Economic Costs of Civil Conflicts: The Case of Burundi

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Abstract

This study examines the effects of episodes of civil conflicts in Burundi on its economic performance. The study applies the regression method using Extreme Bound Analysis, and the Synthetic Control method. Our main results indicate that: (i) from 1970 to 2015, civil conflicts, on average, reduced economic growth by 4 percentage points per year of conflict; (ii) the 1993-2003 civil war cost each Burundian between US$ 1,290 and US$ 1,520 and between US$ 8 billion and US$ 10 billion to the whole country; (iii) the last civil conflict in 2015 has been relatively costly, having reduced economic growth by 8.9 percentage points relative to its counterfactual. These results highlight the need to consolidate peace to eliminate fragility and achieve long-term economic development.

1. Introduction

Generally known for its history of political instability and civil conflicts, Burundi is a small East African country, roughly the size of Belgium, the former colonizer, from which it gained independence in 1962. It has a population of approximately 11 million people[1]. Its GDP per capita, estimated at US$ 800[2] (PPP) in 2021, places the country among the poorest in the world. Although Burundians share the same language, the same culture and live side by side in different regions, it is commonly admitted that they are divided into three ethnic groups: 85% of Hutus, 14% of Tutsis and 1% of Twas, even though the last ethnic affiliation census dates to colonial times[3].

Since its independence in 1962, the country has experienced six episodes of civil conflicts, respectively in 1965, 1972, 1988, 1991, 1993-2013 and 2015. Apart from the last conflict that was fuelled by a wide-ranging opposition to a third term of President Pierre Nkurunziza, the other conflicts were typically triggered by a localized Hutu insurrection in which Tutsis were killed, followed with a disproportionate and indiscriminate military repression of the Hutu population. Some scholars, notably the historian and Great Lakes Region specialist Jean Pierre Chrétien (See Chrétien, 2000, Chap. V), have attributed the recurrent Hutu insurgencies to an ethno-racism against the Tutsis minority, while for others, the deep cause of the violence was the political and economic exclusion of the Hutu majority (Ndikumana, 2000; Nkurunziza and Ngaruko, 2005). There is, however, a consensus that politicians on both sides have utilized ethnicity for their personal interests.

Over the last 54 years, the economy of Burundi grew on average at 2.6% a year. Despite political instabilities and civil unrests in the 1960s and 1970s, the economy managed to grow moderately. While in the 1970s the economy of Burundi was growing at a similar rate as an average Sub-Saharan African country, economic growth of Burundi in the 1980s was 4.2%, almost triple the average for Sub-Saharan Africa (1.4%) (see Tables A4 and A5 in the Appendix). However, with the 1993 civil war, the trend reversed. Today, Burundi is one of the poorest[4] countries in the world with one of the lowest human development[5]. Like many other post-conflict countries, Burundi is classified as a fragile[6] state by the World Bank with Country Policy and Institutional Arrangement - CPIA[7] score in 2015 of 3.1.

A few studies have sought to examine the economic performance of Burundi (see for example, Nganou and Mabushi, 2007; Nkurunziza and Ngaruko, 2008; Basdevant, 2011; Nganou and Kebede, 2012). However, the aim of these studies was not to

examine the impact of civil conflicts on economic performance but more of analyzing the determinants of economic growth. While a number of studies exist on economic impacts of conflicts (see for example, Costalli et al., 2017; Bove et al., 2017), Burundi has not been an interest of study, despite experiencing six episodes of civil conflicts since its independence in 1962. Thus, the impact of civil conflicts in Burundi remains unknown.

This study fills this gap in the literature by examining the impact or cost of civil conflicts in two different ways. First, we examine the impact of civil conflicts on economic growth using a regression method involving Extreme Bound Analysis to address specification uncertainty and obtain upper and lower limits of the impact of war. This approach provides an average effect of all the civil conflicts that Burundi has experienced from independence till 2015. Second, we apply the synthetic control method to quantify the economic cost of the 1993-2003 civil war, that is, the loss of GDP per capita due to the war. This method considers the likely path of the Burundian economy in the absence of the conflict. We focus on the 1993 civil war since it lasted for a decade and was more devastating than the previous episodes that were short-lived. Moreover, before 1993, despite political instabilities and episodes of civil unrests, GDP per capita was following an upward trend up to 1992.

Therefore, this study estimates the GDP cost of civil conflicts that Burundi has experienced from 1970 to 2015, paying particular attention to the 1993-2003 civil war, in terms of the lost GDP per capita due to that civil war. and the effect of the recent 2015 conflict. The estimated costs are substantial. They should raise awareness on the importance of avoiding conflicts, which are major sources of fragility. They should speak to Burundian policy makers, too often immune to the adverse effects of conflicts.

The rest of the paper is organized as follows. Section 2 discusses in further details the evolution of the Burundian economy from independence till 2015. Sections 3 and 4 present the theoretical framework and the review of the literature on the economic consequences of conflicts. Section 5 details our various estimation methods. In Section 6 we present results from different estimation methods along with robustness checks. The findings are summarized and discussed in Section 7. Section 8 concludes the study.

2. Burundian economic performance since independence

We analyze the economic growth patterns of Burundi over five periods of time according to episodes of civil conflicts that were experienced. The following categories of periods are considered: from 1961 to 1972, from 1973 to 1992, from 1993 to 1999, from 2000 to 2004, and from 2005 to 2015. The period of 1961-1972 was a period of high political tensions. In October 1961, Prince Louis Rwagasore, the independence hero of Burundi, was assassinated. As Nkurunziza and Ngaruko (2005) argue, Prince Louis Rwagasore had instilled unity among Burundians and after his assassination, political fights began among political elites. This resulted in several political assassinations and civil conflicts in 1965, 1969 and 1972. However, despite continued political tensions and sporadic conflicts, the economy managed to grow, on average, at 3.7% while real per capita GDP grew at 1.6% per year during that period. During 1961-1972, Burundi's economy contracted four times; that is, in 1961 by 13.7%, in 1968 by 0.3%, in 1969 by 1.5%, and in 1972 by 6.4%, mainly due to civil unrests that claimed thousands of people's lives and caused massive displacements, which in turn lowered agriculture value-added and productivity in other sectors (Nganou and Mabushi, 2007). In contrast, the period 1973-1992 was characterized by less political tensions and relative calm, apart from the year 1988 when civil conflicts occurred in northern Burundi. In that period, real GDP grew on average at 4% while per capita GDP grew at 1.4% per annum. As Nkurunziza and Ngaruko (2005) and Nganou and Mabushi (2007) indicate, growth performance in this period was due to massive investment programmes that were undertaken from 1975, financed mostly through foreign resources. While the annual investment ratio stood only at 6.2% during the period 1960-1974, it more than doubled during the period 1975-1992, standing on average at 14.6% (Figure 1). However, this was also a period of economic difficulties caused by high budget deficits and high debt servicing. As for the period 1993-1999, this was the most chaotic period in the Burundian history. After almost three decades of military dictatorial regimes (1966-1993), Burundi had the first democratically elected president, Melchior Ndadaye, in 1993, who was killed three months later in a military coup. Consequently, a civil war erupted and lasted for about a decade. The civil war claimed thousands of lives while many others fled the country or became internally displaced. From 1995, the attacks of rebel groups intensified, and the situation was aggravated by an economic embargo imposed on Burundi by the international community after another military coup in July 1996. The economic embargo went up to 2001. Consequently, Burundi's

economy contracted sharply during that period, recording a positive economic growth only once; that is, in 1998. Also, during this period, investments fell dramatically, reaching a record low of 3% in 2000, down from an average of 16%[8] in the decade before the civil war.

Figure 1: GDP per capita (left scale), investment (right scale) and inflation (right scale) from 1967 to 2015
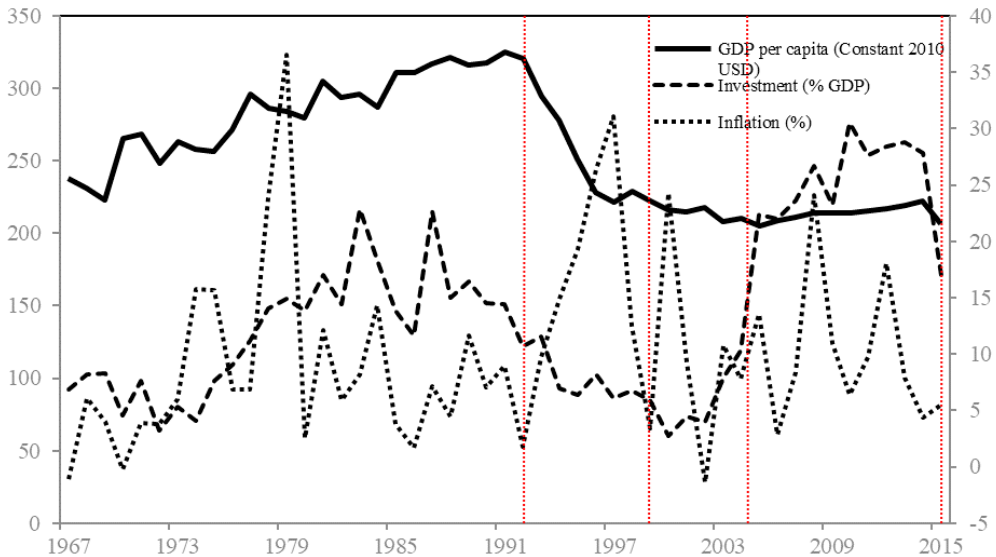
Source: World Bank (2017), World Development Indicators

   The period 2000-2004 is the transition period in which peace talks were held and peace agreements signed. The events followed as follows: Arusha Peace Agreement was signed in August 2000 and in November 2001, a transition government was formed. In November 2003, a cease fire agreement was signed between the government and the main rebel group, the *Conseil national pour la défense de la démocratie-Forces de défense de la démocratie* (CNDD-FDD). External aid which had stopped in the previous years due to economic embargo resumed in this period (Figure 2). Also, the government carried out several policy reforms for economic recovery, which were supported by the World Bank. During this period, despite the relative calm, the economy did not grow much. However, compared to the previous period (1993-1999), the economy recovered a little bit (1.9%) but per capita GDP growth remained negative (-1.1%). The weak recovery in this period was also due to some prolonged droughts that started in 1999 and continued in 2000 and caused the agriculture value-added to fall by 5.2% (Figure 2).

