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**Working Paper**

## The macroeconomic impact of recent political conflicts in Africa: Generalized synthetic counterfactual evidence

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# A G D I Working Paper

WP/21/060

## **The Macroeconomic Impact of Recent Political Conflicts in Africa: Generalized Synthetic Counterfactual Evidence**

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**The Macroeconomic Impact of Recent Political Conflicts in Africa: Generalized Synthetic Counterfactual Evidence**

**Samba Diop, Simplicé A. Asongu & Vanessa S. Tchamyou**

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**Abstract**

This paper measures the macroeconomic impact of recent political crisis, protest and uprisings in Africa with the generalized synthetic control method and evaluates the role played by natural resource dependence on the modulation of the impact. We find that political crisis, protests and uprisings have a significant and negative impact on economic growth while the impact is positive on investment and price level. For economic growth, the deviation of the actual series from the counterfactual is negative, instantaneous, persistent and highly significant; indicating non-negligible costs of the shock. Indeed, dependence on natural resources amplifies the negative effect of political crisis, protests and uprisings on GDP. Finally, the more the treated country depends on natural resources, the more it becomes resilient from the investment losses caused by political crisis.

*Keywords:* political conflicts; economic growth; Africa

*JEL Classification:* F52; K42; O17; O55; P16

## 1. Introduction

There are two main scholarly and policy tendencies that motivate the focus of the present study, notably: (i) the criticality of political crisis in Africa's economic development and (ii) gaps in the extant political crisis literature. These two perspectives are engaged in turn below.

Consistent with contemporary literature (Asongu, Yapatake-Kossele & Nnanna, 2021), a fundamental threat to Africa's economic development in the recent decades has been political instability. This narrative is better articulated by Asongu and Nwachukwu (2016a) who substantiate the perspective with insights from specific notable case studies of political strife and crisis: Angola (from 1975 through 2002); Chad (from 2005 through 2010); recently South Sudan and the Western region of Cameroon as well as the long standing crisis in the Democratic Republic of Congo; Liberia (from 1999 to 2003); the Central African Republic (from 1996 through 2003; reignited between 2004 through 2007; 2012 to the present day); Burundi (1993 through 2005); Sierra Leone (1991 through 2002); Somalia with recurrent crises since the 1990s; Sudan with the Darfur crisis and Côte d'Ivoire (2002 to 2007 and 2010 to 2011). According to the attendant literature, the spades of political unrests and civil wars have engendered substantial economic liabilities that fundamentally influence countries' ability to engage in a number of economic activities and projects.

Building on the above, during the last ten years, Africa has been characterized by a long series of anti-government protests, uprisings and revolutions. The most famous of which is the Arab Spring. The Arab Spring is a wave of protests and uprisings that began in Tunisia and Egypt in 2010 and 2011. This wave of protests spread to some other countries in Africa and the Middle East. According to the literature on economic losses, crises such as civil wars are very important (Costalli et al., 2014; World Bank, 2003). Other studies have tried to depict the determinants of crises of which, the most treated are civil wars. For example, Anyanwu (2002) investigated whether civil wars in Africa have economic and political determinants.

Second, the extant contemporary literature on political crisis in Africa has largely focused on *inter alia*: the relevance of political crisis on trade (Asongu et al., 2021); the importance of party systems in economic development (Pelizzo & Nwokora, 2016, 2018); externalities of political instability from tax structure (Dalyop, 2020) and income inequality (Oualy, 2020); regional intervention in boosting democracy and the importance of political crisis in the nexus (Ateku, 2020); politico-economic effects of predicting natural resource income (Frynas & Buur, 2020); nexuses between political instability, foreign investment and economic growth (Williams, 2017) and the effect of political instability on economic growth

(Okafor, 2017). The closest studies in the literature to the present study are Williams (2017) and Okafor (2017). The present study departs from the underlying papers by measuring the macroeconomic effect of protests, uprisings, political crisis in Africa by means of the generalized synthetic control methods and by extension, assesses the incidence played by dependence in natural resources in the investigated nexus.

In the light of the above, the objective of our paper is to evaluate the macroeconomic effects of the recent crisis in Africa. Firstly, instead of civil war or classical crisis, the paper is interested in recent political crisis mainly dominated by revolutions, protests and uprising. Secondly, in comparison to previous works which used Synthetic Control (SC), we employ the recent generalized extension labelled Generalized Synthetic Control (GSC). Thirdly, we go beyond the existing literature by evaluating the role played by natural resource dependence in modulating the impact of the crisis on the macro-economy.

The remainder of the paper is organized as follows. The theoretical underpinnings are engaged in Section 2 while Section 3 presents the data as well as identifies the candidate countries and their counterfactuals. Section 4 covers the methodology while Section 5 discusses the results. Section 6 evaluates the role played by natural resources on the average treatment effect on the treated while Section 7 concludes with implications and future research directions.

## **2. Theoretical underpinnings: economic growth and political conflicts**

Consistent with Asongu et al. (2021), it is relevant to clarify the nexus between economic growth and political conflicts. Such theoretical insights are in accordance with Olson's (1963) Rise and Decline of Nations (RADON) in the perspective that, there are some elements of political stability that are favorable for economic growth and other dimensions of political instability that can facilitate economic growth. Therefore, the problem statement of this study on the nexus between political crises and economic growth is directly linked to the theoretical underpinnings surrounding Olson's (1963) RADON.

According to the attendant theoretical literature (Olson, 1963; Hunitngton, 1968), political systems that are destabilizing (i.e. political crisis), can be linked to economic growth such that political instability or crisis is not necessarily linked to negative macroeconomic outcomes in terms of economic prosperity. This theoretical underpinning has been recently confirmed by Asongu et al. (2021) within the remit of trade openness. Moreover, as also substantiated by Hussain (2014), there are some types of political stabilities that are

associated with negative macroeconomic outcomes and in the same vein, some types of political instabilities that are linked to positive macroeconomic outcomes.

