearly affects the health of those suffering from food insecurity. Conflict also leads to displacement which in particular increases children's exposure to and risk of water and vector-borne diseases (Verwimp et al., 2010). In addition, the destruction of health infrastructure in the course of conflict and lower financial resources reduce access to healthcare and the demand (ability to pay) for it, respectively. These channels all lead to worse health conditions during conflict or, conversely, improve health at peace. It is also noteworthy that a change in health conditions in turn translates into respective changes in work and education. In particular, better health conditions would lead to increased self-employment activity and education.¹⁹

4. Data

4.1. Data Sources

I am using two different sources of data for this study. The first is the Nigerian General Household Survey (GHS) with socio-economic data on Nigerian households. I am using

¹⁷Although this is potentially not clear in the short run if there is massive involvement of households in resource theft as discussed above, this should at least be what we observe in the medium and longer run.

¹⁸Strictly speaking, this is a demand side factor as well but the focus here is on the substitution effect towards other goods arising from an increase in the cost of education. By contrast, the first channel focuses on the mere income effect from a reduction in financial resources. Therefore, authors like Shemyakina (2011) and others usually state this channel as a separate point.

¹⁹Miguel & Kremer (2004) show how impressive the effect of health on education can be in itself.

survey rounds 2006, 2007, 2008 and 2012 (National Bureau of Statistics Nigeria, 2012). These surveys provide measures for the four outcomes considered: education, health, self-employment income and household expenditures. The data collection of GHS survey round in year y is actually carried out early in year $y+1$, more precisely, typically between February and July of the following year. Therefore, the GHS rounds 2006, 2007 and 2008 with data on the first halves of 2007, 2008 and 2009 are used for the matching procedure to create the synthetic control region. This procedure creates a synthetic control region that matches both the key variables in 2009 and a short pre-trend of two years. Earlier rounds are not available. The GHS round 2012 provides data on outcome variables in the first half of 2013 that is used to measure the effects of the peace policy four years later.

Using data from 2013 seems to be striking a good balance between capturing meaningful medium-run consequences after peace has been established and not having any confounding problems the end of the amnesty programme in 2015 or heavily increased violent activities due to Boko Haram in some Nigerian states from 2014. The amnesty programme established a period of lasting peace in the Niger Delta region for at least a couple of years, but it took at least a year to show seriously low levels of violent conflict. Hence, using data from 2010 that would be alternatively available is likely to be too early and would not capture the arguably more meaningful longer term outcomes. On the other hand, 2015 is the year when the amnesty programme ended, conflict increased to some extent again and some Nigerian states were so badly affected by Boko Haram activities that they may not pose a valid counterfactual any more. Therefore, alternatively available data from 2015 seems also inappropriate.

For measures of conflict, I am making use of data provided by the Armed Conflict Location & Event Data Project (ACLED, 2015). This is a very rich data source covering all conflict events with precise location data in many developing states from 1997. In particular, I am using the data on Nigeria from 2006 to 2009 for the matching procedure. In addition, I am using conflict data before 2006 and between 2010 and early 2013. The pre-2006 data is used to verify that the conflict development is similar in the synthetic control and Niger-Delta region over a longer time horizon before 2006. The post-2009 data is used to assess the first stage of my investigation, i.e. whether the matching indeed produces a synthetic control that displays sustained post-2009 high levels of conflict relative to the Niger Delta region in which conflict reduces.

4.2. Relevant Measures

As a measure for conflict, I consider fatalities in a conflict event. In particular, for the matching procedure and as an outcome variable, I use the sum of fatalities in violent events in a particular state and year as a measure of the degree of conflict. Following the definition of ACLED regarding political violence, I include the following event types: Battles (“Battle – No change of territory”, “Battle – Non-state actor overtakes territory”, “Battle – Government regains territory”), “Remote violence” and “Violence at civilians”. The predominant reason for the inclusion of these events is that they involve violence and variation in the number of fatalities. However, even if other event types are included that are typically associated with no or very few fatalities (e.g. “Strategic development”), the results do not change dramatically. The main reason for using the sum of fatalities as opposed to other measures of conflict is that it captures both the *extent* and *intensity* of conflict. As a demonstrating example, consider the following two scenarios of conflict a state could undergo: Very few events involving enormous amounts of fatalities vs. an extremely large amount of events with relatively few fatalities each. In my simple categorisation, the former is rare, but quite intense conflict while the latter means extensive, but low-intensity conflict. It is unclear whether one scenario represents more conflict than the other or not. Taking the average number of fatalities in an event would, for example, capture only the intensity of conflict, but disregard the extent and give the first scenario a much higher score. Taking the number of incidents as a measure would, on the other hand, capture the extent, but disregard the intensity and give the second scenario a much higher conflict rating. Therefore, it seems reasonable to use the sum of fatalities as a measure in order to capture both elements.

As an education measure, I am employing a standard measure: Years of schooling. This is observed in great sample size at the state level. For health, I am taking the height of children under the age of five which is a commonly used measure as well. This measure is usually applied when studies wish to investigate long-term health outcomes as opposed to mechanically increased death rates from conflict. Since my analysis is in line with this purpose, it seems appropriate to use height as a measure.²⁰

In order to capture overall economic capacity or welfare, I use a measure of household

²⁰In order to create some measure of life expectancy using the available data, I used mean death age, taking households with at least one deceased household member in the last 12 months to construct this measure, in a previous version of this paper. Although I excluded cases without signs of previous sickness that were captured by another variable, it is not clear whether this would fully account for all the mechanical deaths that arise from conflict. In addition, this may not capture life expectancy very well for various reasons. In any case, the main results are extremely similar when this alternative health measure is considered which provides some robustness to the measure considered here.

expenditures. Although this does not capture savings, I prefer this measure over household income for several reasons. Firstly, household income is imprecisely measured. For the GHS 2008 survey, the monthly income is only measured in 1000s of NGN (1000 NGN were approximately 6.80 USD in 2009) which – although this seems to be a fairly small inaccuracy in absolute terms – may have non-negligible implications given the fact that 25% of the population report to have an income below 6000 NGN. For the 2012 survey, the income question is on the last payment and not for a specific time period. In light of the high irregularity of income flows that is common for many people in developing countries, it is unclear how informative and accurate such a measure is. Secondly, key quantiles in the distribution of monthly income and expenditures in the GHS 2008 survey used for the matching procedure are very close. It doesn't seem to be the case that large amounts of constant saving disguise the true welfare of household. Thirdly, and relatedly, household expenditures also capture the ability of households to smooth out consumption. While income measures for the last month may be due to high degrees of fluctuation, expenditures are much more smooth and provide a clearer picture of the household's economic welfare situation. Indeed, the distribution of expenditures for the GHS 2008 survey looks considerably more smooth than the one for income.

As another measure of economic activity that may differently be affected by conflict than overall economic capacity or welfare, I consider self-employment income.²¹ In particular in the developing country context, it seems reasonable to consider self-employment as an economic activity which includes many small and micro-businesses that a substantial share of households run relative to formal waged employment. Regarding *income* as a measure as opposed to a mere measure of whether household members own a business or not, this captures the extent of self-employment activity arguably better. It obviously captures any additional time and effort going into one's business as well as success through a more conducive environment. In addition, however, it also captures an increase in the number of businesses indirectly since this would translate into more competition, crowding-out of low-productivity businesses, and therefore higher income on average.

In order to capture the average in a meaningful way for both household expenditures and self-employment income, I am using the median as opposed to the mean for standard reasons.²² The mean is subject to high volatility for such measures coming from changes in

²¹See section 3 for a small exploration of the different mechanisms at play.

²²While I observe expenditures at the household level, I observe self-employment income at the enterprise level within a household. Most households have one (small) business but around a third have more than one. I therefore consider median household expenditures and median enterprise incomes for states.

the extreme top part of the distribution. This is a potentially particularly severe issue in my context where I only have data on monthly expenditures and self-employment income in the month preceding the survey interview.

5. Empirical Design

5.1. The Synthetic Control Method

In order to get a valid counterfactual region that the Niger Delta region can be compared to after the policy implementation, I employ the same method as Abadie & Gardeazabal (2003) for their investigation of the economic cost of conflict in the Basque region in Spain in the late 1960s. I am constructing a synthetic control region from the states that are outside the Niger Delta region and thus not affected. 28 states are outside the Niger Delta region (denote the number of non-Niger Delta states $N_{NND} = 28$) and remained unaffected by the policy. The idea is to use a weighted average of these 28 states that is comparable to the population weighted average of the nine Niger Delta states prior to the policy implementation. Since I am investigating the impact of the policy on education, health, household expenditures and self-employment activity, it seems appropriate to make the synthetic control region comparable to the Niger Delta region in these characteristics before the policy change. Unfortunately, I do not have the health measures for the pre-2009 surveys, but I use the data on the other three outcome variables in all survey rounds for the matching procedure. In addition, I am taking a measure of conflict for the period between 2006 and 2009 into account which is what the policy addresses.²³

To introduce some notation for this procedure, let the matrix X capture the five variables that I match on in the available time periods for the Niger Delta region: 2007-2009 measures of education, self-employment income and household expenditures and 2006-2009 measures of conflict. These are 13 variables for each of the 9 states in the Niger Delta region (denote the number of Niger Delta states $N_{ND} = 9$), so X is of dimension (13×9) . Similarly, let the matrix Y of dimension (13×28) capture the same measures for the 28 states outside of the Niger Delta region.²⁴ Furthermore, let v be a (9×1) vector of population weights for the Niger Delta states and w be a (28×1) vector of *some*

²³This period is chosen because it captures the same time horizon as the GHS surveys and because the MEND group, one of the largest militant groups in the Niger Delta, became violently active in 2006 which marks a sharp increase in conflict before the amnesty programme was started in 2009.