Figure 2: **Official Development Assistance (left scale) and agriculture value added (right scale) from 1970 to 2015**
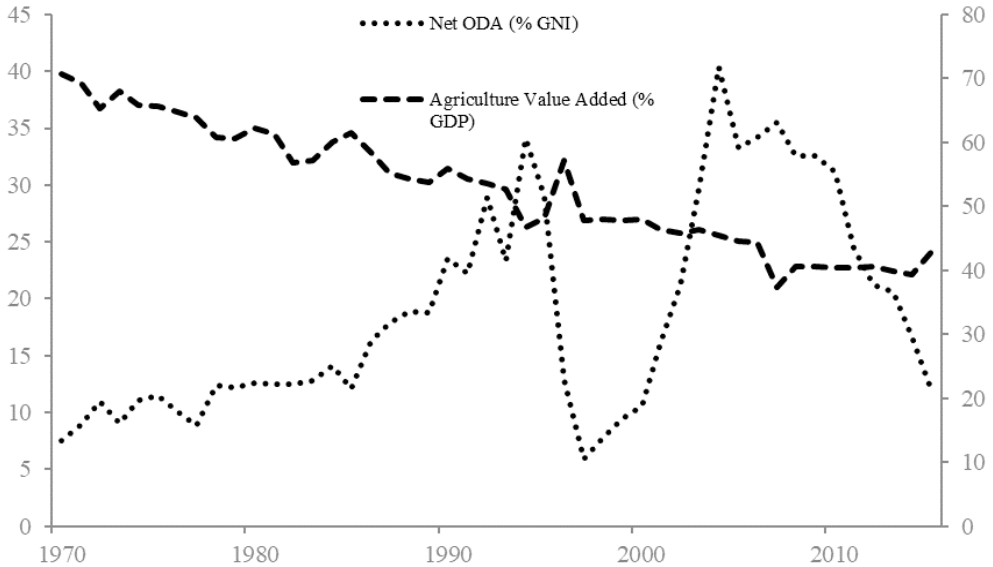
Source: World Bank (2017), World Development Indicators

The last period we consider is 2005-2015, which is the post-conflict period. After the peace agreement between the government and the main rebel group, the (CNDD-FDD), in November 2003, violence in the country reduced drastically. The peace agreement with the last rebel group (FNL) was secured in May 2008. Therefore, between November 2003 and May 2008, there was still some sporadic violence in some parts of the country, especially in the area around the capital city Bujumbura. It is to be noted that, unlike other post-conflict countries (for example Mozambique, Rwanda, and Sierra Leone) that recorded high economic growth rates after the conflicts, Burundi did not reap the peace dividend as the economy grew, on average, only at 3.4% per annum during the period 2005-2015 while per capita GDP fell by 0.1%. It is to be noted that, while from 2006 to 2014, the economy managed to grow at 4% on average, in the year 2015, the economy contracted by 3.9 percent due to civil unrests that started in April 2015 and lasted for many months. Several factors can explain the sluggish growth in the post-conflict period. That period was characterized by high corruption and poor governance (Rufyikiri, 2016), and several financial scandals and embezzlements of public funds were reported by the media and the anti-corruption observatory (International Crisis Group, 2012). Consequently, the country has failed to attract enough foreign direct investment in a context of low domestic resource mobilization, thus failing to boost growth and exit fragility. For the period 2005-2017, the country attracted an insignificant amount of FDI equivalent to 0.70% of GDP while domestic saving as a share of GDP was negative (-7.02%). However, it is to be noted that the failure to attract FDI and low domestic resource

mobilization is a general pattern in Burundi and does not apply to the post-conflict period only. It is due mainly to political and economic uncertainties, among other things. For the period 1985-2005, the situation was no better, the average level of FDI attracted by Burundi was only 0.13% of GDP and domestic saving was also negative (−3.61% of GDP).

The above analysis suggests that while other factors such as corruption, poor governance, etc., might have caused the sluggish economic performance, civil conflicts, in particular the 1993 – 2003 civil war, seem to have had a detrimental impact on economic performance of Burundi.

3. Theoretical framework

Two mainstream strands of literature are found on the factors determining economic performance in the long run; the neoclassical theory of exogenous growth formalized by Solow (1956) and the theory of endogenous growth, pioneered by Romer (1986, 1990), Lucas (1988) and Barro (1990).

According to the Solow growth model, changes in the investment rate and the population growth rate affect the long-run level of output per worker, but do not affect its long-run growth rate. The neoclassical Solow model shows that in the long term, the growth rate of output per worker depends on the rate of labour-augmenting improvement in technology, which is exogenous to the model. The model implies that permanent differences in countries' productivity levels are caused by faster/slower population growth or a higher/lower savings rate. Therefore, in the Solow model, technological progress, which is exogenous, is the only engine of growth. Policy changes can have level effects but do not have long-run growth effects.

On the other hand, the theory of endogenous growth (Romer, 1986, 1990; Lucas, 1988) put emphasis on human capital and innovation capacity. According to endogenous growth theory, economic growth is the result of endogenous factors; investment in human capital, innovation, and knowledge are significant contributors to economic growth.

Recently, other fundamental sources of growth such as institutions and socio-cultural factors are also found in the economic growth literature. Indeed, the literature has identified institutions and cultures, notably property rights, being important for growth (Acemoglu, Johnson and Robinson, 2001; Goldstein and Udry, 2008). Similarity, corruption (Mo, 2001; d'Agostino, 2016), social capital and cohesion (Knack and Keefer, 1997; Easterly et al., 2006) are also found to be important. Regarding the institutional factors, a conflict context is often filled with uncertainty regarding property rights and therefore impacts growth negatively. Similarly, corruption increases during conflict and weak institutional environment, and this can reduce growth via its negative effect on innovation and incentives. This may happen if corruption tends to over protect established producers by imposing heavy bribes and expropriations to innovators and hard workers. However, corruption can also have a positive effect on growth by providing a leeway for entrepreneurs to bypass inefficient regulations. Overall, the strength of the institutions that are good for growth may be determined by social cohesion as Easterly et al. (2006) argue. Countries divided along class or ethnic lines may find it difficult to improve the quality of such institutions.

On the effect of conflicts, Dunne, and Tian (2015) highlight four channels through which conflicts affect economic growth. The first is through the destruction of physical capital stocks as well as the reduction of foreign direct investment inflows due to higher perceived risk. The second channel is through the destruction and displacement of labour and human capital. The third channel is trade. During a civil conflict, both domestic and international trade are likely to reduce, hence harm economic growth. The last channel is the reallocation of resources to less productive activities, which includes increased military spending; diversion of resources from productive activities harms economic growth.

According to Dunne and Tian (2015), one basic theoretical model used to estimate the effects of a conflict on economic growth is the augmented Solow model which includes human capital. This model could be further augmented to include the conflict variable via the technology parameter, A. The starting point is the following human capital augmented production function

$$Y_t = K_t^\alpha H_t^\beta [A_t L_t]^{1-\alpha-\beta}, 0 < \alpha + \beta < 1 \tag{1}$$

Where Y denotes output, K is physical capital, H is the stock of human capital, L is labour, while A is the technology parameter. and are the elasticities of output with respect to physical and human capital respectively. In per effective worker terms, the above equation is written as follows, where $y = \frac{Y}{AL}, k = \frac{K}{AL}, and\ h = \frac{H}{AL}$ are respectively output per effective worker, physical capital per effective worker, and human capital per effective worker:

$$y_t = k_t^\alpha h_t^\beta \tag{2}$$

By determining the transition equations of k and h, then solving for the steady state levels of k, h, and y, a model which can be empirically estimated is obtained; where g_y is the growth rate of income per capita, y_0 is the initial level of income per capita, s_k is the investment in physical capital, s_h is the level of human capital, while $n, g, and\ \delta$, are respectively the growth rate of population, technical progress and the rate of depreciation of physical and human capital. In growth models, $(g + \delta)$ is assumed to be equal to 5 percent, and is added to the population growth rate, to form $(n + g + \delta)$ (Dunne and Tian, 2015).

$$g_{yt} = \beta_0 + \beta_1 \ln(y_0) + \beta_2 \ln(s_k) + \beta_3 \ln(s_h) + \beta_4 \ln(n + g + \delta) \tag{3}$$

Augmenting the latter equation with a conflict variable (civcon) gives:

$$g_{yt} = \beta_0 + \beta_1 \ln(y_0) + \beta_2 \ln(s_k) + \beta_3 \ln(s_h) \\ + \beta_4 \ln(n + g + \delta) + \beta_5 civcon_t + \varepsilon_t$$

As indicated in the methodology section, to examine the effect of conflicts on economic growth, this study uses Extreme Bounds Analysis (EBA) approach because of the uncertainty on the variables to consider as control variables. Therefore, on top of the regressors[9] shown in equation (3), we control for other growth predictors found in the literature.

4. Empirical literature review

Empirical investigations on economic consequences of civil wars have exposed their adverse effects (see for example Collier, 1999; Rodrick, 1999; Cerra and Saxena, 2008). In a much-cited paper in the civil war literature, Collier (1999) finds that GDP per capita declines at an annual rate of 2.2% during war. This figure implies that for a conflict that lasts 5 years, GDP per capita is expected to fall by roughly 10% during the conflict. More recently, the United Nations Development Programme (UNDP) Bureau for Crisis Prevention and Recovery has estimated that civil war reduced a country's GDP by 1.7% to 3.3% per year before 1990 and by approximately 12.3% after 1990[10] (UNDP, 2008). These results are of course sensitive to the choice of the counterfactual. This issue is dealt with by considering that the counterfactual performance is either: (1) the economic performance during peace (Collier, 1999); (2) the trend of the economic indicator before conflict outbreak; (3) the trajectory of a "similar" country or countries that remained peaceful (Abadie and Gardeazal, 2003). In our view, while the first two methods are relatively suited for short conflict periods, the third one is the most appropriate for conflicts that last many years. This is because economic performance in peaceful periods is not constant, just as the trend may vary for many reasons other than conflict.

Regarding the mechanism through which conflict affects the economy, Collier (1999) provides an explanation of the decline, which is centered on the gradual loss of capital stock due to destruction, dissaving and "portfolio substitution" by private agents who shift their assets (physical and human capital) out of the country. This capital flight also results in low levels of new investments, which leads to the deterioration of the existing capital (Collier and Hoeffler, 2004). In the case of many developing countries, cattle and other farm assets often represent a substantial part of household's savings, which may be destroyed or stolen during civil war (see Bruck, 1997) for the case of Mozambique; and Annan et al., 2006 for the case of Uganda).

Empirical research has also shown that civil wars devastate lives directly through battle-related deaths and mutilations, and indirectly through diseases (malaria, cholera, yellow fever and other illnesses) and famine. For instance, Lacina and Gleditsch (2005) estimate that civil war in the Democratic Republic of Congo caused 145,000 battle-deaths and approximately 2.5 million indirect deaths from 1998 to 2001. Human capital may also become impaired by breakdown of health and school systems during conflict as public expenditure is diverted to military expenditure

at their expense (Knight et al., 1996). For instance, military expenditure during the Burundian civil war went from approximately 4% of GDP in 1994 to 8% in 2001 while the share of spending on education stagnated at 4% (Ndikumana, 2005). On average, Collier and Hoeffler (2004) found that civil war raises military spending as a share of GDP by 1.8% percentages points per year.

Compared to physical and human capital, the quantitative effect of civil war on institutions, culture and other fundamental determinants of economic growth is less well-known owing perhaps to the difficulty of measuring it. Mo (2001) found that a 1% increase in corruption level reduces the growth rate by about 0.72% via mainly the effect of corruption   on political instability.

However, the effect of war on institutions need not have a destructive effect on the economy. On the contrary, civil war can destroy some political and social institutions that inhibited development in the first place (Van Raemdonck and Diehi, 1989; Blattman and Miguel, 2010; Bove et al., 2016) and give way to institutional changes, technological innovations and social developments that stimulate growth. For instance, Nkurunziza and Ngaruko (2005) argue that the Burundian Civil war (1993-2003) weakened a small group of rent seekers who had blocked socio-economic changes for decades. Internal warfare is also believed to change time and risk preferences of individuals (Nillesen, 2016), social cooperation and civic engagement (Bauer et al., 2016). Most of these changes are likely to occur in the aftermath of the conflict but not always. By comparing Somalia's economic performance before and after it became stateless in 1991, Leeson (2007) and Powell et al. (2008) find that the country improved on a number of indicators, notably law and order, during war. Instead of providing social order, the pre-war Somali government "suck the life out of the economy" (Powell et al., 2008).

Although cross-country studies dominate the empirical literature on the economic cost of conflict, these are criticized for not taking into consideration country-specific responses to conflict shocks (Bove et al., 2016). As these last authors argue, conflicts should not be assumed to produce the same outcome in different economies. The cross-country literature is also criticized for not properly controlling for institutional and social time varying variables that can affect both the probability of war and economic growth. Case studies are also limited in that they often do not allow generalization. This study attempts to estimate economic costs of civil conflicts in Burundi with these issues in mind.

5. Methodology

We start by estimating a GDP growth equation on a number of economic growth predictors. We then move on estimating the counterfactual GDP per capita trajectories using the synthetic control method. For comparison, we also construct a counterfactual GDP per capita using an OLS trend. We first present the theory behind these different methods before we present the results of their application.