Beyond the relevance of Olson's RADON engaged in the preceding paragraphs, the theoretical fundamentals on the linkage between political crisis and economic growth are in line with the corresponding literature on linkages between development outcomes and political systems (McGuire & Olson, 1996; Zureiqat, 2005; Asongu et al., 2021). Consistent with the attendant literature, the relationships build on three main types of political organizations, namely: anarchy, dictatorship and democracy. It is worthwhile to emphasize that these three types of political organizations are in line with the notion of political stability that is employed in this study given that political stability is conceived and measured in terms of the likelihood that a government can be overthrown or destabilized by violence and mechanisms that are not constitutional, involving terrorism and domestic violence. In other words, it is understood by contemporary literature (Asongu & Nwachukwu, 2016b, 2017a; Tchamyou, 2021) as the election and replacement of political leaders. Accordingly, the approach via which political leaders are brought into office by means of political elections can engender the identified three principal types of political organizations. For instance, "roving bandits" is typical of bandits who determine the laws of society and such anarchy is not characterized by governments that are interested in providing public goods and services, not least, because within the remit of such anarchies, a few elite leverage on armies to increase their wealth instead of using public funds for more productive societal engagements (Zureiqat, 2005). It follows that when such a political organization is prevalent, economic growth is anticipated to be low.

With respect to McGuire and Olson (1996), autocracy aims to primarily monopolize theft in profit of "stationary bandits". Accordingly, in the light of the perspective that governing entails stakes as to the manner in which society produces, it may be apparent that some amount of public services and goods are provided by autocratic leaders who are constrained to do so in exchange for some taxes. The obvious ramification is that the society is left with some incentives of production which can enhance economic growth beyond considerations from an anarchy-oriented political organization. In essence, while the personal income of autocrats is likely to increase given that they considerably extort rents from citizens through taxation, compared to anarchists; these autocrats enable citizens to have relatively better average standards of living.

Consistent with McGuire and Olson (1996), the third strand or democracies is linked to relatively more public commodities compared to other dimensions of political

organizations. Additionally, this type of political organization has been established to be associated with enhanced political stability (Asongu & Nwachukwu, 2016c). Moreover, economic growth is linked to better democratic standards of political organization relative to anarchies and autocracies. In the light of the narrative, better public commodities are provided by governments because citizens are most likely prepared to pay taxes in exchange for enhanced delivery of public commodities.

The linkages between the discussed forms of political organizations and political stability can be understood in the perspective that the attendant political organizations are connected with some level of political stability which is linked with incentives for economic activities that engender economic growth. As documented in Asongu et al. (2021), the theoretical nexus between stability/instability and economic prosperity is provided by Olson (1963). With respect to the study, as much as political stability is positively linked to economic growth, political instability can also be positively connected with economic prosperity. These linkages have been substantiated by subsequent literature, notably by Alesina, Ozler, Roubini and Swagel (1996) and De Haan and Siermann (1996) who have broadly confirmed the same arguments on the nexus between political stability/instability and macroeconomic ramifications.

Putting the above into greater perspective, Asongu and Nnanna (2019) and Alesina et al. (1996) have maintained that political stability is linked to certainty about economic policies and consequently, avail avenues of more incentives for economic agents to consider engaging in investments that can boost economic activities and by extension, economic growth. The underlying position is also because investors have been established to give more priority to macroeconomic environments that are stable (Kelsey & le Roux, 2017, 2018) in order avoid opportunities for capital flight and maintain a positive economic outlook. The perspective of De Haan and Siermann (1996) is in accordance with the narrative in the previous paragraph, not least, because such opportunities are connected with greater availability of capital and labor supplies, which are naturally, linked to more economic growth avenues.

### **3. Data presentation and identification of candidate countries and their counterfactuals**

This section presents the data used in the study and identifies the selected countries and their counterfactuals.

### 3.1 Data presentation

The variables are presented in Table 1. The data cover the 1980-2020 periods, both for the treated group and the control group. The selection is based on macroeconomic growth theory on applications of the synthetic control method (Abadie & Gardeazabal, 2003; Billmaer & Nannicini, 2013; Colonescu, 2017, *inter alia*). We have 3 predictors of the outcome variable (GDP, investment and inflation) to assess the impact of the shock.

**Table 1: Presentation of variables**

Variables	Definitions	Sources
Gdp	Gross domestic product, current prices U.S. dollars Billions	WEO
Gdppc	Gross domestic product per capita, current prices U.S. dollars	WEO
Industry	Industry (including construction), value added (% of GDP)	WDI
Oda	Net ODA received (% of GNI)	WDI
Investment	Total domestic investment Percent of GDP	WEO
Inflation	Inflation, consumer prices (annual %)	WDI
fuelexp	Fuel exports (% of merchandise exports)	WDI
Xr	Exchange rate, national currency/USD (market+estimated)	PWT100
Gcf	Gross capital formation (% of GDP)	WDI
Political Stability	<i>“Political stability/no violence (estimate): measured as the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional and violent means, including domestic violence and terrorism”</i>	WGI
Natural	Total natural resources rents (% of GDP)	WDI

Source: Authors, WEO: World Economic Outlook, WDI: World Development Indicators, PWT100: Penn World Table.