²⁴In order to guarantee comparability in the scale of the different measures, I am actually using constructed z scores of each measure by standardising on the 28 non-Niger Delta control states. However, I am reporting the non-standardised values for ease of interpretation in the following.

weights for the non-Niger Delta states. Now, for the thirteen measures used and some vector of weights w , the difference $Xv - Yw$ captures the simple distance between the population weighted average outcome in the Niger Delta region and a weighted average of the non-Niger Delta states using weights w . The goal of the synthetic control method is then to minimise the squared distance between characteristics of the Niger Delta region Xv and its synthetic control Yw by choosing weights w ; that is, the optimal weights arise as the solution to the following optimisation problem:²⁵

$$\begin{aligned} \min_w \quad & (Xv - Yw)'(Xv - Yw) \\ \text{s. t.} \quad & w_j \geq 0 \quad \forall j, \\ & \sum_{j=1}^{28} w_j = 1 \end{aligned}$$

The resulting optimal vector w^* has non-zero weights for only six of the 28 non-Niger Delta states (denote the number of states in the synthetic control region $N_{SC} = 6$): Abuja (4%), Adamawa (20%), Anambra (12%), Borno (14%), Kogi (27%) and Lagos (23%). The Niger Delta and synthetic control states are displayed in Figure 1.²⁶

The synthetic control region overcomes the substantial gap between the population weighted average of Niger Delta states and a mere population weighted average of states outside the Niger Delta region before the policy change. A simple comparison between these two regions would be subject to selection bias and lead to massive overestimation of the effects since the non-Niger Delta states perform systematically worse than the Niger Delta states in all relevant characteristics. However, the synthetic control constructed using the weights w^* is comparable to the population weighted average of Niger Delta states. In addition, in order to provide some confidence that w^* actually provides a valid counterfactual region, I checked how it performs on some indicative socio-economic characteristics relative to the Niger-Delta region that can be found in the GHS 2009 survey: Average age, the share of own account workers among all working people as well as the share of individuals with electricity supply, ownership of at least one TV and ownership of at least one mobile phone. Table 1 provides the results for both the matched

²⁵I use the Sequential Least Squares Programming (SLSQP) within Python's SciPy library to run a numerical optimisation.

²⁶The shares are rounded to the nearest integer. All other states have a weight of zero rounded to the nearest integer. It is not unusual that only a minority of potential control states has a non-zero weight. Abadie & Gardeazabal (2003), Gong & Rao (2016) and Matta et al. (2016) similarly get that only fewer than five control states or countries out of a considerably larger set have non-zero weights. Four out of six states making up the synthetic control region are indeed spatially close to the Niger Delta region. Section 7.2 deals with potential spillover concerns.

variables and unmatched characteristics. Focussing on the period between 2007 and 2009, Figures 3, 4, 6 and 7 display the matching results for the matched variables graphically and Figure 2 shows the results for the further characteristics.

As the graphs show clearly, the conflict trend between 2006 and 2009 as well as the developments for education, self-employment income and household expenditures are very well matched. While there are considerable differences between all non-Niger Delta states and the Niger Delta region, the synthetic control region closes this gap.²⁷ All but one difference are statistically insignificant at the 5% level and any differences are usually not very sizeable in magnitude. As for the non-matched further characteristics, the synthetic control also substantially closes the gap between the Niger Delta region and the simple average of all non-Niger Delta states for most variables.²⁸ Lastly, it is notable that the pre-2006 conflict trend (which is not matched) in the Niger Delta region is more closely followed by the synthetic control region than by the trend in all non-Niger Delta states.

5.2. Differences with other approaches

Comparing the synthetic control method to standard regression techniques (involving in particular DID regression methods that are commonly used in the micro-empirical literature on the effects of conflict), three distinct advantages of the former method emerge. Firstly, while it can be shown that a regression-based estimator would essentially also produce a weighted average of potential control states with the weights summing up to one, the weights may lie outside the unit interval (Abadie et al., 2015). Therefore, regression techniques allow for extrapolation and hence potential extrapolation problems whereby the extent of extrapolation is typically unknown to the empirical analyst since the weights are usually not computed in practice. Secondly, and especially relevant to this multi-

²⁷It also becomes very clear that there is no linear or uni-directional trend for education, employment income and expenditures. There are several important developments that may be reasons for the patterns observed: General elections in 2007, a sharp food price hike in 2008 and the financial crisis in 2008. Multiple channels are conceivable. Sharply increasing food prices from 2007 to 2008 (UNFAO, 2009) may have increased expenditure mechanically, but may also have resulted in substitution away from children's education towards income-generating activity through lower income. The crisis may have hit Nigeria throughout 2008 and resulted in worse economic performance in 2009, in particular in the Niger Delta region suffering from oil price drops as the Central Bank's governor suggested (CBN, 2009). The new president's policy may have had its own effect on education and economic performance. Irrespective of what combination of key events or developments may explain these patterns, however, it is more important for my identification that the synthetic control region matches the Niger Delta region in this trend.

²⁸It is indeed true that for all characteristics, the difference between the Niger Delta region and the synthetic control region is still statistically highly significant. However, this is due to the fact that I have a very large number of observations at the individual level for these characteristics and averages are therefore extremely precisely estimated – even small differences, consider for example mean age, would show up statistically highly significant. However, they are not necessarily economically meaningful.

outcome analysis, a regression-based analysis would not produce the *same* counterfactual for all the outcomes while the synthetic control method does and successfully matches not only 2009 outcomes, but also the pre-trend. This may yield more convincing estimates of the causal effects of peace. Thirdly, the commonly used DID techniques do not allow to control for time-varying fixed effects in different regions while the synthetic control method does.²⁹ Abadie et al. (2010) prove that the synthetic control method is essentially a generalisation of the usual DID model in precisely the way that it allows unobserved characteristics to vary with time. The key common trend assumption in DID analyses which basically assumes away that unobserved characteristics in treatment and control units are time-varying can actually be verified in my data. Since my data allows me to observe how the treatment and control states evolve with regards to three of the outcomes of interest in the two years preceding the policy implementation in 2009, it can actually be observed how the common trend fails between 2008 and 2009 for self-employment income and household expenditures: The reduction in the former variable is considerably more pronounced in the non-Niger Delta states. It amounts to 27.34 USD in non-Niger Delta states while it is only 12.79 USD in Niger Delta states. Household expenditures show the reverse pattern; they decrease more strongly in Niger Delta states (by 54.31 USD vs. a 34.95 USD reduction in non-Niger Delta states). A close look at the trend in Figures 6 and 7 between 2008 and 2009 identifies this differential pattern graphically. In fact, implementing a simple DID procedure as a robustness check, I show that the DID results deviate from the results coming out of the synthetic control method in exactly the direction of the violations of the common trend assumption (see section 7.1 for details).

5.3. Interpretation and Potential Concerns

It is instructive at this point to think about the interpretation of results coming out of the synthetic control method in the study context given that I take the unusual approach of evaluating peace in the Niger Delta region relative to continued conflict in other Nigerian states serving as counterfactual. Most studies conversely evaluate either ongoing conflict

²⁹While it is possible to control specifically for potentially confounding observable variables – here, past realisations of outcome variables could for example be controlled for – and hence capture their time-varying effects within regions, this does not solve the problem entirely. First of all, there may still be *unobserved* characteristics that vary in time. In fact, including past outcome variables in the DID regressions that I carried out as robustness checks does not change the results substantially. In addition, this still imposes a linear relationship between the observed control variables that are included while the synthetic control method does not make such a parametric assumption. Finally, including past outcome variables as control variables engenders the standard problem of putting the assumption of no correlation between the error term and regressors at risk since any degree of autocorrelation in the error would result in a violation of the assumption.

relative to peace or the consequences of a period of conflict some time after the conflict has ended (with greatly varying time horizons) by comparing areas that were affected by conflict to counterfactual areas that did not experience conflict in the past. I choose to evaluate peace relative to continued conflict because the amnesty policy in the Niger Delta region and conflict in other Nigerian states after 2009 provide a unique (quasi-experimental) setting for this estimation. Conflict in the period between 2009 and early 2013, especially the later part of this period, happens in a number of Nigerian states mainly – but not exclusively – in the North Eastern part of the country where Borno lies, one of the states making up the synthetic control region. This is partly driven by Boko Haram’s activities in that region. In this sense, the results I am finding can also be interpreted as the contemporaneous impact of continued conflict in some parts of the Nigeria (represented by the synthetic control region) relative to peace in a comparable Niger Delta region. However, I prefer to interpret them conversely as the benefits of peace in the Niger Delta region relative to what would have happened counterfactually in the same region had the policy not been implemented. This is essentially an estimate of a peace dividend, an evaluation of the potential damage the amnesty policy prevented. To some degree, since the counterfactual displays (only) sustained levels of conflict very comparable to the ones in 2009, this may even be a lower bound of the true peace dividend. The reason is that it is not clear whether conflict levels would have been sustained or further escalated in the absence of the amnesty policy. Given long underlying tensions and violent conflict that sparked shortly before 2009, it may not be unreasonable to assume that an escalation of conflict would provide a more realistic counterfactual.