Examining the effect of civil conflicts on economic growth

To assess the effect of civil conflicts on economic growth in Burundi, the following equation is estimated for the period 1970 to 2015:

$$g_t = \beta_0 + \beta_1 CIVCON_t + X'_t\theta + \varepsilon_t$$

g denotes economic growth, CIVCON stands for civil conflicts; it is a dummy variable taking the value of 1 for a conflict year and 0 otherwise. In addition to the dummy variable, an indicator of conflict intensity is used. X is the vector of control variables and ε_t is the error term.

Arvanitidis et al. (2007) highlight the factors affecting a country's economic growth as found in the literature (see also Barro 1991, 1997; Barro and Sala-i-Martin, 2003; Edwards, 1998; Dollar and Kraay, 2002; Rodrik, 2000, etc.). These include, among others, the rate of investment, foreign direct investment, official development assistance, human capital, innovation and Research and Development (R&D) activities, economic policies and macroeconomic conditions, openness to trade, institutions, demography, etc.

In examining the effect of civil conflicts on economic growth, we consider the following pool of control variables: openness to trade, investment rate, population growth rate, inflation rate, official development assistance (% GNI), institution quality captured by polity2 index, change in the real effective exchange rate, agriculture value added (% GDP), household final consumption expenditure (% GDP), primary school

enrolment, industrial value added (% GDP), services value added (% GDP), military expenditure (% GDP), external debt stock (% GNI), government expenditure (% GDP), total natural resources rents (% GDP), broad money (% GDP), and domestic credit to the private sector (% GDP). The description of the variables and their descriptive statistics are in Table A1 and Table A2 of the Appendix.

Extreme Bounds Analysis (EBA) is used in analyzing the effect of civil conflicts on economic growth because of the uncertainty on the variables to consider as control variables. As Sala-i-Martin (1997) points out, the impact of a focus variable in a regression depends on the combination of the control variables in the equation. The use of Extreme Bounds Analysis here is therefore to show the effect of a changing set of control variables on the estimated effect of civil conflicts. The idea of Extreme Bounds Analysis is to find out which variables from the set X are robustly associated with the dependent variable Y. This is done by running a regression model combining variables in the set X (Marek, 2016). In Extreme Bounds Analysis (see, next equation), some variables are "focus" variables, others are considered as "*free*" (fixed) to be included in all regressions, while others are "*doubtful*" variables.

$$y = \alpha_j + \beta_{vj}v + \beta_{Fj}F + \beta_{Dj}D_j + \varepsilon$$

where y is the GDP growth rate, v is the focus variable, F is the set of free variables, and D_j is a vector of doubtful variables taken from the set X of variables. Following Levine and Renelt (1992) and Sala-i-Martin (1997), three (3) doubtful variables are included in each combination.

To decide on the free variables to include, we follow Marek (2016) and run a naïve[11] Extreme Bounds Analysis, which provides a particularly strong test for a determinant's robustness. According to Marek (2016), this might indicate which variables should be treated as free. From our naïve EBA results,[12] it seems that inflation rate, population growth rate, openness to trade, primary school enrolment, domestic credit to private sector, and official development assistance, are the most robust determinants[13] of economic growth. We consider them as free variables, but we divide them into two sets: one set comprising of inflation rate, openness to trade and population growth rate, and another set on official development assistance, domestic credit to private sector, and primary school enrolment. Sala-i-Martin (1997) considers as free variables the investment rate, secondary school enrolment rate and rate of population growth.

To determine whether a focus variable v is robust or fragile in determining y, Leamer (1985) defines the lower and upper extreme bounds as the minimum and maximum values of $\hat{\beta}_j + \tau\hat{\rho}_j$ across the M estimated regression models, where $\hat{\beta}_j$ is the estimated regression coefficient, $\hat{\rho}_j$ is the standard errors, and τ is the critical value for the requested confidence level. If the upper and lower extreme bounds have the same sign, the focus variable v is said to be robust. But, if the

bounds have opposite signs, the variable is said to be fragile. This makes Leamer's (1985) EBA too strong and very few or no variable pass it. However, Sala-i-Martin (1997) suggests another approach focusing on the entire distribution of regression coefficients, not just on its extreme bounds. Extreme Bounds Analysis proposed by Sala-i-Martin (1997) considers a variable more robust if a greater proportion of its coefficient estimates lies on the same side of zero. According to Sala-i-Martin (1997), a focus variable v is robust if the Cumulative Density Function of all the regression coefficients is larger than 95%.

Estimating the cost of conflict: A synthetic control method

To estimate differently the economic costs of civil conflicts, this study applies the synthetic control method developed by Abadie and Gardeazabal (2003). The focus in this section is on the 1993 – 2003 civil war. As it was previously indicated, episodes of civil conflicts before 1993 (1965, 1969, 1972, 1988, and 1991) were short-lived and do not seem to have caused significant economic impact. In this study, the outcome variable of interest is the GDP per capita. Thus, we seek to examine the economic cost of the 1993 civil conflict on GDP per capita. Using the synthetic control method, this consists of estimating the lost GDP per capita due to the 1993 civil war. In other words, we want to estimate what would have been the level of GDP per capita if the 1993 civil war had not happened. To get that, we take the difference between the actual GDP per capita during the 1993 civil war period and the counterfactual GDP per capita or the synthetic control.

    Abadie et al. (2015) indicate that the synthetic control is defined as the weighted average of the units in the donor pool (untreated units), which is represented by a $(J \times 1)$ vector of weights $W = (w_2,...,w_{J+1})'$, with $0 \le w_j \le 1$ for $j = 2,...,J$ and $w_2 + ... + w_{J+1} = 1$.[14]

    The weights are chosen in such a way that the formed synthetic control mimics as closely as possible the behavior of the treated unit of interest before the intervention (Costalli et al., 2017), that is, before the 1993 civil war for our case. As Abadie et al. (2015) point out, "the pre-intervention characteristics of the treated unit can often be much more accurately approximated by a combination of untreated units than by any single untreated unit".

    According to Abadie et al. (2015), the synthetic control is chosen by minimizing the following difference $\| X_1 - X_0 W \|$[15], where X_1 is the $(k \times 1)$ vector of the values of the characteristics of the treated unit in the pre-intervention period, while X_0 is the $(k \times J)$ matrix of the values of the same variables for the control group. Abadie et al. (2015) suggest that the pre-treatment characteristics to use can be the determinants of economic growth, such as investment rate, education attainment, industry share of value added, inflation, openness to trade, etc.

We follow this literature by choosing the synthetic control which minimizes the following expression:

$$\sum_{m=1}^{k} v_m (X_{1m} - X_{0m}W)^2$$

Subject to: $w_2 + ... + w_{J+1} = 1$. and $0 \le w_j \le 1$, where v_m is the weight showing the importance assigned to the mth variable when measuring the $\| X_1 - X_0W \|$.

The impact of the intervention in the post-intervention period at time t is given by:

$Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt}$, where Y_{1t} is the value of the outcome at period t for the treated unit

and $\sum_{j=2}^{J+1} w_j^* Y_{jt}$ represents the counterfactual, that is, the synthetic control.

To sum up, using the impact evaluation vocabulary: the treated unit is Burundi, the treatment is the 1993 civil war, the outcome variable is GDP per capita, the intervention period is 1993 - 2003, the pre-treatment period is 1970-1992.

Countries used to construct the synthetic control were chosen from the list of Sub-Saharan Africa countries using the World Bank data. We first excluded from that list countries which experienced any armed conflict, following the definition of the UCDP[16]/PRIO[17] (see Gleditsch et al., 2002)[18], from 1993 to 2003. We then selected countries whose GDP per capita (the outcome variable), in 1992 was not more than 200 USD[19] away from that of Burundi.[20] So the final donor pool is composed of Burkina Faso, Madagascar, Malawi, Mozambique and Togo.

We used annual country-level data for the period 1970 – 2003, which gives a pre-intervention period of 23 years and a post-intervention period of 10 years. For the pre-war characteristics in X_1 and X_0 we essentially use growth predictors that are found to be robustly associated with growth in Extreme Bounds Analysis (EBA).

6. Presentation of the findings

The properties of the variables used are examined prior to any other analysis, to check whether they follow a stationary process or not. Phillips-Perron unit root tests results are presented in Table 1. Phillips-Perron unit root tests indicate that Real GDP growth, Change in the real effective exchange rate, Inflation rate, Agriculture value added (% GDP), Broad money (% GDP), and Household final consumption expenditure (% GDP) are stationary processes. The rest of the variables are found to be non-stationary variables that but became stationary after one differentiation. Since EBA does not accommodate for cointegration tests and an error correction modeling, to avoid the problem of spurious regression in this study, non-stationary variables are considered in first difference in the regressions. However, it should be acknowledged that, this helps us to capture only short-term effects.

Table 1: Unit root tests results

Variables	Level	First Difference
	P-value	P-value
Primary school enrolment	0.692	0.002
Real effective exchange rate change	0.000	-
Inflation rate	0.000	-
Population growth	0.517	0.048
ODAR	0.601	0.000
Real GDP growth	0.000	-
Industrial value added (% GDP)	0.191	0.000
Agriculture value added (% GDP)	0.000	-
Trade openness	0.336	0.000
Gross fixed capital formation (% GDP)	0.354	0.000
Services value added (% GDP)	0.088	0.000
Military expenditure (% GDP)	0.923	0.000
Debt stock (% GDP)	0.987	0.000
Domestic credit to private sector (% GDP)	0.177	0.000
Broad money (% GDP)	0.009	-
General government final consumption	0.381	0.000
Total natural resources rents	0.341	0.000
Household final consumption expenditure (% GDP)	0.001	-

EBA regression results[21]

To examine the impact of civil conflicts on economic growth, we first capture civil conflicts by a dummy variable taking the value of 1 in the year of civil conflict and 0 otherwise; the results are presented in Table 2. For our focus variable, "civil conflict dummy" (CIVCON), the EBA results[22] show that for the two sets of free (fixed) variables considered, all the estimated coefficients (100%) for all the 939 regressions are negative (Figure 3). The estimated coefficients are also statistically significant for almost all the regressions (100% with the first set of free variables, and 99.75% for the second set). This implies that civil conflicts are harmful to economic growth in Burundi. Moreover, the results indicate that 99.9% of the Cumulative Density Function (CDF) of all the estimated coefficients lies below zero. According to Sala-i-Martin (1997)[23], this suggests that the civil conflicts dummy variable is robustly associated with economic growth. The average coefficient across all the 939 regressions is, respectively, -3.907 and -4.189 for the two sets of free variables. This shows that, on average, holding all else equal, civil conflicts reduced economic growth by 4 percentage points.

The results further show that for the free variables considered, the estimated coefficients for all the regressions are all positive for primary school enrolment, openness to trade, and population growth rate, all negative for inflation rate, while some few (less than 0.5%) coefficients are negative for Official Development Assistance (ODA) and domestic credit to private sector. Most of the estimated coefficients are statistically significant for inflation rate (99.4%), population growth rate (81.3%), primary school enrolment (64%), while for openness to trade, only 18.9% of the coefficients are significant and none for ODA and domestic credit to private sector. Looking at the distribution (CDF) of the coefficients, primary school enrolment, inflation rate and population growth rate are robustly correlated with economic growth. Primary school enrolment and population growth rate are found to be positively correlated with economic growth while inflation is negatively correlated with growth.