### 3.2 The identification of candidate countries and their counterfactuals

To have a response of whether political crisis has a significant impact at the macroeconomic level, the definition of the treatment and treatment period is required. The first step in the empirical section is the definition of the treatment. In conformity with the program evaluation methods, we define the treatment as the event or the intervention to which units are exposed or not. Thus, in our study, the term “treated country” and “control country” will represent



respectively, countries exposed to event and countries which are not exposed. Accordingly, an event or intervention is a political shock such as revolutions, protests and uprisings that have occurred in Africa since the 2000s. Table 1 provides the selected countries used for the study. The treated countries are those that have experienced a political crisis or protest and uprisings lasting more than one year and where the crisis has reached a certain level of intensity. The selection is also subject to data availability. In order to apply a synthetic counterfactual method, it is essential to have a control group. In order to do this, we use African countries which are not exposed to a severe uprising or protest. Note that the notion of similarity is essential at the step of choosing a control group. We identify a set of African countries having similar conjunctural and structural characteristics before the date of the events. Table 1 provides the selected countries.

**Table 2: Selected countries for the sample**

Treated Countries	Controls Countries
Algeria- Burundi- Cote d'Ivoire- Egypt- Libya- Morocco- Sudan-Tunisia- Zimbabwe- Mozambique-Mauritania-Djibouti	Benin-Botswana-Burkina faso-Cameroon- Comoros-Congo-Gabon-Ghana-Kenya- Malawi-Namibia-Niger-Nigeria-Rwanda- Senegal-South Africa- Swaziland-Tanzania- Togo-Uganda-Zambia

Source: authors

Table 2 and Graph 1 provide a panoramic view of the different episodes of political crises in Africa in recent years. The shocks are widely dominated by the Arab Spring. We note 3 revolutions (Egypt, Libya and Tunisia), 5 protests and uprisings (Algeria, Burundi, Morocco, Sudan and Zimbabwe) and 1 political crisis transition (Cote d'Ivoire). As it is shown in Graph 1, of the 12 treated countries, 10 corresponding incidents characterising the treated countries took place either in 2010 or 2011.

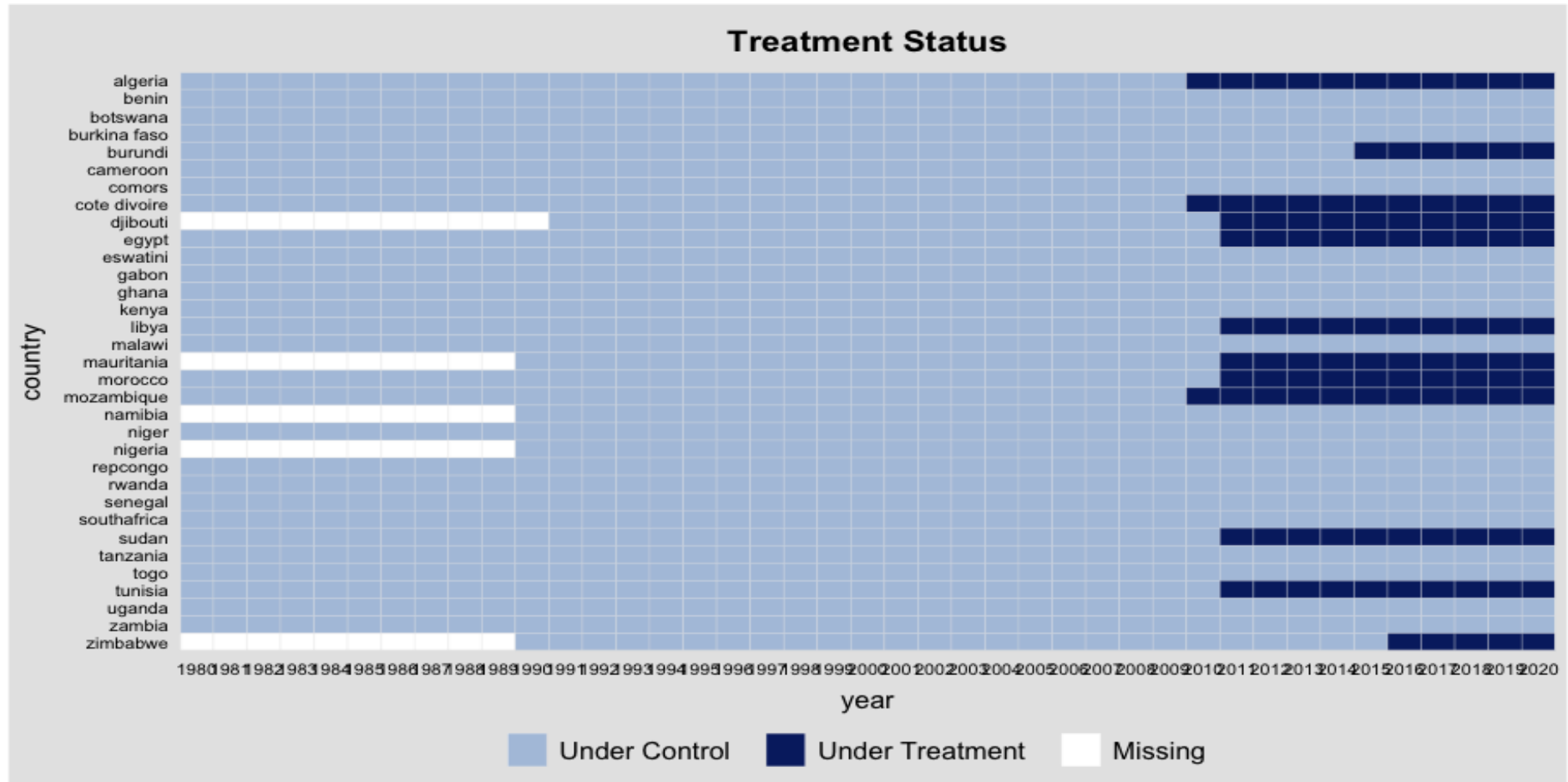
**Table 3: Summary of PTC and protests in Africa**