Related to the interpretation and context, one may wonder why an amnesty policy was carried out as a response to conflict in the Niger Delta region and not in other states of Nigeria that experienced ongoing conflict and – more importantly – whether the underlying reasons pose a threat to identification. Clearly, the fact that the Niger Delta region is an oil rich region and that the oil production is a main determinant of the government’s fiscal resources plays a role. However, I argue that this is not a concern for bias and internal validity and, if anything, affects external validity. First of all, any relevant influence of systematic differences in oil production between the Niger Delta region and the synthetic control region should show up in the pre-2009 trend which is actually well matched. Furthermore, oil production was decreasing in the Niger Delta region before 2009 (Abazie-Humphrey, 2014; OPEC, 2010). Any concern (in the sense of an omitted variable) postulating that oil production may have picked up before 2009 when the pol-

icy happened to be put in place and therefore observed effects are actually confounded with positive effects of already increasing oil production before 2009 is inconsistent with such a decrease. Much to the contrary, in fact, it seems likely that the policy was put in place precisely because of massive losses from decreased oil production due to conflict. However, this means that the effects of peace (partly) operate *through* increased oil production after 2009 which is not a source of endogeneity, but just a channel through which peace operates.³⁰ Therefore, my results just provide a reduced form effect of peace from all possible channels. Of course, because of the Niger Delta's oil richness, the region is particularly suitable and may be expected to generate large benefits from peace. This is an issue of external validity, related to the idea of "site selection" in randomised controlled trials (Allcott, 2015). As a consequence, and as usual, my results should first and foremost be interpreted as the effect generated in the specific context of conflict in the Niger Delta region. To assess to what extent external validity may be compromised, it is then instructive to regard them in light of findings from different settings.

Another concern is that the synthetic control method is generally unable to distinguish the effect of the analysed policy from the potential effect of other policies or developments over the same time horizon in the same area. In this case, the peace effects cannot be isolated from any other political or economic development between 2009 and 2013 that affects the Niger Delta region. The most prominent such development that springs to mind would be the election of President Goodluck Jonathan in 2010 who comes from the Niger Delta region. Given Nigeria's clientelistic nature of government, it may not be unreasonable to assume that his policies may have benefited the Niger Delta region relative to other parts of the country in the outcomes of interest. While I cannot perfectly exclude any such effects, considering the outcomes in the state Bayelsa that Goodluck Jonathan is from separately from the entire Niger Delta region suggests that this is not a major concern. For all four outcomes, Bayelsa exhibits a lower value in 2013 than the average of the Niger Delta region; except for health, the difference is actually substantial. Furthermore, the development over time in Bayelsa is not better than for the other states of the Niger Delta region. Indeed, while it is comparable for education, it is actually considerably *worse* for self-employment income and household expenditures.³¹

³⁰Note that the synthetic counterfactual displays sustained levels of conflict reflecting a counterfactually sustained low oil production. Again, if anything, it seems reasonable to assume that conflict may actually have escalated further and induced further drops in fiscal revenues from oil production, in which case the results are lower bounds.

³¹Note that the development over time for health cannot be observed since I don't have data on the health measure used in before 2013. However, the effect on health that I find as a main result for the Niger Delta region is insignificant anyway.

6. Results

6.1. The “First Stage”: Conflict Reduction

While the sharp conflict trend was stopped and reversed in the Niger Delta region as a consequence of the policy from 2010, the synthetic control region continues to show high conflict levels after the policy implementation. Figure 3 depicts this first stage relationship very clearly. The synthetic control region maintains high conflict levels relative to both the Niger Delta region and the non-Niger Delta states after the amnesty policy implementation in 2009. Although there is a sharp drop in the synthetic control region in 2010, conflict levels are high again and comparable to the 2009 Niger Delta levels from 2011 to 2013. It is particularly convenient that conflict levels are very similar in the synthetic control in early 2013 and in the Niger Delta region in 2009 since the peace dividend estimation is based on outcomes in early 2013. By contrast, a population weighted average of all states outside the Niger Delta region does not match these conflict levels.³²

6.2. Main Results on Developmental Outcomes

Comparing the Niger Delta region to its synthetic control region in early 2013, the effect of peace in the Niger Delta region on education, health, self-employment income and expenditures is considered in this section. Table 2 and Figures 4 to 7 summarise the main findings.

The results represent a peace dividend over a period of four years. Except for the health effect, all results are significant at the 1% level. The substantial magnitude of the results suggests that there are considerable benefits from peace or, conversely, severe consequences of conflict. Average education increases by 0.5 years of schooling which is broadly in line with what the literature finds in other countries. According to estimates by Aromolaran (2006) and Schultz (2004), returns to primary and secondary schooling in Nigeria range between 2% and 7% and are even higher for post-secondary education (10%-15.5%).³³ Given these estimates, even if we were to ignore the potentially overestimated

³²As an additional regression peace of analysis on the first stage, consider the Niger Delta region only. A simple regression of fatalities from 2006 to 2015 on a dummy taking the value 1 from 2010 onwards (2010+ dummy) – essentially a mean comparison – shows a significant reduction in conflict. I consider an effect from 2010 only since the policy came officially in effect in August 2009 as a response to violent conflict in earlier years and particularly early 2009 itself. Therefore, conflict in 2009 is actually quite high and only reduces from 2010 onwards. This effect is particularly strong for more violent events, defined here as events involving at least five fatalities. In addition to this reduction in conflict, there is also a stark trend reversal. A further regression including a time regressor for years as time periods starting in 2006 and an interaction with the 2010+ dummy – again, for more violent events – shows a significant and substantial trend reversal. The results are shown in Table 5 and 6.

³³Even though these authors merely run OLS regressions on household survey data, they argue that the

returns for post-secondary education which only about 10% of the Nigerian population enjoyed in 2013, an average increase by half a year of schooling has a meaningful long-term economic effect.

The effect on health is around zero and not statistically significant. This is indeed not in line with the literature that finds effects of conflict on health, but the lack of findings in my context may be related to the time horizon I consider. In particular for developmental health impacts that would manifest itself in long-run changes of average height, four years may be too short a time horizon to expect any changes.

With regards to both measures for economic activity, I find substantial effects. In the Niger Delta region, self-employment income is 47.49 USD higher than in the synthetic control region at the median and household expenditures exceed its counterfactual by 30.98 USD at the median. The relative effects are enormous. Given the counterfactual median values, these differences represent 67% and 19% increases, respectively.

Since the match for both variables for 2009 is not perfect and there are statistically significant differences (that are however small in magnitude) between the Niger Delta and synthetic control region, one might be concerned about bias of the estimator. However, even if we take the initial differences in 2009 into account and subtract them from the outcome difference in 2013 (following the logic of a simple DID procedure), we would still have sizeable effects. For self-employment income, the effect would be 39.35 USD (or 56%) and it would amount to an increase by 35.69 USD (or 22%) for household expenditures.³⁴

In relation to the existing literature, the effect on self-employment is considerably larger than what the only comparable study in Mexico finds (Velásquez, 2015). This may hint at the external validity issue discussed above;³⁵ however, since there is only one comparison study, it is generally hard to draw any conclusions. In addition, my results on overall economic performance, here captured by household expenditure, are in line with what the most closely comparable literature finds. In any case, the large findings on self-employment income suggest that this may be an exciting link to explore further in future research.

potential upward bias from omitted socio-economic factors may very well be offset by downward bias from measurement error, referring to Card (1999) and Ashenfelter & Krueger (1994). In particular for primary and secondary education, the quality of education measurements in the household surveys would suggest that this is quite likely to be the case or that the bias from measurement error may even be larger in which case, if anything, their return estimates provide lower bounds.