Table 2.1: Impact of civil conflicts on economic growth

Panel A: Impact of civil conflicts considering the first set of the free variables

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	Weighted Mean of β	S.E (Weighted Mean)	% ($\beta<0$)	% ($\beta>0$)	% (significance $\beta<0$)	% (significance $\beta>0$)	CDF ($\beta<0$)	CDF ($\beta>0$)
Intercept	4.914	2.861	0.122	99.878	0.000	57.579	5.084	94.916
ODA	0.099	0.124	0.489	99.511	0.000	0.000	22.721	77.279
PSEN	0.212	0.102	0.000	100.00	0.000	64.425	2.456	97.544
DCPS	0.114	0.276	0.122	99.878	0.000	0.000	34.434	65.566
CIVCON	-3.907	1.160	100.00	0.000	100.00	0.000	99.940	0.060

Panel B: Impact of civil conflicts considering the second set of the free variables

Variables	Weighted Mean of β	S.E (Weighted Mean)	% ($\beta<0$)	% ($\beta>0$)	% (significance $\beta<0$)	% (significance $\beta>0$)	CDF ($\beta<0$)	CDF ($\beta>0$)
Intercept	8.149	2.691	0.122	99.878	0.000	88.509	1.722	98.278
INFLATION	-0.164	0.056	100.00	0.000	99.389	0.000	99.632	0.368
OPENNESS	0.135	0.082	0.000	100.000	0.000	18.949	6.514	93.486
POPGR	5.504	2.360	0.000	100.000	0.000	81.296	1.640	98.360
CIVCON	-4.189	1.157	100.000	0.000	99.756	0.000	99.933	0.067

Note: In this table, civil conflicts are captured by a dummy variable (CIVCON). Column (4) reports the percentage of negative coefficients and column (6) the percentage of negative coefficients which are significant. Columns (5) and (7) report results for estimated positive coefficients. In columns (8) and (9), the cumulative density functions are reported.

As a robustness check, we examine the impact of civil conflicts by categorizing civil conflicts by intensity. The intensity variable is coded in two categories: minor armed conflict (between 25 and 999 battle-related deaths in a given year), and major armed conflict (at least 1,000 battle-related deaths in a given year). War intensity dummy variables are from UCDP/PRIO Armed Conflict Dataset. The results presented in Table 2.2 indicate that all the 1,789 estimated coefficients[24] for the two dummy variables (MINCON and MAJCON) are negative for the two sets of free variables included, except for MINCON in the regression, including inflation rate, openness to trade and population growth rate as fixed (free) variables, where a small proportion of coefficients (0.1%) are found to be positive. We find that for major conflicts (MAJCON), more than 95% of the estimated coefficients are negatively and statistically significant, while for minor conflicts (MINCON), only 24.4% and 53.2% are statistically significant, respectively, for the 2 sets of free variables considered. The Sala-i- Martin EBA test indicates that major conflicts dummy variable (MAJCON) is robustly correlated with economic growth (more than 99% of the Cumulative Density Function (CDF) of all the estimated coefficients lie below zero), while the robustness of the minor conflicts dummy variable (MINCON) depends on the free variables included. Major conflicts seem to reduce economic growth by 5% while minor conflicts reduce it by around 2% in Burundi. Among the free variables considered, only inflation, population growth rate and primary school enrolment rate are robust determinants of economic growth.

Table 2.2: Impact of civil conflicts on economic growth

Panel A: Impact of civil conflicts considering the first set of the free variables and alternative conflict measure

(1) Variables	(2) Weighted Mean of β	(3) S.E (Weighted Mean)	(4) % (β<0)	(5) % (β>0)	(6) % (significance β<0)	(7) % (significance β>0)	(8) CDF (β<0)	(9) CDF (β>0)
Intercept	8.760	2.868	2.627	97.373	0.000	80.660	3.639	96.361
INFLATION	-0.195	0.065	100.000	0.000	95.137	0.000	99.556	0.444
POPGR	5.940	2.890	0.000	100.000	0.000	48.351	4.182	95.818
OPENNESS	0.135	0.107	0.168	99.832	0.000	15.484	13.752	86.247
MINCON	-2.219	1.318	99.897	0.103	24.408	0.000	93.165	6.835
MAJCON	-5.234	1.468	100.000	0.000	98.146	0.000	99.662	0.338

Panel B: Impact of civil conflicts considering the second set of the free variables and alternative conflict measure

Variables	Weighted Mean of	S.E (Weighted Mean)	% (β<0)	% (β>0)	% (significance β<0)	% (significance β>0)	CDF (β<0)	CDF (β>0)
Intercept	4.854	2.944	5.198	94.802	0.000	65.903	7.680	92.320
ODA	0.116	0.141	6.931	93.069	0.000	0.838	23.800	76.200
DCPS	0.110	0.281	36.445	63.555	0.000	0.000	35.873	64.127
PSEN	0.246	0.104	0.000	100.000	0.000	70.933	2.485	97.515
MINCON	-2.608	1.288	100.000	0.000	53.244	0.000	97.012	2.988
MAJCON	-4.886	1.817	100.000	0.000	95.263	0.000	99.281	0.719

Note: In this table, civil conflicts are categorized by intensity, minor conflict (MINCON) and major conflict (MAJCON)

Figure 3: Distribution of estimated coefficients for the variable "Civil Conflicts" (dummy variable)
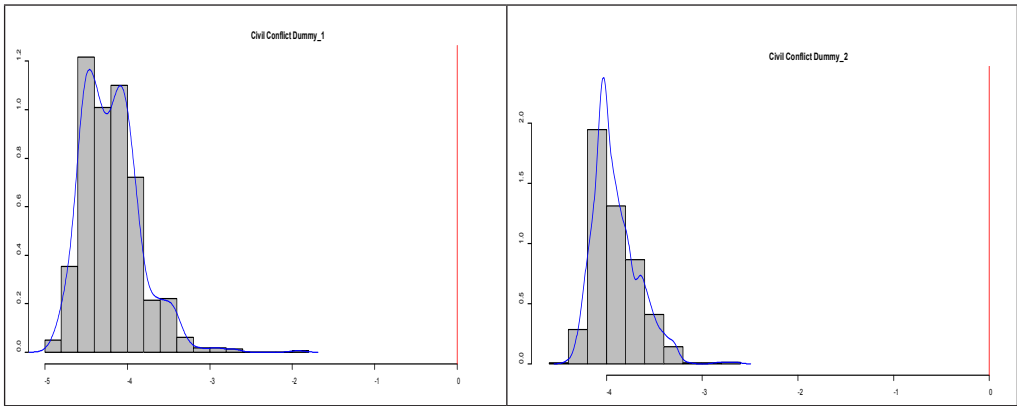
Note: The 2 figures are for the two sets of free variables respectively

Figure 4: Distribution of estimated coefficients for the variable "Civil Conflicts" (conflict intensity)
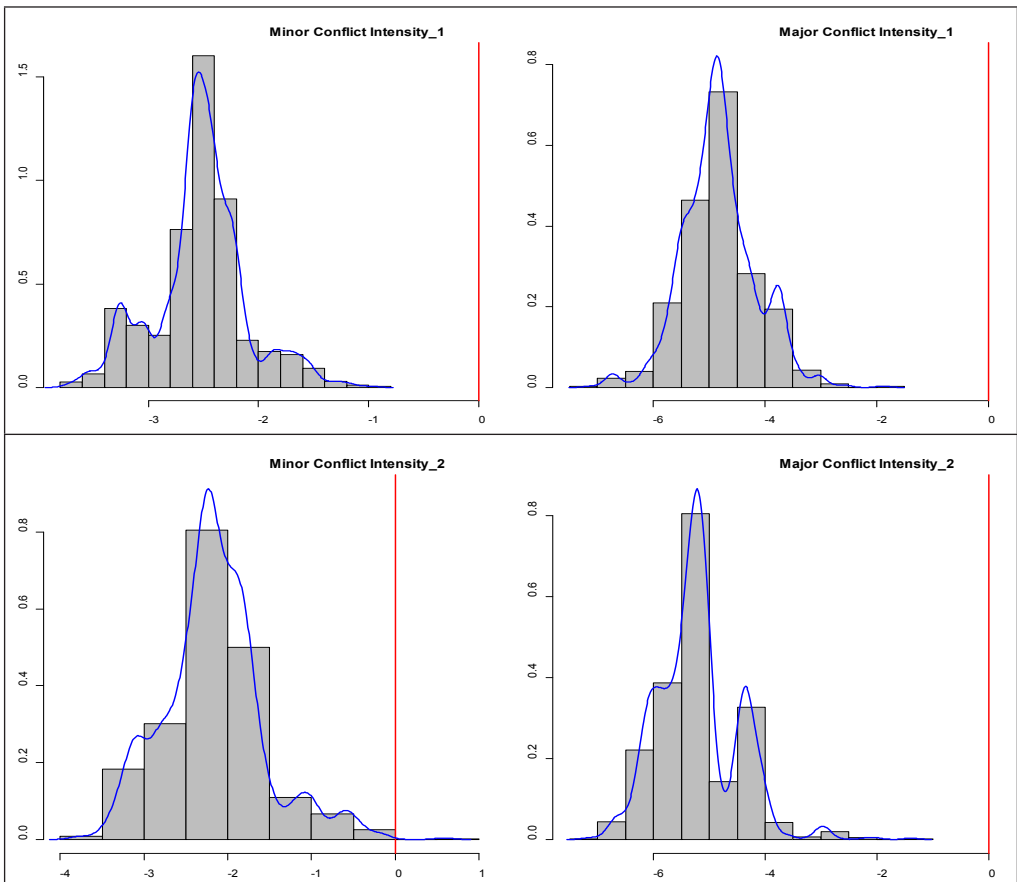
Note: The figures are for the two sets of free variables.

Estimating the economic costs of the 1993–2003 civil war

We first estimate the counterfactual path of the GDP per capita of Burundi, had the country not experienced war in the 1993 – 2003 period, using the synthetic control method. Recall that the synthetic Burundi is a combination of comparison countries such that its characteristics (growth predictors) best resemble those of the actual Burundi in the pre-civil war period.

As stated earlier, weights associated to the different countries in the synthetic control, w*, depend on the weights, , attributed to the growth predictors. These weights reflect the importance assigned to the different growth predictors. Referring to the regression results in Table 3, we have fixed the   weights so that they reflect the magnitude of the effect of the corresponding variable on economic growth as follows[25]: Primary School Enrollment (0.024), Inflation (0.019), Population Growth (0.656), GDP per Capita in 1992 (0.10), GDP per capita in 1983 (0.10) and GDP per capita in 1970 (0.10). The last three variables have been added to control for the effect of unobserved factors affecting both the outcome variable (GDP per capita) and the growth predictors (Abadie et al., 2015). However, Kaul et al. (2021) recommend not using all pre-intervention outcomes for matching as this renders other characteristics irrelevant. We have then kept in the model the values of 1970 (at the beginning of the pre-intervention period), 1983 (in the middle of the pre-intervention period) and 1992 (right before the beginning of the Burundian civil war).

The following country weights were obtained by solving the optimization problem presented in section 5.2 using STATA software. Burkina Faso (0.796), Mozambique (0.167), Togo (0.021), Madagascar (0.016) and Malawi (0). Therefore, the constructed synthetic Burundi is a weighted average of the latter countries (except Malawi). The country with the largest weight, i.e., Burkina Faso, indeed resembles Burundi in many characteristics. Given these weights, we discuss below the economic and political evolution of Burkina Faso, as well as Mozambique, from 1970 to 2003.

Table 3 compares the means of growth predictors of the actual, the synthetic Burundi and the population-weighted averages of the sample of SSA countries in the donor pool over the period 1970 to 1992. These results suggest that the synthetic Burundi, i.e., a certain convex combination of Burkina Faso, Mozambique Togo and Madagascar, is a better comparison for Burundi than a simple population weighted average of the considered sample of SSA countries.

In other words, characteristics of Burundi before the 1993 civil war are better reproduced by the synthetic Burundi. Indeed, for all the characteristics considered, the corresponding values of the synthetic control are closer to the actual Burundi than the sample average of donor pool countries.

Table 3: Economic Growth Predictors before the Burundian 1993 – 2003 civil war

	Actual Burundi	Synthetic Burundi	Average of comparison countries*
Population Growth (annual %)	2.2	2.2	2.4
Primary School enrollment (% gross)	40	33	71
Inflation	9	12	21
GDP per capita in 1992	333	325	318
GDP per capita in 1983	298	308	340
GDP per capita in 1970	265	265	373

*Burkina Faso, Madagascar, Malawi, Mozambique, and Togo.