Country	Event	Nature	Date	Caused by	Methods
Algeria	Algerian protests	Protests	2010-2012	Authoritarianism, inflation, low salaries, unemployment, regressive taxes	Civil resistance, demonstrations
Burundi	Burundian Unrest	Protests	2015-2018	Proposal to allow the country's president, Pierre Nkurunziza, to run for a third term in office	Protests, demonstrations government crackdown
Cote d'Ivoire	2010-2011 Ivorian Crisis	Political Transition Conflicts	2010-2011	Constitutional crisis, rejection of election results	Military conflict
Djibouti	Djibouti protests	Protests	2011	Influence from the concurrent Arab Spring	Demonstrations, riots
Egypt	Egyptian revolution	Revolution	2011-2012	Police brutality, state-of-emergency laws, electoral fraud, political censorship, corruption, unemployment, food price rises, low wages, demographic structural factors, other regional protests, authoritarianism, political repression	Civil disobedience, civil resistance, demonstrations, online activism, riots, self-immolation, strike actions
Libya	First Libyan Civil War	Revolution	2011	Inspiration from concurrent regional protests (Arab Spring)	Demonstrations, riots, civil resistance, spontaneous uprisings
Morocco	Moroccan Protests	Protests	2011-2012	Police brutality, electoral fraud, political censorship, widespread corruption, high unemployment, utility costs, no minimum wage	Demonstrations, civil disobedience, boycott, self-immolation, online activism, riots
Sudan	Sudanese protests	Protests	2011-2013	Corruption, unemployment, austerity measures, inspiration from concurrent regional protests	Demonstrations, strike action, riots, sit-ins, self-immolation, online activism
Tunisia	Tunisian Revolution	Revolution	2011	Government corruption, social inequalities,	Civil resistance,

				unemployment, political repression, self-immolation of Mohamed Bouazizi	demonstrations, general strikes, self-immolations, spontaneous uprisings
Zimbabwe	Zimbabwe protests	Protests	2016-2017	Corruption, hunger, late payment of civil servants' salaries, economic repression, police brutality	Civil resistance, demonstrations, protest marches, rioting, picketing

Note: the different information is obtained from the Bibliographic details for “list of conflict in Africa”

### Figure 1 : Political Transition Crisis and Protests in Africa



Source: authors

## 4 Methodology

In this section, we present the Synthetic Control model and its generalized version used to evaluate the macroeconomic costs of recent political crisis in African countries.

### 4.1 A motivating model: The Synthetic Control Model (SC)

The Synthetic Control (SC) is a method for program evaluation impact developed by Abadie and Gardeazabal (2003) and extended by Abadie, Diamond and Hainmueller (2010). Thereafter, it has been widely used in macroeconomic literature. Some notable studies that have employed the technique include: Covallo, Galiani, Noy and Pantano (2013) who have investigated the impact of natural disasters on economic growth; Abadie, Diamond and Hainmueller (2010) who have assessed the effect of Germany's Reunification on West Germany' GDP; Campos, Coricelli and Moretti (2014) who have investigated the benefits of membership within the European enlargement and El-Shagi, Lindner and Von Schweinitz (2016) who have examined real effective exchange rate misalignment in Euro area. The SC method is also a useful tool to assess the macroeconomic impact of crisis such as civil wars. To put this in perspective, the seminal paper of SC is applied on the economic costs of conflicts with the case study of the Basque country (Abadie & Gardeazabal, 2003). Costalli al. (2014) measure the economic consequences of civil wars in a sample of 20 countries, while Colonescu (2017) proposes an empirical study on the effects of adopting a common currency (i.e. the euro) on a country's GDP, inflation and debt by trying to answer the following question: *"what would a country's GDP have been if the country did not join the euro area, while the other countries did?"*.

Thus, to estimate the causal effect, this chosen method makes it possible to define the counterfactual (i.e. the result that would have been obtained for a group of treated if the intervention had not taken place). It is for this reason that the following question is answered in the present study: what an African country's GDP (or investment or price level) would have been if the country did not been endure the crisis?

Following Colonescu (2017), there are 4 stages are required to construct a SC: i) the selection of the control group, ii) the construction of the counterfactual, iii) the prediction of the evolution of the outcome variable in the post-treatment period and finally, iv) the observation of the gap between the treated country and the counterfactual.

Now let us describe the technical framework of the SC methodology established by Abadie, Diamond and Hainmueller (2010). Suppose there are  $J + 1$  units of which, only one unit is exposed to the treatment, so we have  $J$  control units (donor pool). Let  $Y_{jt}^N$  represent the outcome for unit  $j$  at time  $t$  in the absence of treatment, with  $j = 1, 2, \dots, J + 1$  and  $t = 1, 2, \dots, T$ . Let  $T_0$ , denote the period where the treatment starts, with  $1 \leq T_0 < T$ . Let  $Y_{jt}^I$  denote the outcome observed for unit  $j$  at time  $t$  in the presence of treatment covering the period  $T_0 + 1$  to  $T$ . We assume that the treatment has no effect on the outcome before the implementation period. Thus, for  $t \in \{1, \dots, T_0\}$  and for for all  $j \in \{1, \dots, N\}$ ,  $Y_{jt}^I = Y_{jt}^N$ . Let  $\alpha_{jt} = Y_{jt}^I - Y_{jt}^N$  be the effect of the treatment for unit  $j$  at the period  $t$  and let  $D_{jt}$  be a binary indicator equal to 1 if the unit has been exposed to the treatment and 0 otherwise,  $Y_{jt}$  denotes the sum of a time-varying treatment effect,  $\alpha_{jt}D_{jt}$  and the no-treatment counterfactual  $Y_{jt}^N$ .