³⁴Using the information in Table 1 and 2, $39.35 = 47.49 - (94.81 - 86.67)$ and $35.69 = 30.98 - (100.3 - 105.01)$.

³⁵The fact that we may expect large economic benefits of peace in the oil-rich Niger Delta region may be due to both any spin-off businesses of the oil industry and the fact that oil or any derivative materials are key inputs in many businesses, e.g. for using generators or cars.

With regards to the theoretical considerations, the results are in line with what peace is expected to generate. In particular, the effect on household expenditure, taken as a measure of overall economic performance, is strongly positive. Clearly, the medium-run benefits of peace significantly dominate any potential immediate economic losses from diminished militant activity and oil theft. We can also observe that the increases in self-employment income are relatively larger than the increase in overall economic performance which may reflect that some labour supply shift from military activity and oil theft into self-employment activity has indeed taken place. Of course, alternative explanations may be that not all additional income is spent, but part of it is saved, or that self-employment activity has increased relatively more strongly than waged labour supply as a response to peace.

7. Robustness

7.1. DID Results

As a first robustness check, I will use a simple DID approach as an alternative method for the outcomes education, self-employment income and household expenditures. Since I do not have data on my health measure in 2009, I cannot perform this analysis for health as an outcome variable. The simple comparison is essentially just a comparison of two differences in means. In regression format, the DID estimator would be the coefficient δ in:

$$y_{it} = \alpha + \beta ND_i + \gamma T2013_t + \delta(ND_i \times T2013_t) + u_{it}$$

where y_{it} and u_{it} are the outcome and error term in state i and year t respectively, ND is a dummy variable indicating whether state i is in the Niger Delta region or not and $T2013$ is a dummy taking the value 1 if the year is 2013.³⁶

I can demonstrate that the DID results are in line with my previous results for outcomes for which the parallel trend assumption holds and deviate from the results in the expected direction for outcomes for which the pre-2009 trend for the non-Niger Delta states deviates from the Niger Delta and synthetic control region. Table 3 presents the results in the format of simple two-way differences. Comparing them with the results from the synthetic

³⁶Most DID approaches are finer in the sense that they control for regional fixed effects by taking a dummy variable for each region instead of a coarser distinction between Niger Delta states and non-Niger Delta states only. However, which set of dummies is used does not make a difference for the magnitude of the DID estimator δ . Furthermore, if past values of the outcome variables are included as additional controls, the results do not change much. The simple version of the DID is therefore reported here.

counterfactual procedure, it must first of all be noted that the two estimators are not significantly different for any of the four outcome variables (the lowest p-value on the four difference tests is 0.24 – for median household expenditures). As for education, the difference between the two estimators is very small. In the case of the former outcome, we can observe the pre-trend and note that the parallel trend assumption strongly appears to be satisfied which is consistent with finding coinciding DID and synthetic counterfactual estimates. Graphically, Figure 4 demonstrates this clearly. Especially for the employment income and expenditure measure, however, the fact that the two estimates are statistically indistinguishable may not necessarily be a result of the two estimators in fact coinciding, but of large standard errors. Nevertheless, considering the point estimates, the direction of the DID estimator’s deviation is perfectly in line with pre-trend differences between the Niger Delta states and those outside the Niger Delta region. Figures 6 and 7 demonstrate this point graphically. It seems that the two regions follow a similar trend between 2007 and 2008 and have different trends between 2008 and 2009 (– as discussed in section 5.1, the magnitude of these trend deviations is not negligible). Therefore, the direction of the common trend assumption’s violation can be well captured by a simple DID between 2009 and 2008. As for median self-employment income, this trend deviation is positive. Therefore, we would expect the DID estimator to underestimate. In the case of median household expenditures, the trend deviation is negative and we would expect the DID estimator to overestimate. Relative to the estimator using the synthetic counterfactual, these are exactly the bias directions that we observe.³⁷ The fact that in precisely these two cases in which we observe non-negligible differences between the two estimators, they are in line with the direction of the common trend violation and that we do not observe differences when there are no or no observable such violations, should place some further confidence in the main results found using the synthetic counterfactual.

7.2. Spillover Effects

Since four of the six states that are part of the synthetic control region are quite close to the Niger Delta region, one might be concerned about spillover effects. Any effect of peace in the Niger Delta region on states outside it would form a violation of the Stable Unit

³⁷With regards to the magnitude of bias, the standard errors are extremely large which makes it impossible to make precise statements on whether the magnitude of the bias reflects the actual difference observed between the two different estimators. Indeed, the point estimates are close and statistically indistinguishable in both cases. For median self-employment profits, the estimator difference is 11.25 and the trend deviation is 14.55; for median household expenditures, the estimator difference is -11.17 and the trend deviation is -19.36.

Treatment Value Assumption (SUTVA) and bias the results. There are potential spillover effects in two directions that would bias the results in opposite ways. Firstly, there may be spillover effects from peace on other states that would form a positive impact on them, for example through increased trade with neighbouring states if economic activity improves in the Niger Delta region or through infrastructure extending into neighbouring states. Such effects would mean that states outside the Niger Delta region are also “treated” and their outcomes would show up more *positively* than the true counterfactual should. Therefore, these effects go against my results and would mean that I am underestimating and the true effect is even larger than what I find. Secondly, posing more reason for concern, peace in the region may attract people from other states into the Niger Delta region. In this case, outcomes of states outside the Niger Delta region would show up more *negatively* than the true counterfactual should and I would overestimate the true effect. Typically – and plausibly – these effects would be stronger for states that are closer to the treatment region which is what I am exploiting to test for spillover effects.

As a first piece of evidence against the presence (or dominance of) one type of spillovers, consider the above DID results again. The particular spillover concern with the synthetic control region is that four out of the six states making it up are very close to the Niger Delta region. The DID approach, however, takes all 28 non-Niger Delta states as part of the counterfactual. Since spillovers are expected to be stronger in states closer to the treatment region, the DID results should be systematically different from the main results using the synthetic control region in their presence. This is not the case. Not only are the DID results not significantly different, but also do different point estimates for median self-employment income and median expenditures go in *different* directions. They do not jointly indicate the presence or dominance of one type of spillover. Much rather, as discussed above, these differences can be explained by pre-trend deviations.

Migration flows, taken from the GHS 2012 survey, shall serve as a second piece of evidence against the presence (or dominance of) one type of spillovers. The particular spillover concern in terms of migration flows is that there may be a massive inflow of (in particular highly economically contributing) people into the Niger Delta region from the synthetic control region relative to the opposite flow in times of peace or that peace generally attracts in-migration in which case states closer to the Niger Delta region should show more migration into that region than states further away. Table 4 demonstrates that both these concerns do not seem to apply. In fact, the migration flow of people from synthetic control states into the Niger Delta region is very small in absolute terms and

considerably (as well as statistically significantly) lower than the opposite migration flow (the same result holds when comparing the *share* of migration from the synthetic control region into the Niger Delta region and vice versa). In addition, both the migration flow from states directly neighbouring the Niger Delta region (NS)³⁸ and from the synthetic control region into the Niger Delta region are very close (and if anything lower, but indeed statistically indistinguishable at conventional levels) to the general migration flow from non-Niger Delta states into the Niger Delta region (again, similar results arise when comparing migration *shares*). Therefore, the data does *not* suggest that the migration flow from states that are closer to the Niger Delta region is over-representative of the general migration flow into the Niger Delta region which is what we would expect to see if the second type of spillover effects was at play.

7.3. Placebo Study

A typical disadvantage of synthetic control methods that work with aggregate data is that aggregate data does not provide standard errors indicating any uncertainty as to whether a sample is reflective of a population (Abadie et al., 2010). For example, studies that employ GDP data to produce a synthetic control for some treatment region (or country) from a set of potential control regions (or countries) essentially use the universe of available GDP observations in their context.³⁹ Standard inference uses standard errors reflecting the unavailability of universal data. However, not all uncertainty is due to lacking universal data. In studies employing the synthetic control methods, “an additional source of uncertainty derives from ignorance about the ability of the control group to reproduce the counterfactual of how the treated unit would have evolved in the absence of treatment” (Abadie et al., 2010). In this study, I actually use sample averages from household surveys for my outcome variables which is why I can produce classic standard errors reflecting the uncertainty around whether the sample is representative of the universe of households. In a way, this uncertainty also captures the extent to which the Niger Delta region and its synthetic counterfactual are comparable before the policy intervention and differ after it. The underlying assumption is essentially that households in the synthetic control region display the same relevant characteristics on average before the policy is implemented. The matching procedure is supposed to produce exactly such a counterfactual satisfying

³⁸These eight states have a common border with at least one of the Niger Delta states and are thus defined to be the neighbouring states: Anambra, Benue, Ebonyi, Ekiti, Enugu, Kogi, Ogun, Osun.

³⁹This is precisely the approach taken by Abadie & Gardeazabal (2003), Gong & Rao (2016) and Matta et al. (2016).

this assumption and considering further characteristics that I did not match on enables me to verify how reasonable the assumption is. Therefore, reporting the classic standard errors as a measure of uncertainty around whether the synthetic control is a viable counterfactual is meaningful.