GDP per capita cost of the 1993–2003 civil war

Figure 5 plots the path of the GDP per capita of the synthetic Burundi, the actual Burundi and a simple average of the comparison countries. While the synthetic Burundi almost exactly reproduces the pre-1993 path of Burundi, the relationship of Burundi with the average of comparison countries is much less tight. It is therefore relatively accurate to consider the synthetic Burundi as the counterfactual of Burundi during the civil war period. Hence, our estimate of the cost of the civil war is given by the difference between the actual GDP per capita of Burundi and its synthetic counterpart.

Figure 5: Evolution of GDP per capita of actual Burundi and synthetic Burundi
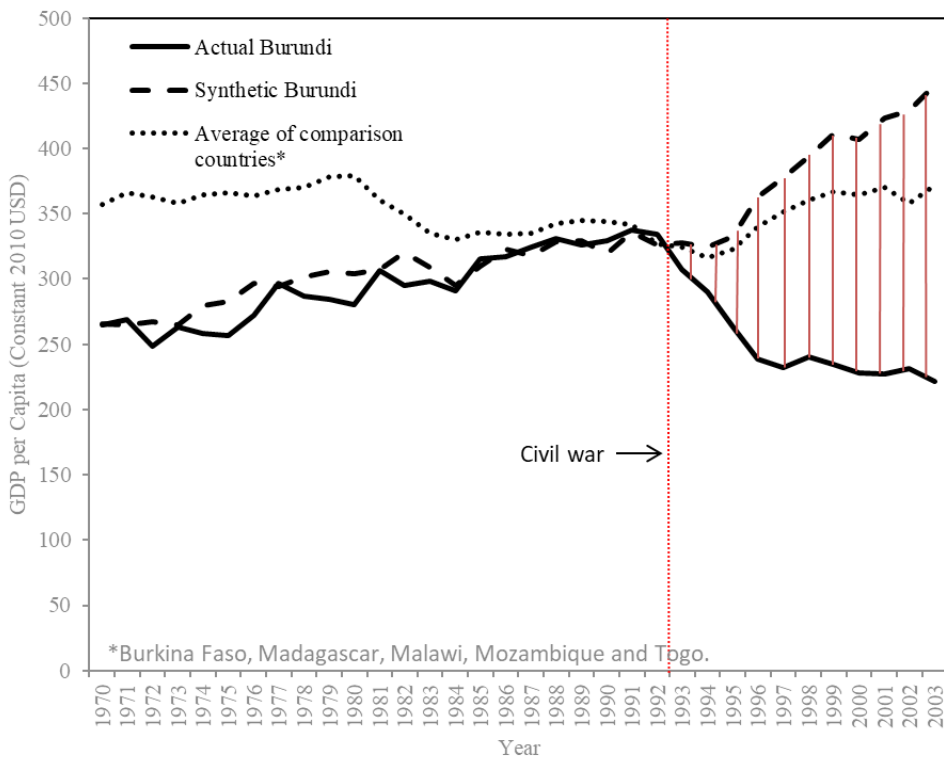
On average, GDP per capita fell by approximately 140 dollars per annum during the civil war period, compared to what it would have been in the absence of war. The mean annual loss as a percentage of the actual real GDP per capita is 59.7%. Considering that GDP per capita stood at roughly 300 USD (in constant 2010 USD) right before the civil war, this means that on average Burundians saw their annual income reduced by almost a half because of the conflict. The total monetary cost of the war during the 1993-2003 period is estimated at USD 1520 per person (in 2010 US dollars) and almost 10 billion USD for the whole country.

Burkina Faso and Mozambique from 1970 to 2003

We previously determined that a good counterfactual for the GDP per capita path of Burundi from 1970 to 1993 is a weighted average of Burkina Faso, Madagascar, Mozambique, and Togo, with almost all the weight on Burkina Faso (0.80) and to a less extent Mozambique (0.17). Since the synthetic control mostly resembles Burkina Faso, the following discussion mainly concerns the comparison of the "country of upright people" to Burundi. There are indeed many similarities between Burundi and Burkina Faso, even though differences naturally exist.

Focusing on characteristics that make Burkina Faso so close to Burundi in the pre-treatment period that have not been put in our data, we find some similarities in the fundamental determinants of growth: geography, institutions, and integration (or international trade) (following Rodrik et al., 2002). Considering geography, the two countries are landlocked and have relatively scarce natural resources. Regarding international trade, we notice that they both have narrow export bases. Burundi's main exports are coffee and tea and Burkina Faso primarily exports cattle, cotton, and gold. As for institutions, in both countries the army appears as the most powerful group since the 1960s. As is the case in Burundi, from independence (1960 in Burkina Faso and 1962 in Burundi) until the beginning of the 1990s, succession at the top of the country has been in the form of coup d'etats. Moreover, the two countries turned to electoral democracy in the early 1990s, notably under the instigation of France, following the "Discours de la Baule" in which the President of France stated that his country would henceforth only support democratic countries (National Security Archive, 1990). It is shortly after the 1993 general election in Burundi (at the start of the civil war) that the economic paths of the two countries started to diverge substantially (see Figure 6).

Figure 6: Trends in GDP per capita: Burkina Faso, Burundi, and Mozambique
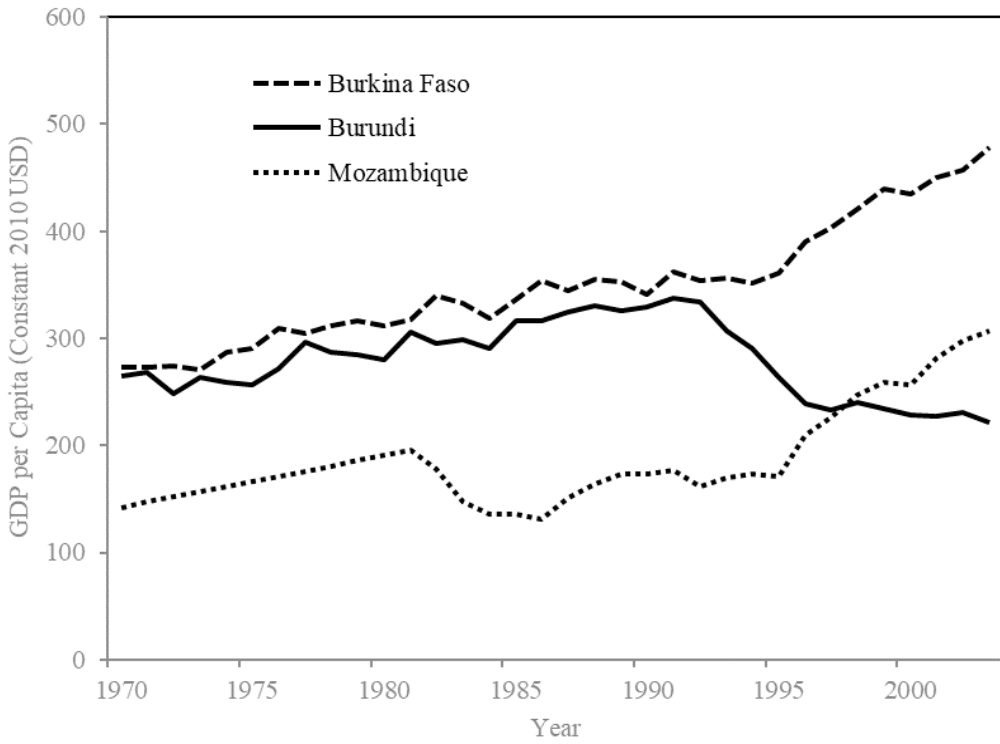
Since synthetic Burundi is mainly a weighted average of Burkina Faso and Mozambique, it is important to check whether there has been any unusual positive or negative shocks in the two countries between 1993 and 2003, which could bias the estimated cost. This is because a positive shock in one of the control countries would inflate the cost of the Burundian civil war and inversely a negative shock would underestimate the true cost of the war. This verification is particularly important in the case of Burkina Faso because of its relatively high weight in the synthetic control.

While the Burundian economy was in freefall in the 1990s, Figure 6 suggests that Burkina Faso and Mozambique were having economic booms. The acceleration of economic growth in Burkina Faso in that period is linked to the devaluation of the "Franc CFA" (the regional currency) to better rainfall and to higher commodity prices (Koussoube et al., 2014). In the case of Mozambique, the country transitioned from more than a decade of civil war (that ended in 1992) to peace and improved macroeconomic management (Fauvet, 2000). These positive performances in the 1990s are not specific to Burkina Faso and Mozambique; they are also observed in some other African countries that did not experience war during this period. This leads us to think that, as the synthetic control suggests, Burundi's GDP per capita growth would have accelerated in the 1993-2003 period had the country remained peaceful and hence the synthetic control is a good representation of Burundi without civil war.

Placebo studies

To evaluate the credibility of our results, we conduct two placebo studies. We first assign the treatment (civil war) to a random year (1983). In other words, we calculate country weights (the synthetic control) using data from the period 1970 to 1983 (instead of 1970 to 1992). In the period after the placebo treatment (1984-1992), the path of the synthetic Burundi should not diverge substantially from that of the actual Burundi, otherwise the results presented in Figure 5 would be indicative of a potential lack of predictive power after 1993.

   Figure 7 shows the results of using 1983 as a placebo year of the beginning of the Burundian civil war, 10 years before the real war started. As it is observed, the GDP per capita trajectory and its synthetic counterpart do not diverge substantially before 1983. More importantly, in contrast to the case where the treatment year is the beginning of the real civil war, the path of the synthetic Burundi remains close to the actual Burundi after the placebo civil war, i.e., from 1983 to 1993, and starts to move away thereafter. This result improves our confidence that cost estimated in Figure 5 reflects the impact of the civil war.

Figure 7: Placebo civil war 1983 – Trends in per capita GDP: actual Burundi and synthetic Burundi
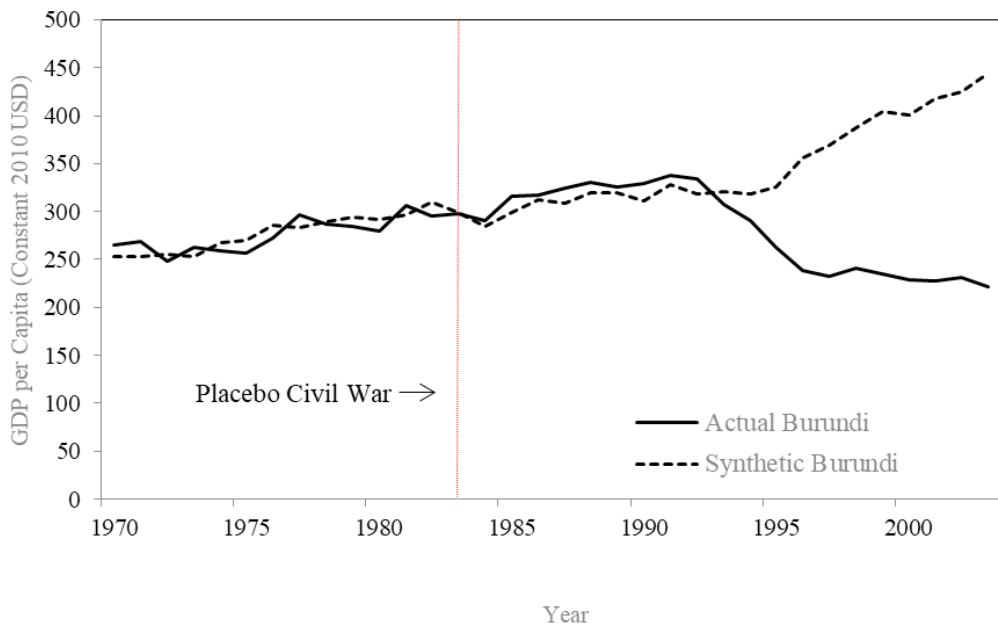
The second placebo study we conducted consists in assigning the treatment not to Burundi but to other countries in the donor pool. We then calculated the ratio of the post-treatment Root Mean Square Prediction Error (RMSPE) to the pre-treatment RMSPE. The RMSPE is a measure of the magnitude of the discrepancy between the synthetic control and the actual outcome[26]. If pre-treatment RMSPE is as large as the post-treatment RMSPE, we consider that the treatment had no effect. If the post-treatment RMSPE is significantly larger than the pre-treatment one, this is indicative of a large effect of the intervention. Figure 8 presents results of this placebo test. All the control countries have a much lower RMSPE ratio compared to Burundi. In fact, for Burundi, the post-civil war gap is approximately 11 times larger than pre-war gap while it is less than 3 for the other countries.