The observed outcome for unit  $j$  at the period  $t$  is given as:

$$Y_{jt} = Y_{jt}^N + \alpha_{jt}D_{jt}$$

And then we suppose that  $Y_{jt}^N$  follows a factor model, i.e.

$$Y_{jt}^N = \delta_t + \theta_t Z_j + \lambda_t \mu_j + \varepsilon_{jt}$$

So

$$Y_{jt} = \alpha_{jt}D_{jt} + (\delta_t + \theta_t Z_j + \lambda_t \mu_j + \varepsilon_{jt})$$

Where  $\delta_t$  is an unknown time factor,  $Z_j$  is an  $(r \times 1)$  vector of observed covariates unaffected by the treatment,  $\theta_t$  is an  $(1 \times r)$  vector of unknown parameters,  $\lambda_t$  is a  $(1 \times F)$  vector of unknown factors,  $\mu_j$  is an unknown  $(F \times 1)$  vector of factor loadings and  $\varepsilon_{jt}$  the error term, independent across units and times with 0 mean. Thus, we can now estimate the treatment effect with the approximation of the unknown  $Y_{jt}^N$  with a weight average of untreated units:

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

## 4.2 The Generalized Synthetic Control Model (GSCM)

According to Abadie (2021), SCs have become widely used in empirical research in economics and social science. With respect to the author, this is probably explained by their interpretability and transparent nature. However, there are some limitations of the method as have been apparent in the recent waves of extension. Hence, it is worthwhile to mention the Generalized Synthetic Control (GSC) model proposed by Xu (2017). According to Xu (2017),

the GSC improves the SC in efficiency and interpretability into several ways. Firstly, it generalizes the SC method to cases of multiple treated units and/or variable treatment periods. Secondly, the GSC provides uncertainty estimates such as standard error and confidence intervals with a possibility of parametric bootstrap procedures. Thirdly, in order to reduce the risks of overfitting, GSC can provide the correct number of factors with the cross-validating perspective. We present the GSC model in the framework presented by Xu (2017).

Let  $Y_{jt}$  denotes the outcome of interest of unit  $j$  at time  $t$ ,  $\mathcal{T}$  and  $\mathcal{C}$  the sets of treatment units and control groups respectively,  $N_{tr}$  and  $N_{co}$  are the number of treatment and control units respectively, so  $N = N_{tr} + N_{co}$  the total number of units,  $T$  is the number of periods. Let  $T_{0,j}$  be the number of pre-treatment periods for unit  $j$  at time  $T_{0,j} + 1$  and subsequently observed for  $q_j = T - T_{0,j}$  periods. When we suppose that all treated units are first exposed at the same time, we have  $T_{0,j} = T_0$  and  $q_j = q$ . If we suppose that  $Y_{jt}$  respects a linear factor model, we have:

$$Y_{jt} = \delta_{jt}D_{jt} + \beta X'_{jt} + \lambda'_j f_t + \varepsilon_{jt}$$

Where  $D_{jt}$  represents the treated indicator ( $D_{jt} = 1$  when  $j \in \mathcal{T}$  and  $t > T_0$  and  $D_{jt} = 0$  otherwise),  $\delta_{jt}$  is the heterogeneous treatment effect on unit  $j$  at time  $t$ ,  $X_{jt}$  is a  $(K \times 1)$  vector of covariates,  $\beta = (\beta_1, \dots, \beta_K)'$  is a  $(K \times 1)$  vector of unknown parameter,  $f_t = (f_{1t}, \dots, f_{rt})'$  is an  $(r \times 1)$  vector of unobserved common factors,  $\lambda_j = (\lambda_{j1}, \dots, \lambda_{jr})'$  is an  $(r \times 1)$  vector of unknown factor loadings and  $\varepsilon_{jt}$  the error term independent across units and times with 0 mean.

Now let  $Y_{jt}(1)$  and  $Y_{jt}(0)$  be the potential outcomes for unit  $j$  at time  $t$  with  $D_{jt} = 1$  or  $D_{jt} = 0$  respectively. Thus, we can write:

$$Y_{jt}(0) = \beta X'_{jt} + \lambda'_j f_t + \varepsilon_{jt}$$

And

$$Y_{jt}(1) = \delta_{jt}D_{jt} + \beta X'_{jt} + \lambda'_j f_t + \varepsilon_{jt}$$

The individual treatment on the treated unit  $j$  at time  $t$  is therefore  $\delta_{jt} = Y_{jt}(1) - Y_{jt}(0)$  for any  $i \in \mathcal{T}$  and  $t > T_0$ .

For each unit the data generator process becomes:

$$Y_j = \delta_j \circ D_j + \beta X_j + \lambda_j F + \varepsilon_j, j \in 1, 2, \dots, N_{co}, N_{co} + 1, \dots, N^1$$

---

<sup>1</sup> The symbol  $\circ$  represents the Hadamard product operator.

Where  $Y_j = (Y_{j1}, Y_{j2}, \dots, Y_{jT})'$ ,  $D_j = (D_{j1}, D_{j2}, \dots, D_{jT})'$  and  $\delta_j = (\delta_{j1}, \delta_{j2}, \dots, \delta_{jT})'$  are  $(T \times 1)$  vectors;  $X_j = (X_{j1}, X_{j2}, \dots, X_{jT})'$  is a  $(T \times K)$  matrix and  $F = (F_1, F_2, \dots, F_T)'$  is a  $(T \times r)$  matrix.

The control and the treated units are subscripted from 1 to  $N_{co}$  and from  $N_{co} + 1, \dots, N$  respectively. For a control unit, its data generator process can be written as:

$$Y_j = \beta X_j + \lambda_j F + \varepsilon_j, j = 1, 2, \dots, N_{co}$$

And for all control units, we have:

$$Y_{co} = \beta X_{co} + \Lambda_{co} F + \mathcal{E}_{co}$$

Where  $Y_{co} = (Y_1, Y_2, \dots, Y_{N_{co}})$  and  $\mathcal{E}_{co} = (\varepsilon_1, \varepsilon_2, \dots, \varepsilon_{N_{co}})$  are  $(T \times N_{co})$  matrices,  $X_{co}$  is three-dimensional  $(T \times N_{co} \times p)$  matrix and  $\Lambda_{co} = (\lambda_1, \lambda_2, \dots, \lambda_{N_{co}})$  is a  $(N_{co} \times r)$  matrix, hence the product  $X_{co}$  and  $\Lambda_{co} F$  are also  $(T \times N_{co})$  matrices.