Nevertheless, as an additional check, I provide the classic solution to the problem of working with aggregate data in the context of the synthetic control method: A placebo study. Much more directly, implementing the same method for control regions that are actually unaffected and verifying what change after 2009 can be observed, this gives us an idea of how precisely the obtained estimates are and whether they are larger than what “placebo coincidence” would produce. In addition – particularly considering states that are part of the synthetic control region for placebo checks – this allows us to verify whether there is systematic movement (in a particular direction) in the synthetic control region which would suggest endogeneity and render the region invalid as a counterfactual.

As a placebo study, I carried out the same matching procedure as above to produce a synthetic control region for each of the 28 non-Niger Delta studies. For many states, this procedure unfortunately did not produce a good match. Placebo synthetic control regions for any of the non-Niger Delta states are of course only useful if they produce a reasonable match. In line with Abadie et al. (2010), I calculate the mean squared prediction error (MSPE) for all placebo synthetic control regions on the pre-2009 period to evaluate whether the match is good enough to provide a good placebo check. I consider the results for the following ten non-Niger Delta states, the synthetic control region of which had an MSPE not exceeding five times the MSPE of my original synthetic control region in relation to the Niger Delta region:⁴⁰ Benue, Enugu, Kaduna, Nasarawa, Ogun, Osun, Oyo, Plateau, Sokoto, Yobe. The gap between the state to be matched and its synthetic control in the four outcome variables of interest are presented for the Niger Delta region (black) as well as the the admissible non-Niger Delta states as placebos (grey) in Figures 8 to 11.

The results for education and self-employment income show clearly that the estimates for the Niger Delta region are outside the interval of mere randomness. In both cases,

⁴⁰I consider the MSPE for conflict and the three outcome variables – these are exactly the variables I match on. The MSPE is therefore proportional to the objective function of the optimisation problem. Choosing five times the MSPE of the original problem as a threshold produces ten admissible placebo states and their synthetic controls. Note that this factor of 5 relative to the original synthetic control’s MSPE as a tolerance allows for substantial variation of the synthetic control regions around the actual realisations of their respective non-Niger Delta state to be reproduced. However, given that the majority of matches actually produces little congruent synthetic controls, this factor seemed to be the most reasonable number in the trade-off between having decent matches and having enough placebo studies to include.

the estimated difference between the Niger Delta region and its synthetic counterfactual in 2013 is an extreme value in comparison to the placebo studies. For health, all placebo studies produce a larger effect than the one observed for the Niger Delta region which is in line with the fact that the main result gives an insignificant zero estimate. With regards to household expenditure, the Niger Delta estimate is reasonably within the range of the placebo results. In spite of significance of the main results, this means that the results on household expenditure should be interpreted with a considerable degree of uncertainty. However, it is important to bear in mind that the placebo studies considered here include synthetic control regions that have non-negligible MSPEs on the pre-trend already, i.e. they are suboptimal matches. Therefore, it may not be surprising to see considerable gaps between the non-Niger Delta states and their respective synthetic control regions in 2013 as well. In addition, in spite of these substantial gaps, it is reassuring that this may to a large degree be actual randomness since there does not seem to be a systematic uni-directional “effect” that all placebo studies show jointly.

8. Conclusion

Building on the existing micro-empirical literature on the consequences of conflict, this paper provides evidence from Nigeria. Regarding the issue from the converse perspective, I estimate the benefits of peace for education, health, self-employment income and household expenditures. For this estimation, I make use of the ‘Presidential Amnesty Program’ carried out by the Nigerian government in the Niger Delta region which granted ex-militants in the region pardon, cash and required them to join a ‘Disarmament, Demobilisation and Reintegration’ programme in return for surrendering their weapons. This policy shock led to a period of peace in the region and provides a unique setting to estimate a peace dividend by comparing the Niger Delta region to a synthetic within-country counterfactual in the spirit of Abadie & Gardeazabal (2003). The synthetic control region produces a good match of the Niger-Delta region before 2009 and the estimation results are robust to several checks.

I find that peace in the Niger Delta region resulted in an average of 0.5 more years of schooling, a 67% increase in self-employment income at the median and a 19% increase in household expenditures at the median four years later. I do not find an effect on health. These results are to be interpreted as the peace dividend generated by the amnesty policy in the Niger Delta region relative to a counterfactual of sustained conflict in the region.

Although suffering from a considerable degree of uncertainty around the point estimates, they may even provide a lower bound to the true effects of peace if we were to assume (not unrealistically) that violent conflict in the Niger Delta region would not have remained constant, but further escalated in the absence of the amnesty policy.

The estimates give us an idea of how large and varied the effects of peace – or conversely, conflict – potentially are for different outcomes of economic importance and provoke two exciting questions for further research. Firstly, what are the consequences of conflict for different areas of economic activity beyond general economic performance? Given the extra-ordinarily large effect I find for self-employment income and that there is only little research exploring this link, it seems worthwhile trying to dissect effects on overall economic performance in its various components. Secondly, do these large effects persist long into the future and or do affected regions or countries converge back to their non-conflict counterfactual eventually? Although there is some literature exploring effects in the very long run, the results are inconclusive. More micro-empirical research employing methods that can plausibly establish causal links, such as the synthetic control method, and identify mechanisms between various outcomes and welfare seem necessary to find an answer to this question.

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Appendix

A. Tables

Table 1: Matching Results

Variable	Niger Delta (ND)	non-ND (NND) (p-value ND-NND)	Synth. Control (SC) (p-value ND-SC)
<i>Matched Variables</i>			
Fatalities 2006	2.9	3.2 (n/a)	6.7 (n/a)
Fatalities 2007	16.9	11.7 (n/a)	14.8 (n/a)
Fatalities 2008	16.2	4.4 (n/a)	14.5 (n/a)
Fatalities 2009	163.7	28.7 (n/a)	100.7 (n/a)
Yrs. of Schl. 2007	7.68	6.88 (0.00)	7.89 (0.10)
Yrs. of Schl. 2008	7.28	6.59 (0.00)	7.22 (0.56)
Yrs. of Schl. 2009	7.60	6.85 (0.00)	7.54 (0.48)
Emp. Income 2007	72.65	65.52 (0.04)	68.30 (0.35)
Emp. Income 2008	107.60	90.32 (0.02)	101.11 (0.59)
Emp. Income 2009	94.81	62.98 (0.00)	86.67 (0.10)
Expenditures 2007	96.10	69.98 (0.00)	82.76 (0.01)
Expenditures 2008	154.61	123.95 (0.00)	166.76 (0.13)
Expenditures 2009	100.30	89.00 (0.00)	105.01 (0.08)
<i>Further Characteristics</i>			
Age	26.0	22.7 (0.00)	24.5 (0.00)
Own Acc. Workers	71.9	66.1 (0.00)	66.1 (0.00)
Electr. Supply	72.8	50.7 (0.00)	58.6 (0.00)
TV Ownership	19.5	12.0 (0.00)	16.5 (0.00)
Mob. Phone Own.	44.6	29.8 (0.00)	40.6 (0.00)
<p><i>Note:</i> The matched variables are explained in section 4.2 and the further characteristics are explained in section 5.1. Both self-employment income and expenditures are reported in USD. Standard errors for median self-employment income and median expenditures are based on bootstrapped standard deviations with 500 replications at the state level and computed according to the weighting. Standard errors for all other variables are based on standard deviations at the state level and computed according to the weighting. P-values are based on two-sided t tests with $\min\{N_{ND}, N_{NND}\} - 1 = 8$ d.o.f. for the difference between ND and NND and $\min\{N_{ND}, N_{SC}\} - 1 = 5$ d.o.f. for the difference between ND and SC. Since the measure for conflict is aggregate data on the universe of conflict, typical standard errors are not available.</p>			

Table 2: Main Results

Variable	Niger Delta (ND)	non-ND (NND)	Synth. Control (SC)	ND - SC (Std. Err.)
Yrs. of Schl. 2013	8.56	7.21	8.06	0.50*** (0.12)
Height 2013	86.25	86.24	86.57	-0.32 (1.29)
Emp. Income 2013	118.25	50.17	70.75	47.49*** (12.91)
Expenditures 2013	193.47	140.00	162.49	30.98*** (7.34)

Note: The outcome variables considered are explained in section 4.2. Both self-employment income and expenditures are reported in USD. Standard errors for mean years of schooling mean height are based on standard deviations at the state level and computed according to the weighting. Standard errors for median self-employment income and median expenditures are based on bootstrapped standard deviations with 500 replications at the state level and computed according to the weighting. On the basis of one-sided t tests with $\min\{N_{ND}, N_{SC}\} - 1 = 5$ d.o.f. in line with the theoretical predictions, ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Table 3: DID Results