Figure 8: Ratio of post-civil war RMSPE to pre-civil war RMSPE: Burundi and control countries
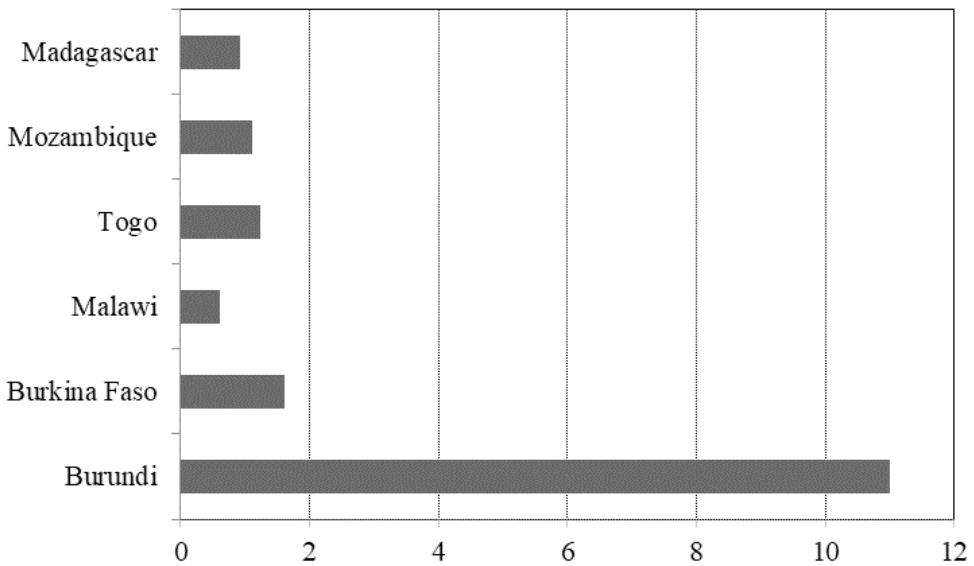
Estimating the counterfactual differently: A Linear Trend Approach

Our last approach to estimating the counterfactual economic performance is conceptually the simplest. As it can be visualized in the graph below, we exploit two clear trends before conflict outbreak: the GDP per capita trend before 1993 and GDP growth trend from 2009 to 2014. We calculate the trend as a simple least square regression line before conflict outbreak. We then suppose that Burundi remained on that trend in the conflict period (see Figure 9).

Figure 9: Trends of GDP per capita and GDP growth
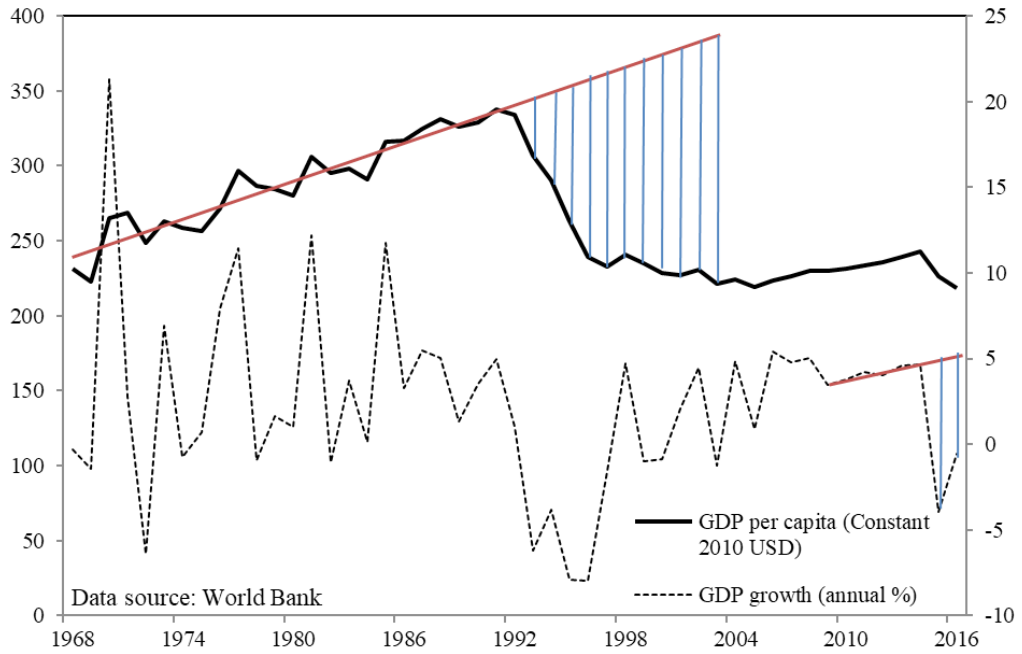
The results of this estimation method indicate that the 1993 to 2003 civil war cost US$ 1,290 per person (in 2010 US$) for a total cost of more than US$ 8 billion. The more recent crisis in 2015 reduced economic growth by 8.9 percentage points in 2015 and 5.6 percentage points in 2016.

7. Summary and discussion of the results

The first approach to estimating the cost of Burundian conflicts considered all the conflict episodes that the country has experienced from 1970 to 2015 in multiple regressions using the Extreme Bound Analysis technique. The results show that GDP growth declined on average by 4 percentage points per annum during the conflict periods.

The second approach focused on the GDP cost of the 1993 to 2003 civil war using the Synthetic Control method. We found that this episode of conflict cost each Burundian US$ 1,520, on average, for a total cost of almost US$ 10 billion. Unsurprisingly, these costs are a little higher than the estimates of the trend approach (US$ 1,290 per person and US$ 8 billion for the whole country). This is because the Synthetic Control method hypothesizes that in the absence of the 1993 civil war, economic growth would have accelerated as it was the case in countries similar to Burundi, in particular Burkina Faso and Mozambique.

How important is the US$ 10 billion for Burundi? If one considers that the GDP of Burundi was less than US$ 2 billion just before the 1993 conflict, it appears that the country paid a high price for the war especially considering that the calculated cost may be underestimated for that it does not include increased expenditure on "security" during war time. Indeed, government military expenditure quadrupled, and many common citizens gave monetary or in-kind contributions, either voluntary or by force, to rebels groups.

If Burundi had remained peaceful, the synthetic control results show that its GDP per capita would have stood at nearly US$ 450 at the time war ended in 2003 compared to the observed US$ 220. Although the country would have remained among the poorest in Africa, it would have ranked 37th out of 47 SSA countries (in 2003) instead of its observed position of 45th[27]. More importantly, the income of the average Burundian would have been double what it was in 2003, which would have secured better schooling, better health, improved housing and progress in other indicators of well-being.

The observed fall in GDP per capita from 1993 to 2003 was a consequence of multiple factors related to war, the sectoral dimension being an important one. For instance, agriculture, then the main economic activity in Burundi, was seriously affected due to the inability of the rural population to cultivate land in times of crisis, either because they had fled the war or because of death or mutilation, which resulted in a decline in agricultural production for both food crops and cash crops (mainly coffee

and tea). The livestock sector also suffered heavy losses since the beginning of the conflict, mainly due to theft and looting. According to UNDP estimates, between 32% and 46% of all farm animals were looted and/or killed during the war (UNDP, 2006), in a country where livestock is one of the main forms of capital accumulation. The industry sector[28] suffered a comparable loss (Figure 10). On the other hand, despite a dismal business climate, the services sector was relatively resilient.

Figure 10: Evolution of agriculture, industry and services value added
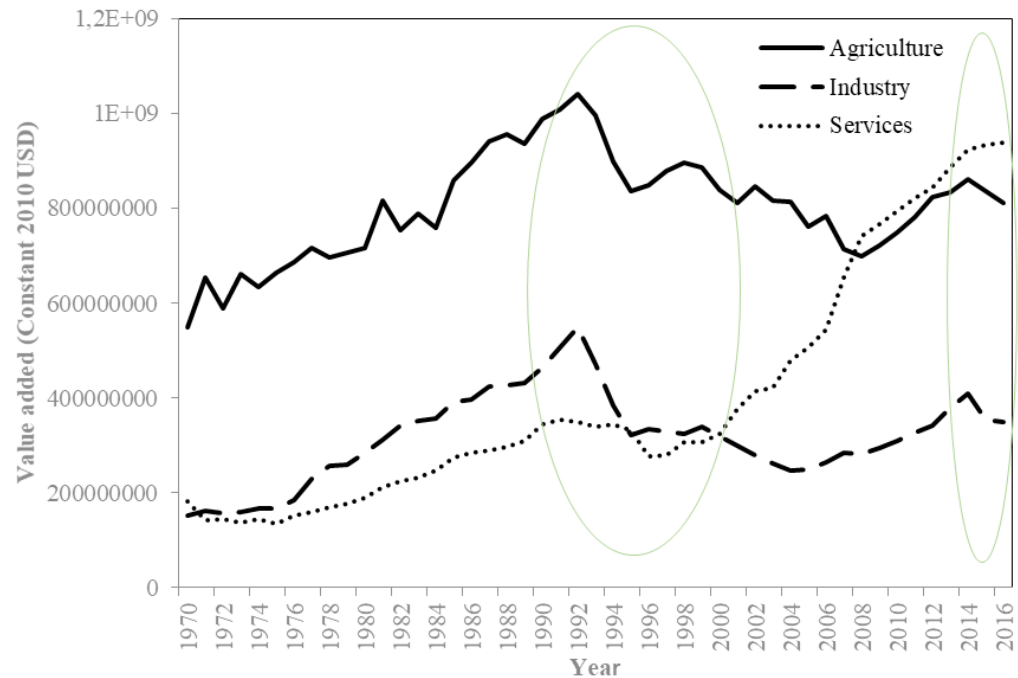
The last estimation approach paid a particular attention to the 2015 conflict. The OLS trend approach shows a reduction of the GDP growth by 8.9 percentage points in 2015. This last conflict also affected the agriculture and industry sectors disproportionately but plausibly through different channels than the ones at play in the 1993-2003 civil war. One remarkable difference between the two conflicts is that the one of the 1990s was spread over the whole country while the more recent one was mainly localized in the capital city Bujumbura. It is then plausible that physical and human capital destruction played a central role in the economic downturn in the first conflict more than the second one. For instance, the number of conflict-related deaths is estimated at 30,000 per year for the 1993-2003 period (Ngaruko and Nkurunziza, 2003), and in hundreds in 2015 (Human Rights Watch, 2016). However, similarities between the two conflicts regarding how they affected the economy remain. Just as the 1990s civil war, the economic environment worsened in 2015 following a substantial decrease in foreign aid and reduced attractiveness of the country for foreign investments.

8. Concluding remarks

Unlike previous papers which studied the economic performance of Burundi, this study examined the cost of the multiple conflicts that the country has experience since independence. Without downplaying the gravity of the human cost of war, which continues to affect the country years after a conflict has ended, we have limited our attention to the economic impact of the Burundian conflicts with a particular focus on the 1993 to 2003 and 2015 conflicts.