Now, the average treatment effect on the treated (ATT) at time  $t$  (when  $t > T_0$ ) is :

$$ATT_{t,t>T_0} = \frac{1}{N_{tr}} \sum_{j \in \mathcal{T}} (Y_{jt}(1) - Y_{jt}(0)) = \frac{1}{N_{tr}} \sum_{j \in \mathcal{T}} \delta_{jt}$$

For the model selection, we can use the mean square prediction error (MSPE) for a given  $r$ :

$$MSPE(r) = \sum_{s=1}^{T_0} \sum_{j \in \mathcal{T}} e_{js}^2 / T_0$$

With  $e_{js} = Y_{js}(0) - \hat{Y}_{js}(0)$  for all  $j \in \mathcal{T}$  and  $s \in \{1, \dots, T_0\}$

## 5 Empirical results and discussion

The average treatment effect on treated (ATT) is reported in Table 4. For the model selection, we refer to the cross-validation procedure before the estimation of the causal effect. We choose the factor that minimizes the mean square prediction error (MSPE). The results show that the ATT is significant at 1%, 5% and 10% for GDP, inflation and investment, respectively. These results imply that political crisis and protests significantly impact the selected macroeconomic variables in Africa. The impact is negative for GDP but positive for investment and inflation. The negative coefficient associated to GDP indicates that if the crisis has not occurred, economic growth would be at a higher level comparatively to the counterfactual. More precisely, if the crisis had not occurred, the GDP level would have been 11.67% higher than its actual level and the price level would have been 27% lower than its



actual level. Surprisingly, we note that the investment exceeds the counterfactual amount by 6% on average.

The results of the ATT over time are displayed in Figure 3. The vertical line represents the date of the political crisis or the protest and uprising. For the GDP, we note instantaneous and persistent decreasing deviation between the actual and the counterfactual over time (-3% (first period), -11% (fourth period) and -21% (ninth period)). This result confirms the literature on the economic costs of crisis (Anyanwu, 2002; Costalli et al., 2014). Regarding the investment, on average, during the first periods after the shock, the ATT is very low (between 0.8% and 0.5% for the first and the fourth period). However, we note a significant increase of the impact from the sixth year after the crisis. The ATT goes from 11% (seventh period) to 25% (eleventh period). This result could be explained by the fact that after the crisis, the affected countries tend to increase their investment especially for economic recovery. Finally, we note that after the political crisis, the actual price levels are higher than those of the counterfactual. For example, one year after the shock, the price levels are 16.3% higher than the synthetic control. The ATT reached the maximum during the fifth period (58%). Beyond this year, we noticed a persistent decrease over time.

**Table 4: Average Treatment effect on the Treated (ATT)**

	ATT. Average	Standard Error	CI. Lower	CI. Upper	P. value	MSPE
GDP	-0.117***	0.032	-0.180	-0.053	0.000	0.008
Investment	0.068*	0.038	-0.007	0.143	0.075	0.032
Inflation	0.276**	0.140	0.002	0.550	0.048	0.600

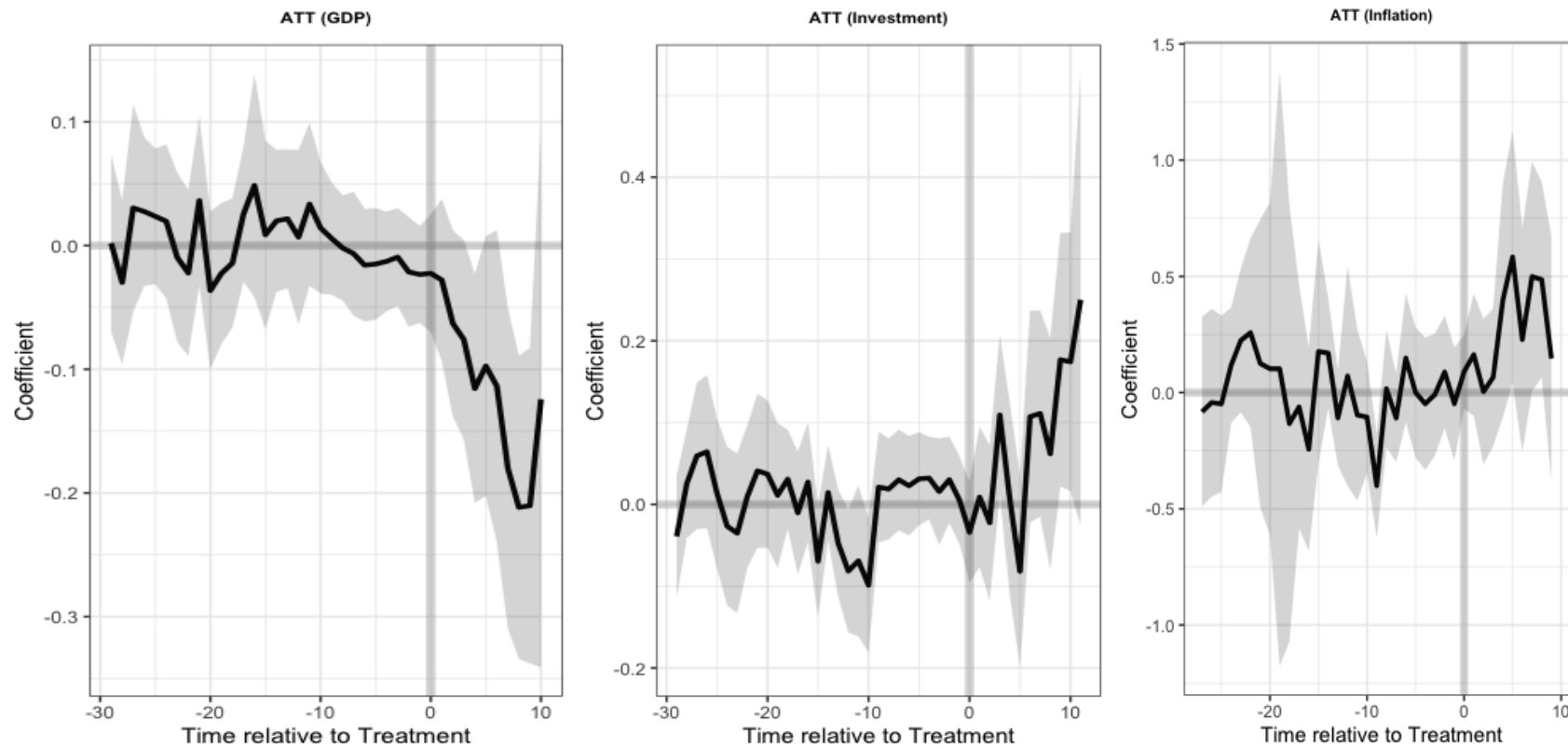
Notes: standard errors are based on parametric bootstraps of 1000 times. For the model selection, we estimate few models with their covariates and choose the better from their MSPE.