Variable	ND	NND	DID (Std. Err.)	ND - SC (Std. Err.)	Trend Deviation (2009-2008)
Yrs. of Schl. 2013	8.56	7.21	0.59***	0.50***	0
Yrs. of Schl. 2009	7.60	6.85	(0.10)	(0.12)	
Emp. Income 2013	118.25	50.17	36.24***	47.49***	+
Emp. Income 2009	94.81	62.98	(12.49)	(12.91)	
Expenditures 2013	193.47	140.00	42.17***	30.98***	-
Expenditures 2009	100.30	89.00	(6.30)	(7.34)	

Note: ND: Niger Delta region; NND: non-Niger Delta states; SC: Synthetic Control region. The outcome variables considered are explained in section 4.2. Both self-employment income and expenditures are reported in USD. The trend deviation (DID 2009-2008) for years of schooling is a quite precisely estimated zero (0.05, p-value: 0.46). Standard errors for mean years of schooling are based on standard deviations at the state level and computed according to the weighting. Standard errors for median self-employment income and median expenditures are based on bootstrapped standard deviations with 500 replications at the state level and computed according to the weighting. On the basis of one-sided t tests with $\min\{N_{ND}, N_{NND}\} - 1 = 8$ d.o.f. for the DID estimator and $\min\{N_{ND}, N_{SC}\} - 1 = 5$ d.o.f. for the SC estimator in line with the theoretical predictions, ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

Table 4: Migration Flows

	Move from SC (Std. Err.)	Move from NS (Std. Err.)	Move from NND (Std. Err.)	Move from ND (Std. Err.)
Move to SC				2.18% (0.0023)
Move to NS				0.89% (0.0014)
Move to NND	8.99% (0.0011)	12.45% (0.0012)	7.75% (0.0006)	3.05% (0.0027)
Move to ND	0.28% (0.0011)	0.40% (0.0012)	0.45% (0.0006)	13.02% (0.0027)
Total Migration	11.05% (0.0041)	12.84% (0.0043)	8.20% (0.0018)	16.06% (0.0045)

Note: SC: Synthetic Control region; NS: States directly neighbouring the Niger Delta region; NND: non-Niger Delta states; ND: Niger Delta region.

Table 5: First Stage in the Niger Delta Region

Variable	Coefficient	(Std. Err.)
2010+ dummy	-34.067***	(12.934)
Intercept	44.781***	(9.744)
N		74
R ²		0.088
F _(1,72)		6.938

Note: The dependent variable is fatalities in a violent conflict event involving at least five fatalities. The *2010+ dummy* takes the value 1 for 2010 and all following years and 0 otherwise. The regressor *time* is a normalised year variable taking the value 0 for 2006 and by one unit increasing values for following years. Normal standard errors are computed and reported, but heteroskedasticity-robust standard errors change none of the significances. ***, ** and * denote significance at the 1%, 5% and 10% level based on two-sided testing, respectively.

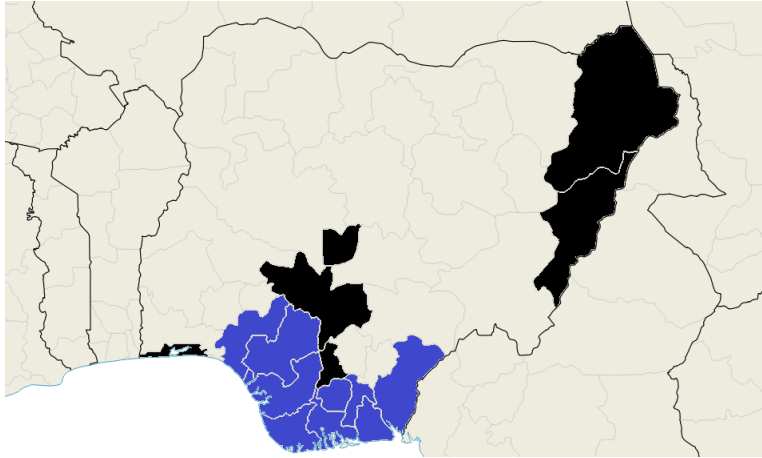
Table 6: First Stage Trend in the Niger Delta Region

Variable	Coefficient	(Std. Err.)
2010+ dummy	97.093**	(43.569)
time	36.664***	(8.156)
2010+ dummy × time	-40.087	(9.295)
Intercept	-59.481	(24.763)
N		74
R ²		0.297
F _(3,70)		9.849

Note: see Table 5.