The calculated costs are substantial. While from 1970 to 2015 Burundian civil conflicts have on average reduced GDP growth by 4 percentage points, the 1993-2003 civil war was particularly costly. According to our estimations, the latter conflict cost each Burundian between US$ 1,290 and US$ 1,520, leading to a total cost between US$ 8 billion and US$ 10 billion. After 2003, Burundi has struggled to make up for the negative impact of the civil war. Again in 2015, the country experienced civil conflict, which reduced GDP growth by 8.9 percentage points in 2015 compared to its counterfactual.

Today GDP per capita is still lower than what it was in 1992, before the outbreak of the civil war. The country clearly needs to make more efforts in the direction of strengthening peace and revitalizing its economy. Burundians and the international community have a role to play. We point to the fact that Official Development Assistance (ODA) received from 2003 to 2014, 5.45 billion USD[29], is just half of the estimated cost of the war while, for instance, neighbouring Rwanda which had a much shorter civil war in the 1990s has received almost twice the amount[30] over the same period.

The estimated costs emphasize the importance of avoiding conflicts, which are major sources of fragility. From a brighter perspective, they highlight the benefits of sustained peace. As it appears that Burundi has not cut ties with its history of conflicts, we hope that this study will draw the attention of policy makers to the importance of peace-building. In the words of Nelson Mandela during his visit to Burundi in 2003, the "country has bled enough. It and its people now deserve enduring peace."[31] In this study we have attempted to show its economic bleeding in numbers.

Notes

1.   Estimate for 2018. Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, DVD Edition.

2.   Source: World Economic Outlook database (IMF). https://www.imf.org/en/Publications/WEO/weo-database/2021/April/select-country-group (Accessed the 12th of May 2021).

3.   1956 estimates show the following ethnic composition: 86.48% Hutus, 12.39% Tutsis and 1.3% Twas (Reyntjens, 1993).

4.   The poverty headcount ratio (US$1.25 a day) was 84.24% in 1992, 86.43% in 1998 and 81.32% in 2006 (World Bank, 2017).

5.   According to the Human Development Index, Burundi ranked 178 out of 186 in 2012, and 180 out of 187 countries in 2013. In 2015, it ranked 184/188 with a HDI index of 0.404.

6.   The World Bank classifies a country as fragile if it has either a harmonized average6 CPIA score, which is less or equal to 3.2, or if it has had a UN and/or regional peace-keeping or peace-building mission during the past three years.

7.   The World Bank CPIA (Country Policy and Institutional Assessment) index includes 16 criteria grouped into four clusters, namely economic management, structural policies, policies for social inclusion/equity and public sector management and institutions.

8.   From 1982 to 1991. Note that investment started to fall in 1992, one year before the beginning of the civil war, reflecting investors' anticipation of the crisis.

9.   Since this is a country case study, initial income is not included among the regressors. It is usually included in panel studies to capture income convergence.

10.   This finding is heavily driven by the economic collapse of several countries that emerged after the dissolution of the Union of Soviet Socialist Republic (USSR).

11.   It is called naïve because all the doubtful variables are regarded as focus. In addition, it does not consider the possibility of high multicollinearity among the included variables, neither does it account for the possibility that some variables measure similar concepts.

12.   See Figure A1 in the Appendix.

13.   Variables for which all the estimated regression coefficients have the same sign.

14.   Note that the subscript 1 corresponds to the treated unit. In our case Burundi.

15.   The distance can be measured in different ways (using the concept of euclidian distance for example).

16.   Uppsala Conflict Data Program

17.   Peace Research Institute Oslo

18.   Two types of armed conflict are defined in the database: a minor armed conflict which occurs between the government of a state and one or more internal opposition group(s) and causes at least 25 battle-related deaths in a single year; and a civil war which also occurs between the government of a state and one or more internal opposition group(s) but causes at least 1000 battle-related deaths in a single year.

19.   We do not consider the 200 dollars in a relative sense but rather from an absolute perspective. We suppose that a difference of 200 dollars between GDP per capita is not significant given how imprecise the indicator is, especially in poor countries (See Jerven (2013) for more details). To make an analogy, we normally don't consider a student who has 2 marks out of 20 to be two times better than a student who has 1 out of 20. Rather, we simply say that the two students have a low mark. However, we acknowledge that the choice of a 200 USD interval remains, to a certain extent, arbitrary. We therefore experimented with intervals of 50 USD and 100 USD. Using the latter intervals, the synthetic control is constructed using Burkina Faso and Malawi, but is less close to Burundi before the 1993 civil war (See Figure A in appendix).

20.   Tanzania and The Gambia were among this last group but were not selected because of substantial missing observations.

21.   Results are from an R package "ExtremeBounds" of Marek (2016).

22.   939 regressions were estimated, corresponding to the number of combinations among the doubtful variables.

23.   Sala-i-Martin (1997) considers to be robust the variables whose CDF is larger than 95%.

24.   1,789 regressions were estimated.

25.   The weights have been normalized to sum up to one. More precisely, the weights of the first three variables (Primary School Enrolment, Inflation and Population Growth) have been normalized to sum up to 0.7, and the last three indicators have equal weights that sum up to 0.3. The regression results in Table 3 show that the total effect of first three

variables on GDP growth is 5.87. This means that Population Growth, with a regression coefficient of 5.5, accounts for approximately 94% of this total. We then assign a weight of 94%   0.7 to Population Growth. We do the same for Primary School Enrolment and Inflation.

26.   Formula for pre-treatment RMSPE: $\sqrt{\sum_{t=1970}^{T=1992} \left(Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \right)^2}$

27.   The rankings are based on World Bank's World Development Indicators' GDP per capita data in constant 2010 US$.

28.   Comprising value added in mining, manufacturing, construction, electricity, water, and gas.

29.   Source: World Development Indicators (2018). The amount is in constant 2014 USD.

30.   US$ 9,520,680,000.

31.   Find complete speech here: http://www.mandela.gov.za/mandela_speeches/2003/0304_burundi.htm

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Appendix

Table A1: Variables descriptions

Variable	Description	Source
Agriculture, value added (% of GDP)	Value added of sectors including cultivation of crops, livestock production and fishing. Degradation of natural resources is not considered (Gross value added)	World Bank, World Development Indicators (WDI)
Democracy	Variable which ranges from -10 to +10. +6 and above corresponds to democracy and -6 and below corresponds to autocracy	Polity IV Project
Education (Primary)	School Enrolment, primary (Gross %)	World Bank, World Development Indicators (WDI)
Education (Secondary)	School Enrolment, primary (Gross %)	World Bank, World Development Indicators (WDI)
Real Effective Exchange Rate	Annual US$ exchange rate	World Bank, World Development Indicators (WDI)
GDP per capita	GDP per capita in Constant 2010 US$	World Bank, World Development Indicators (WDI)
Gross capital formation (% of GDP)/ Investment	Outlays on additions to the fixed assets (equipment purchases, construction of roads, schools, etc) of the economy plus net changes in the level of inventories	World Bank, World Development Indicators (WDI)
Industry, value added (% of GDP)	Value added of sectors including manufacturing, mining, construction. Depreciation of assets is not considered (Gross value added)	World Bank, World Development Indicators (WDI)
Inflation (%)	Annual percentage change in the cost of acquiring a basket of goods and services for an average consumer	World Bank, World Development Indicators (WDI)
Terms of trade (%)	Computed as the export price index divided by the import price index	World Bank, World, Development Indicators (WDI)

Table A1 Continued

Variable	Description	Source
Official Development Assistance (% GDP)	Concessional loans net of principal repayment plus grants by official country agencies and multilateral agencies to promote economic development and welfare	World Bank, World Development Indicators (WDI)
Population growth (%)	Total residents regardless of citizenship or legal status	World Bank, World Development Indicators (WDI)
Trade openness (% GDP)	(Imports + Exports)/GDP	World Bank, World Development Indicators (WDI)

Table A2: Descriptive statistics of the variables

Variables	Obs.	Mean	Std. Dev.	Min	Max
GDP per capita (Constant 2010 US$)	46	266.59	37.80	219.18	337.70
GDP growth rate (%)	46	2.59	5.37	-8	21.32
GDP per capita growth rate (%)	46	0.16	5.12	-9.31	19.08
Gross capital formation (% GDP)	46	14.02	7.90	2.78	30.51
Openness to trade (% GDP)	46	34.09	8.45	20.96	54.15
Agriculture value added (% GDP)	46	52.83	9.45	37.33	70.63
Industrial value added (% GDP)	46	16.09	2.84	10.16	22.47
ODA (% GDP)	46	18.69	9.31	5.87	40.40
Inflation, consumer prices (%)	46	10.61	8.30	-1.37	36.54
Population growth (%)	46	2.39	0.73	0.96	3.38
Change in the real effective exchange rate (%)	41	-0.31	9.96	-18.39	21.42
Change in the terms of trade (%)	35	2.82	35.51	-44.36	127.12
School enrolment, primary (Gross %)	44	64.02	36.96	21.60	135.19
School enrolment, secondary (Gross %)	37	10.02	10.85	1.41	42.48
Democracy indicator (Polity 2 index)	46	-2.04	5.54	-7	6

Note: Authors, using collected data from different sources

Table A3: Economic growth in Burundi

Indicator	1961-1972	1973-1992	1993-1999	2000-2004	2005-2015
GDP	3.7	4.0	-3.4	1.9	3.4
GDP per capita	1.6	1.4	-5.0	-1.1	-0.1

Table A4: Economic growth in Burundi

Indicator	1960s	1970s	1980s	1990s	2000-2015	1961-2015
GDP	2.9	4.5	4.2	-2	2.9	2.6
GDP per capita	0.7	2.7	1.1	-3.8	-0.4	0.1

Table A5: Economic growth in Sub–Saharan Africa

| Indicator	1960s	1970s	1980s	1990s	2000-2015	1961-2015
GDP	4.3	4.4	1.4	2	5	3.6
GDP per capita	1.7	1.6	-1.4	-0.8	2.3	0.8