For a better view of the impact, we can refer to Figure 3. It shows the actual trends of GDP, investment and inflation and their counterfactual. For each variable, the treated is compared to its counterfactual. For GDP, the crisis has a substantial and persistent effect. From the date of the event, the GDP of the countries where the crisis occurred is under the counterfactual. The deviation between the actual GDP and the counterfactual is continuously widening. This result indicates non-negligible costs of the crisis on economic growth. Regarding investment, we note a relatively strong co-movement between the actual values and the counterfactual during the five first periods. This result implies that the crisis does not have an instantaneous

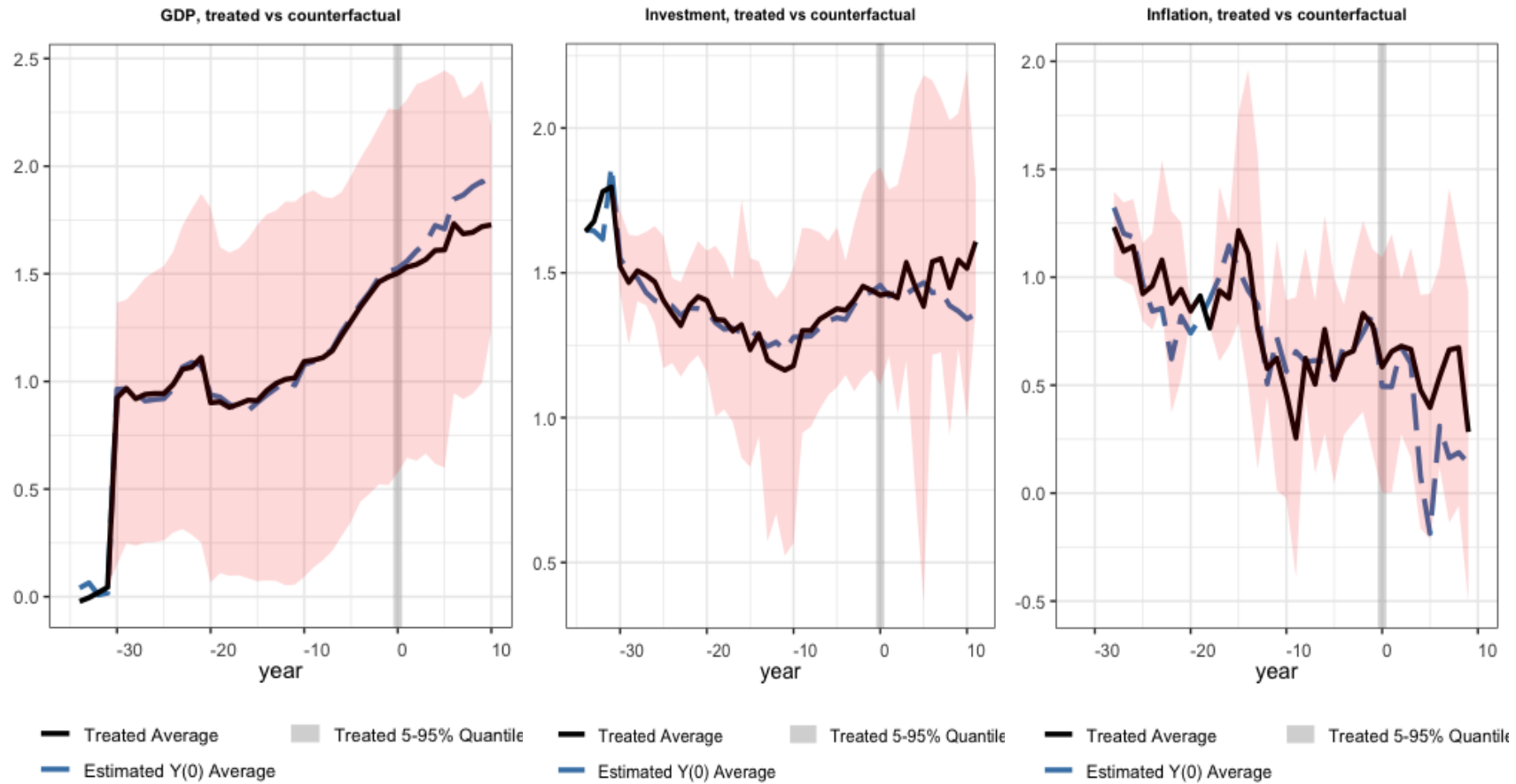
effect on investment. However, from the sixth year, the gap widened continuously. Finally, the actual inflation exceeds the synthetic control especially after the fourth period. The gap reaches its higher magnitude from the fifth year.