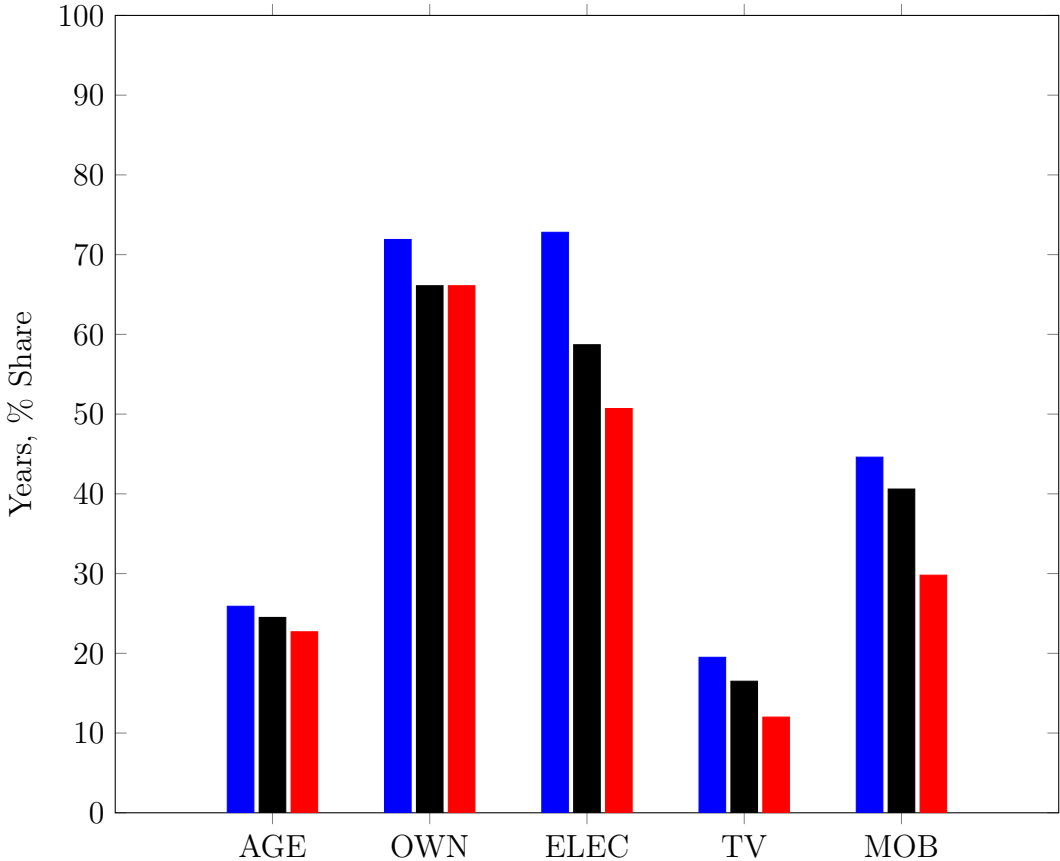
B. Figures

Figure 1: Niger Delta and Synthetic Control Region



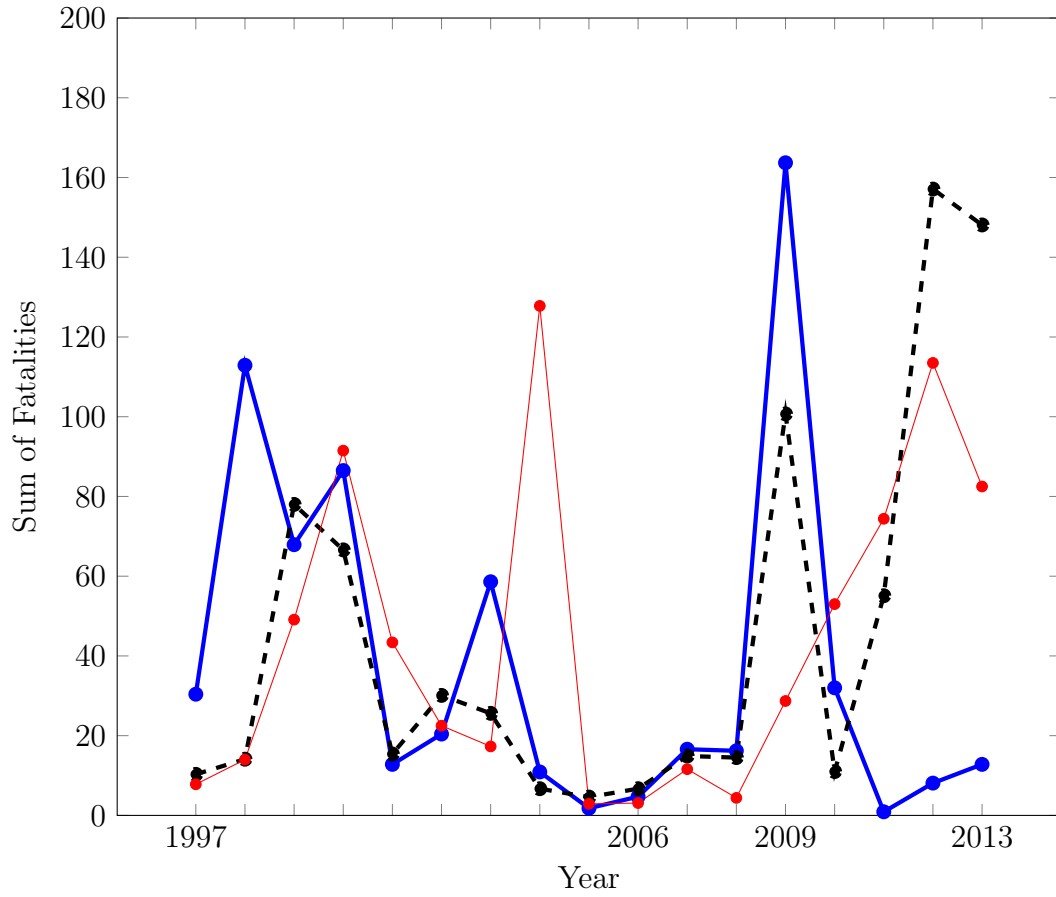
Note: The Niger Delta states are displayed in blue while the synthetic control states are displayed in black.

Figure 2: Matching Results Further Characteristics



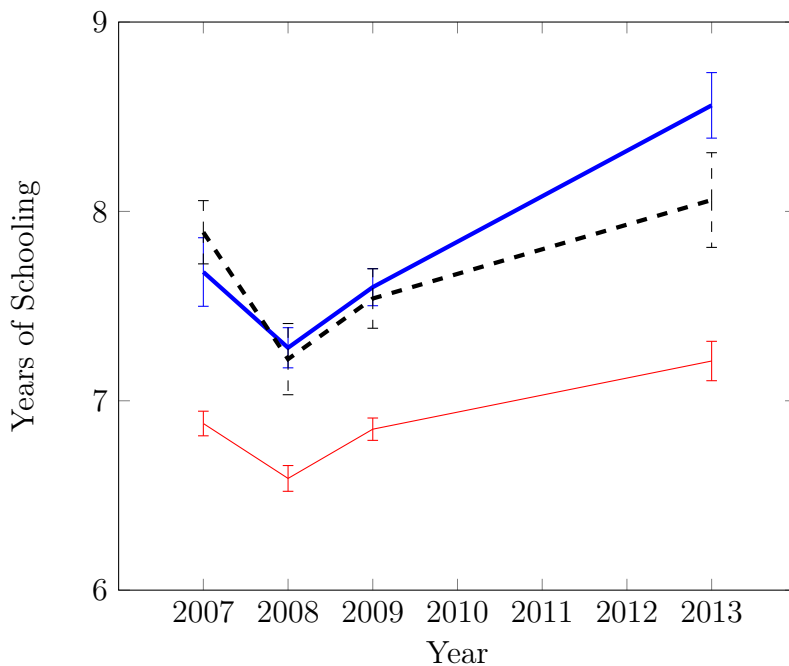
Note: The Niger Delta region is represented by the blue bar, the synthetic control region by the black bar, and all non-Niger Delta states by the red bar. The characteristics are age in years and shares of individuals (in %) that are own account workers (among all working people), have electricity supply, own TVs and own mobile phones. All data is from 2009. The shares are very precisely estimated – all confidence intervals are very small and all differences statistically highly significant.

Figure 3: Conflict Levels Before and After 2009



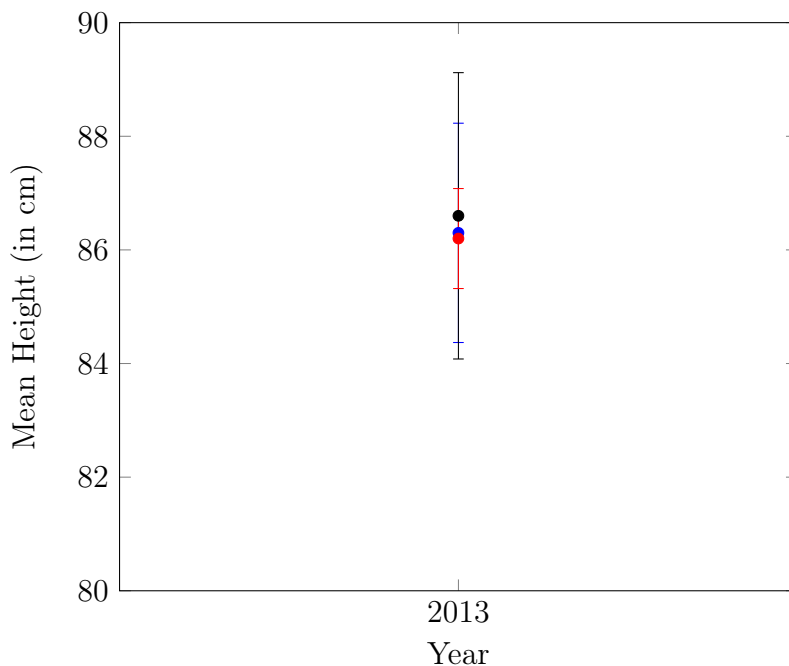
Note: The blue thick line displays the Niger Delta values, the black thick and dashed line displays the synthetic control values and the red thin line displays the non-Niger Delta values. By 2013, the first seven months of 2013 are meant since the data collection for outcome variables in 2013 ended in July.

Figure 4: Education Results



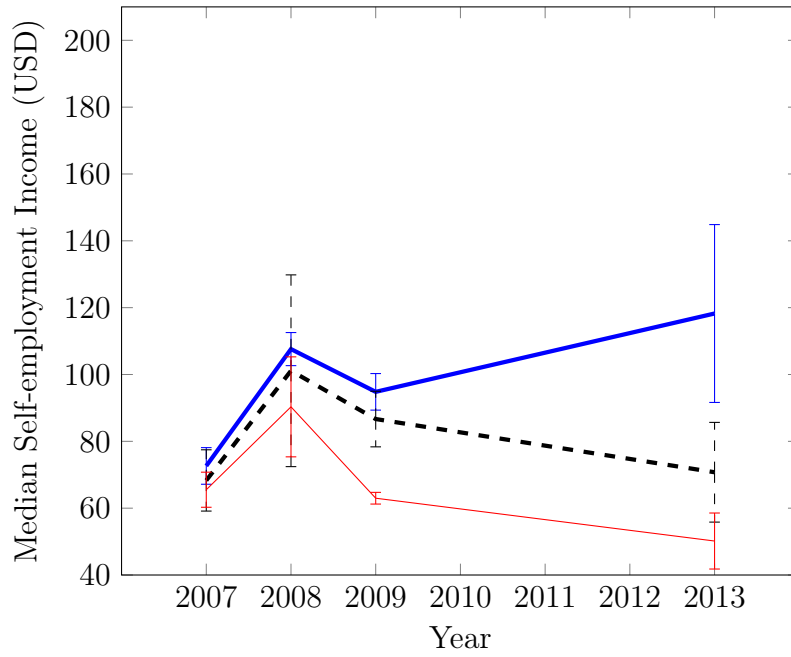
Note: The blue thick line displays the Niger Delta values, the black thick and dashed line displays the synthetic control values and the red thin line displays the non-Niger Delta values. The bars are 95% confidence intervals.

Figure 5: Health Results



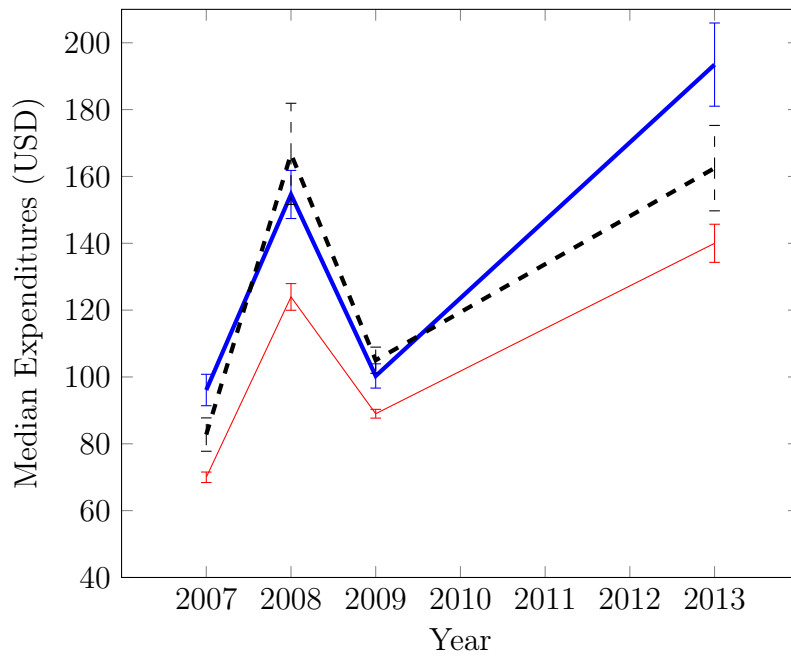
Note: The blue dot displays the Niger Delta value, the black dot displays the synthetic control value and the red dot displays the non-Niger Delta value. The bars are 95% confidence intervals.