Figure A.1: Distribution of coefficients from the Naïve EBA
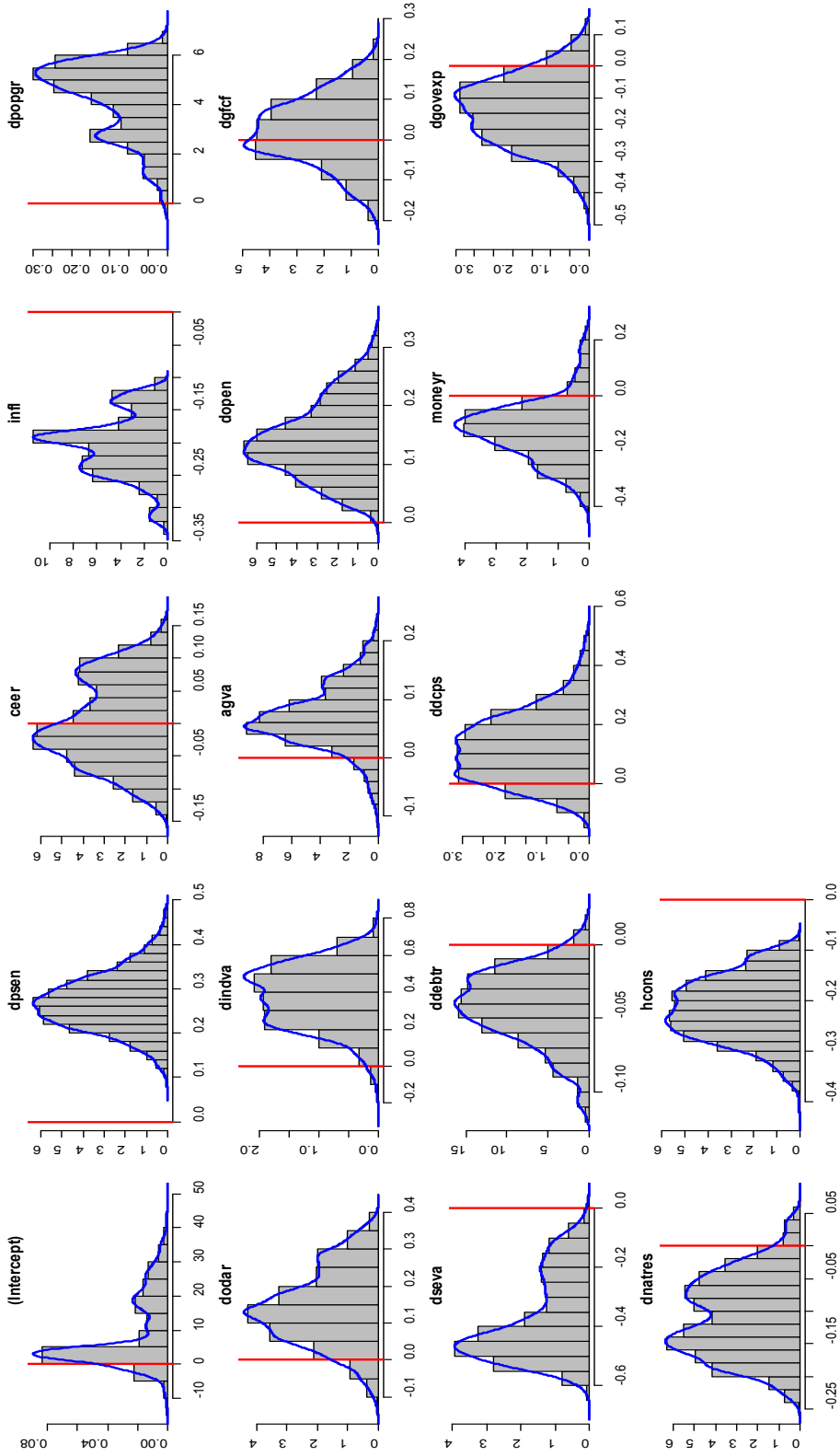
Figure A. 2: Evolution of GDP per Capita of actual Burundi and synthetic Burundi using intervals of 50 and 100 USD to select donor pool countries
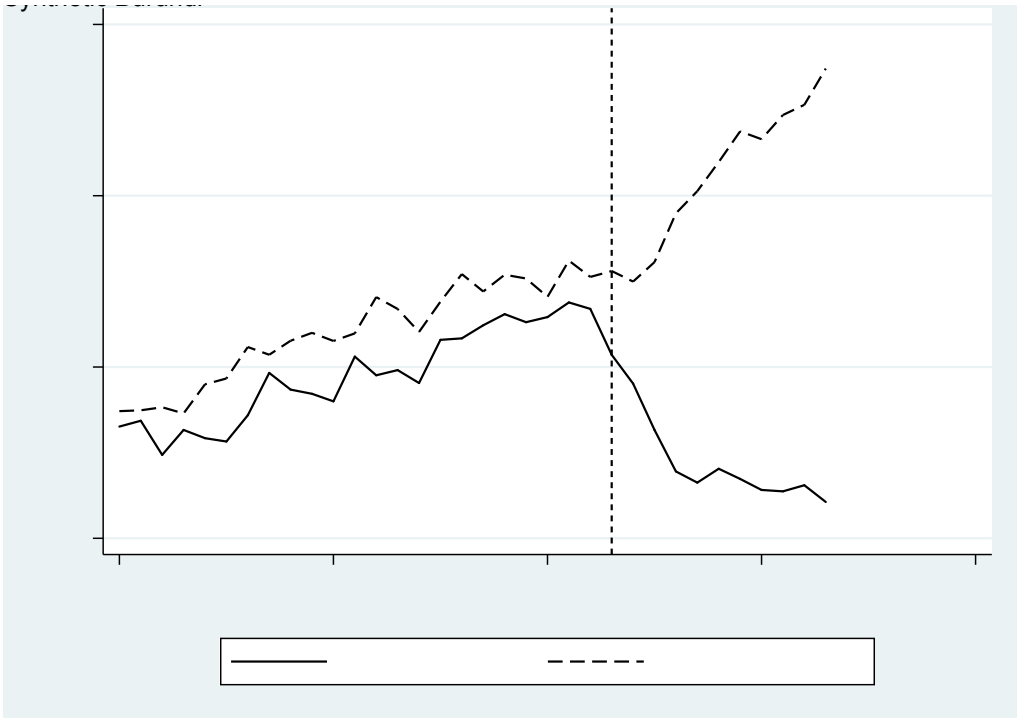
Figure A.3: Evolution of GDP per Capita of Burundi and a Sample Average of Burkina Faso, Madagascar, Malawi, Mozambique and Togo
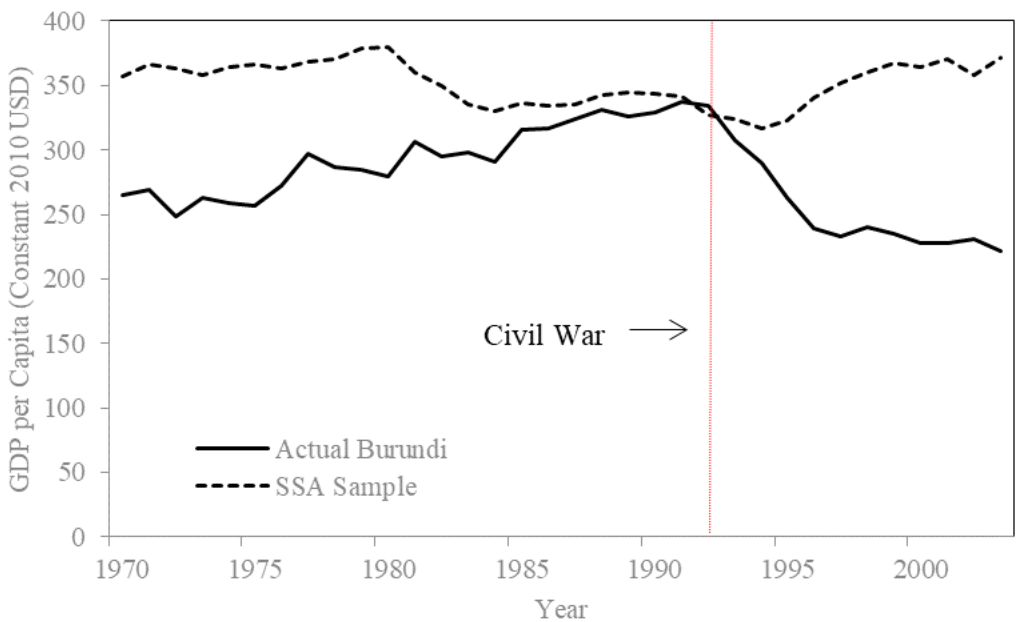
Table A.6: The level of GDP per capita in 1992

Country	GDP per capita in 1992 (Constant 2010 USD)	Country	GDP per capita in 1992 (Constant 2010 USD)
Mozambique	162	Fiji	2957
Ethiopia	164	Ukraine	3263
Myanmar	209	Cuba	3290
Liberia	236	Macedonia, FYR	3392
Uganda	308	Algeria	3404
Malawi	323	Belize	3404
Burundi	334	Bulgaria	3608
Sierra Leone	343	St. Vincent and the Grenadines	3753
Niger	344	Ecuador	3782
Burkina Faso	354	Namibia	3803
Nepal	375	Mauritius	4027
Eritrea	378	Botswana	4040
Rwanda	401	Romania	4332
Central African Republic	414	Colombia	4473
Bangladesh	416	Jamaica	4484
Madagascar	440	Panama	4613
Tanzania	475	Iran, Islamic Rep.	4626
Vietnam	477	Dominica	4680
Lao PDR	481	Grenada	4752
Togo	495	Kazakhstan	4937
Mali	497	Malaysia	5132
Gambia, The	514	Costa Rica	5229
Congo, Dem. Rep.	533	South Africa	5485
India	549	Poland	5632
Guinea	551	Lebanon	5853
Chad	569	Caribbean small states	6069
Benin	611	Suriname	6091
Guinea-Bissau	622	Trinidad and Tobago	6522
Equatorial Guinea	635	St. Lucia	6853
Lesotho	750	Chile	6904
Pakistan	795	Turkey	6932
Tajikistan	809	Argentina	7285
Senegal	827	Uruguay	7576
Bhutan	831	Slovak Republic	7676

Table A.6 Continued

Country	GDP per capita in 1992 (Constant 2010 USD)	Country	GDP per capita in 1992 (Constant 2010 USD)
Sudan	832	Russian Federation	7717
Uzbekistan	843	Mexico	7782
Comoros	844	Brazil	7798
Kyrgyz Republic	846	Seychelles	8158
Ghana	852	Hungary	8584
Kenya	877	St. Kitts and Nevis	9237
China	889	Korea, Rep.	9719
Armenia	949	Antigua and Barbuda	10458
Zambia	975	Gabon	10835
Mauritania	1001	Czech Republic	12318
Cabo Verde	1009	Barbados	12453
Yemen, Rep.	1012	Malta	12889
Nicaragua	1091	Venezuela, RB	13148
Zimbabwe	1164	Oman	15660
Cameroon	1188	Portugal	17660
Sri Lanka	1269	Puerto Rico	18280
Albania	1288	Greece	19733
Nigeria	1304	Hong Kong SAR, China	20155
Cote d'Ivoire	1347	Bahrain	20179
Bolivia	1397	Saudi Arabia	20227
Mongolia	1421	Cyprus	22125
Philippines	1449	Israel	22324
Solomon Islands	1466	Spain	23078
Georgia	1510	New Zealand	23318
Egypt, Arab Rep.	1575	Singapore	23899
Honduras	1590	Macao SAR, China	23996
Kiribati	1652	Ireland	24668
Guyana	1681	Isle of Man	25663
Morocco	1742	Greenland	26012
Papua New Guinea	1768	Bahamas, The	26338
Angola	1833	United Kingdom	28321
Iraq	1840	Finland	30148
Indonesia	1879	Italy	31532
Guatemala	2226	France	33216
Samoa	2238	Belgium	33963

Table A.6 Continued

Country	GDP per capita in 1992 (Constant 2010 USD)	Country	GDP per capita in 1992 (Constant 2010 USD)
El Salvador	2281	Germany	34131
Azerbaijan	2324	Andorra	34279
Tunisia	2388	Australia	35033
Micronesia, Fed. Sts.	2506	Austria	35046
Tuvalu	2507	Canada	35109
Vanuatu	2563	Sweden	36192
Peru	2616	Netherlands	36403
Jordan	2646	North America	36426
Paraguay	2672	United States	36566
Congo, Rep.	2700	Brunei Darussalam	37838
Marshall Islands	2702	Japan	39488
Tonga	2705	Denmark	45803
Eswatini	2716	Bermuda	61914
Belarus	2764	Switzerland	62245
Turkmenistan	2845	United Arab Emirates	62821
Thailand	2873	Norway	63674
Dominican Republic	2898	Luxembourg	71004

Note: Data is missing for these countries: Afghanistan, American Samoa, Aruba, Bosnia and Herzegovina, British Virgin Islands, Cambodia, Cayman Islands, Channel Islands, Croatia, Curacao, Djibouti, Estonia, Faroe Islands, French Polynesia, Gibraltar, Guam, Haiti, Iceland, Korea, Dem. People's Rep., Kosovo, Kuwait, Latvia, Libya, Liechtenstein, Lithuania, Maldives, Moldova, Monaco, Montenegro, Nauru, New Caledonia, Northern Mariana Islands, Palau, Qatar, San Marino, Sao Tome and Principe, Serbia, Sint Maarten (Dutch part), Slovenia, Somalia, South Sudan, St. Martin (French part), Syrian Arab Republic, Timor-Leste, Turks and Caicos Islands, Virgin Islands (U.S.).

Mission

To strengthen local capacity for conducting independent,
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