Overall, political crisis, protests and uprisings have significant impacts on the macro-economic indicator and the impact appears to change over time from the date of the shock. For growth, the deviation of the actual series from the counterfactual is negative, instantaneous, persistent and highly significant indicating non-negligible costs of the shock. This result could also indicate that political crisis, protests and uprisings could have permanent and sustained impact and therefore change the growth path in the long run. For the investment, we find that, political crisis tends to boost investment but only from the sixth period after a while the price level of the treated countries exceeds that of the counterfactual drastically some years after the event.

**Figure 2: Evolution of the Average Treatment effect on Treated**



**Figure 3: Variable Trends, Treated country versus counterfactual**



## 6 Natural resource's role on the treatment effect on treated (ATT)

In this section, we want to analyse the role played by the natural resources in the paths of the ATT. More precisely, we examine the determinants of political crisis on economic growth and focus our analysis on natural resources and governance. This choice can be justified by the fact that our treated countries depend significantly on natural resources such as many African economies. Our idea is based on the Dutch disease theory and its mechanisms (Bhattacharyya & Hodler, 2010; Badeep et al., 2017), *inter alia*.

For this purpose, we use our ATT represented by the gap between the actual indicator and its counterfactual obtained with the GSC previously. We select natural resources rents (% GDP) and the stability to depict the role played by governance to modulate the relation. Moreover, we integrate its interaction with political stability.

The results are presented in Table 5. The Hausman statistic shows that the panel with fixed effects better represents the data generator process. Regarding the ATT on GDP, the results indicate that only natural resources significantly and positively impact the gap between actual growth and the synthetic control. The positive impact indicates that the dependence on natural resources amplifies the negative effect of political crisis and uprisings on economic growth. Indeed, neither the stability nor the interaction variable is significant. This result implies that governance cannot modulate this negative impact. Further, natural resources negatively impact the ATT on the investment. Thus, the more the treated country depends on natural resources, the more it becomes resilient to the investment losses caused by the political crisis. Since the interaction with political stability is significant at 1% level and negative, this resilience is reinforced by a higher level of governance. Finally, regarding the price level, it is apparent that natural resources are significant only with the regression without the interaction. Its negative sign implies that it mitigates the impact of the crisis on inflation.

**Table 5: Natural resources impact on ATT**

	ATT (Gdp)	ATT (Gdp)	ATT(Gdp)	ATT(Inv)	ATT(Inv)	ATT(Inv)	ATT(Infl)	ATT(Infl)	ATT(Infl)
Natural	0.004*** (0.005)	0.004** (0.015)	0.006** (0.013)	-0.005** (0.031)	-0.005** (0.036)	-0.009** (0.013)	-0.012*** (0.001)	-0.013** (0.018)	-0.009 (0.121)
Political Stability		0.030 (0.258)	0.014 (0.716)		-0.005 (0.897)	0.037 (0.437)		-0.153 (0.137)	-0.195 (0.193)
Natural#Stability			0.001 (0.210)			-0.003*** (0.008)			0.003 (0.614)
Haus (Prob>chi2)	0.000	0.000	0.000	0.000	0.002	0.008	0.003	0.006	0.015
Prob F	0.004	0.030	0.017	0.031	0.098	0.043	0.001	0.037	0.007
R_squared	0.190	0.216	0.224	0.107	0.107	0.128	0.111	0.156	0.159
Nb_obs	108	108	108	108	108	108	108	108	108

Source: authors. Notes: coefficients marked with \*, \*\*, \*\*\* are significant at 10%, 5% and 1% levels. P-values are in brackets

## 7 Conclusion and policy implications

In this paper, we have investigated the macroeconomic impacts of the recent political crisis, protests and uprisings in Africa. In the first part of the article, we have employed a recent extension of the Synthetic Counterfactual labelled Generalized Synthetic Control (GSC) on three macroeconomic variables namely: GDP, investment and inflation. In the second part, we have used the estimated difference between the actual macroeconomic variable and their counterfactual (ATT) to assess the role played by natural resources on the crisis negative impact on economic development.

The results can be summarized as follows. In the first exercise, the GSC shows that political crisis, protests and uprising have significant impacts on macroeconomic indicators. Indeed, the impacts change over time from the date of the shock. For growth, the deviation of the actual series from the counterfactual is negative, instantaneous, persistent and highly significant; indicating non-negligible costs of the shock. This result demonstrates that political crisis, protests and uprisings could have permanent and sustained impact and therefore change the growth path in the long run. For investment, we find that, political crisis tends to boost it but only from the sixth period, while the price level of the treated countries drastically exceeds that of the counterfactual some years after the event.

In the second exercise, it appears from the regressions that for the ATT on GDP, only natural resources significantly impact the gap between actual growth and the synthetic control. The positive impact indicates that dependence on natural resources amplifies the negative effect of political crisis and uprisings on economic growth. Further, natural resources negatively impact the ATT on investment. Thus, the more the treated country depends on natural resources, the more it becomes resilient to the investment losses caused by political crisis.

Firstly, given that natural resource dependence amplifies the economic losses from political crisis, African countries should find strategies to diversify their economies away from dependence on natural resources. Secondly while natural resource dependence is favourable for investment in the period after the crisis, a substantial part of the resources should be oriented towards funding economic reconstruction and providing appropriate responses to political crises.

The findings of this study could be improved in different ways. A first way is to reconsider the problem statement using microeconomic data because some insights from

event studies may not be captured with macroeconomic data. Hence, surveys within the remit of primary data could provide more qualitative insights in understanding the investigated nexus. A second way is to assess the role of other macroeconomic variables such as human capital, infrastructure and governance in mitigating economic losses accruing from political conflicts, crises and strife.

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