Figure 6: Employment Income Results



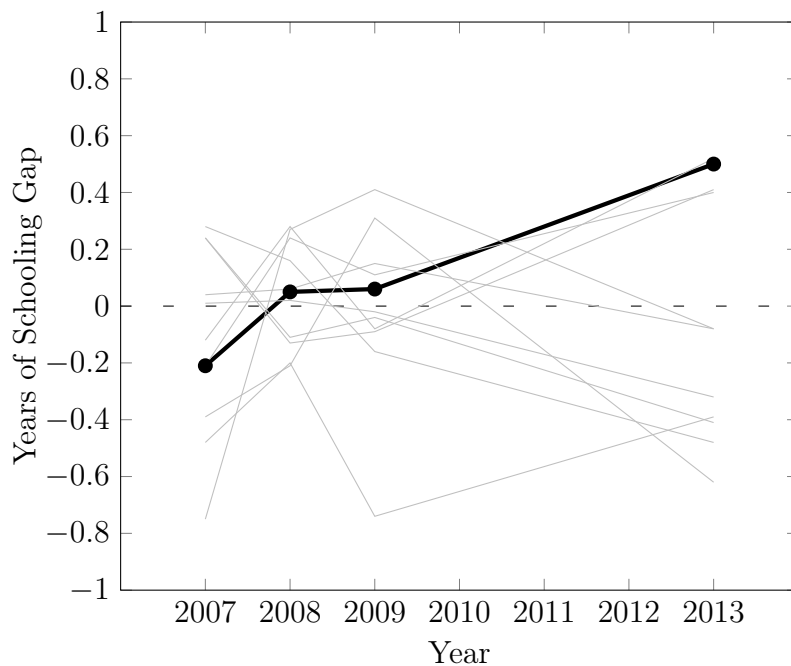
Note: The blue thick line displays the Niger Delta values, the black thick and dashed line displays the synthetic control values and the red thin line displays the non-Niger Delta values. The bars are 95% confidence intervals.

Figure 7: Expenditures Results



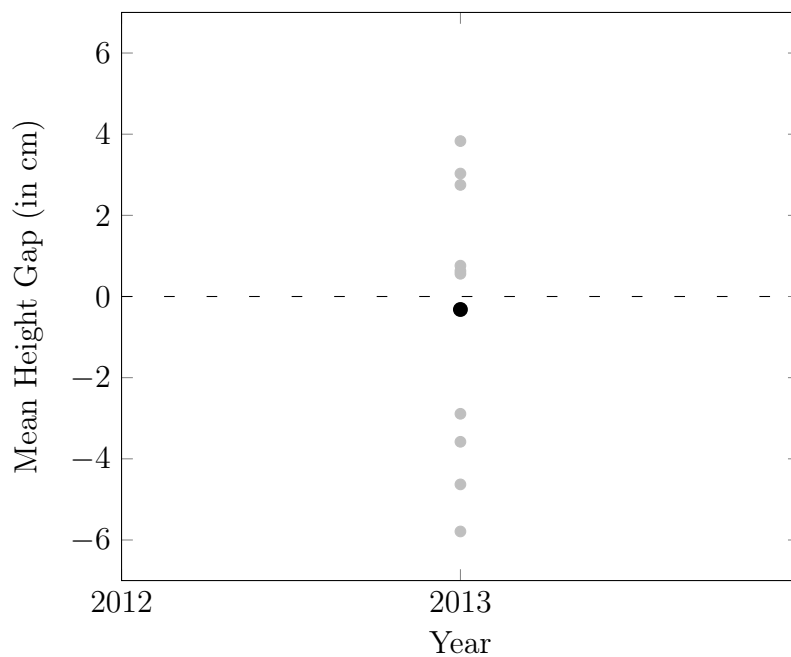
Note: The blue thick line displays the Niger Delta values, the black thick and dashed line displays the synthetic control values and the red thin line displays the non-Niger Delta values. The bars are 95% confidence intervals.

Figure 8: Education Placebo Results



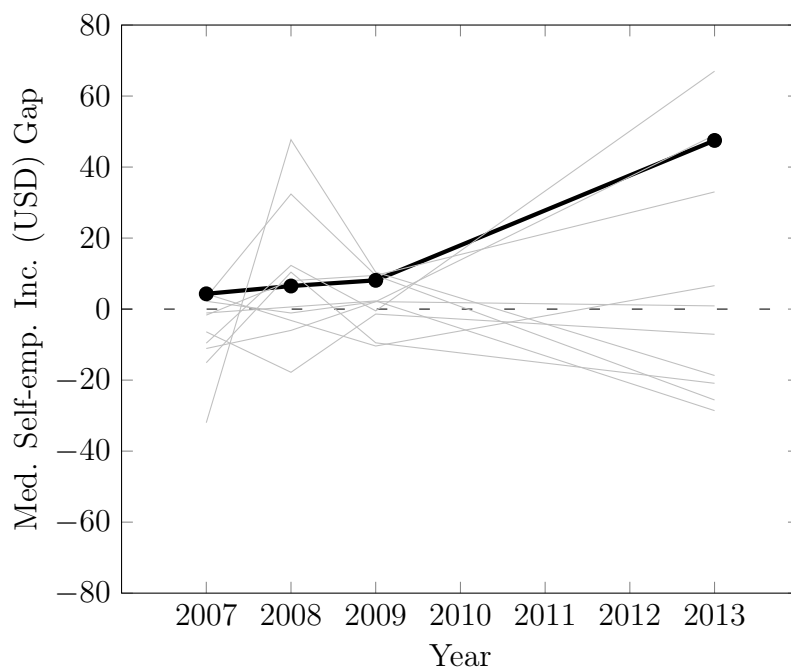
Note: The black thick line displays the Niger Delta values while the gray lines display the values for the ten admissible non-Niger Delta states that serve as placebos.

Figure 9: Health Placebo Results



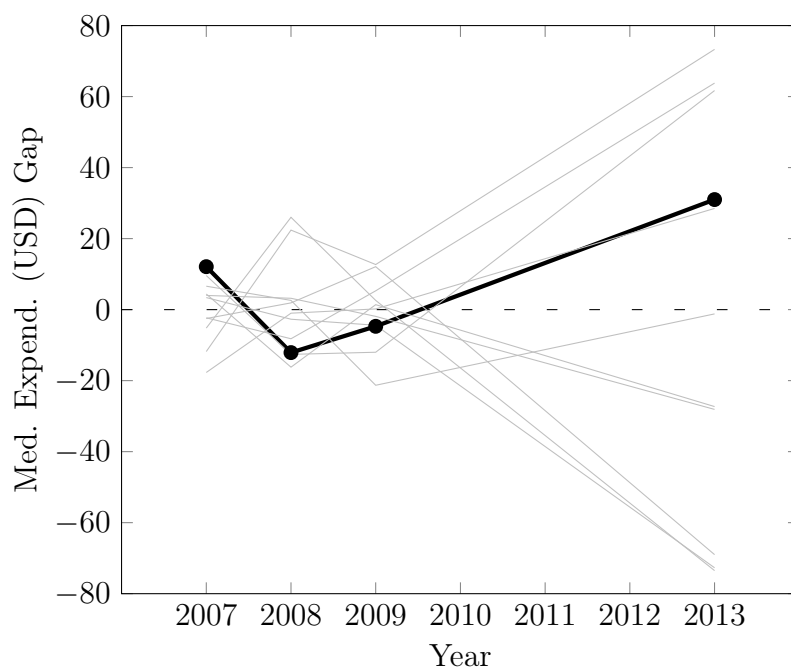
Note: The black thick line displays the Niger Delta values while the gray lines display the values for the ten admissible non-Niger Delta states that serve as placebos.

Figure 10: Empl. Inc. Placebo Results



Note: The black thick line displays the Niger Delta values while the gray lines display the values for the ten admissible non-Niger Delta states that serve as placebos.

Figure 11: Expend. Placebo Results



Note: The black thick line displays the Niger Delta values while the gray lines display the values for the ten admissible non-Niger Delta states that serve as placebos.