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# Economic Costs of Civil Conflicts: The Case of Burundi

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## ABSTRACT

This study examines the effects of civil conflicts in Burundi on its economic performance. The analysis of the structural effects using a structural VAR model points to the long-lasting effects of a civil conflict shock on economic growth in Burundi. After 10 years, the effect on economic growth is still noticeable. The cumulative effect of a civil conflict shock is found to be a 7.1% decrease in economic growth over a horizon of 10 years. Using the Synthetic Control method, estimates indicate that the Burundian civil war led to an average GDP per capita decline of approximately 138 dollars per annum, compared to what it would have been in the absence of war. The average annual loss as a percentage of the counterfactual GDP per capita is 34%. The total monetary cost of the war during this period is estimated at USD 1514 per person and almost 10 billion USD for the entire country. The estimated effects are robust to placebo checks conducted. We compare these results with costs of conflict in other countries to better understand the relative financial burden of the civil war. The study highlights the need to consolidate peace to achieve long-term economic development in Burundi.

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## JEL CLASSIFICATION

C22; C99; E00; O47

## Introduction

Generally known for its history of political instability and civil conflicts, Burundi is a small East African country, roughly the size of Belgium, its former colonizer, from which it gained independence in 1962. The country has a population of approximately 11 million people<sup>1</sup> and a GDP per capita, estimated at US\$ 800<sup>2</sup> (PPP) as at 2021 and ranks amongst the poorest in the world. Although Burundians share the same language, culture and live side by side in different regions, the population is often divided into three ethnic groups: 85% of Hutus, 14% of Tutsis and 1% of Twas, even though the last known ethnic affiliation census dates back to colonial times.<sup>3</sup> Since independence, the country has experienced six episodes of civil conflicts, notably in 1965, 1972, 1988, 1991, 1993–2003 and 2015. Apart from the last conflict in 2015 that was largely fueled by wide-spread opposition to a third term of the late President Pierre Nkurunziza, the other conflicts were typically triggered by localized Hutu insurrections within 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), have attributed the recurrent Hutu insurgencies to an ethno-racism against the Tutsis minority, while for others, the root 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 of the ethnic divide have utilized ethnicity for their personal interests.

Over the period 1961–2020, the economy of Burundi grew at an average of 2.5% a year. Despite political instabilities and civil unrests in the 1960s and 1970s, the economy managed some moderate growth. During the 1970s, the economy of Burundi grew at a similar rate as the average of other Sub-Saharan African countries and grew at 4.2 % in the 1980s, almost tripling the average for Sub-Saharan Africa (1.4%).<sup>4</sup> With the 1993 civil war, this trend was reversed. Today Burundi is one of the poorest countries in the world with one of the lowest human development.<sup>5</sup> Like many other post-conflict countries, Burundi is classified as a fragile state by the World Bank with a CPIA (Country Policy and Institutional Arrangement) score in 2020 of 2.9.

A few studies have sought to examine the economic performance of Burundi (see for example, Basdevant 2009; Nganou and Kebede 2012; Nganou and Mabushi 2007; Nkurunziza and Ngaruko 2005). 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 several studies exist on economic impacts of conflicts (see for example, Costalli, Moretti, and Pischedda 2017; Bove et al. 2017), the Burundian case remains largely a grey area, despite the country having experienced six episodes of civil conflicts since independence. The impact of civil conflicts in Burundi therefore remains unknown. This study fills this gap in the literature by examining the impact or cost of civil conflicts in two different ways. First, by examining the structural effects of civil conflicts on economic growth using a structural VAR model and secondly by applying 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. The latter 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 of conflict, claiming an estimated 30,000 lives per year (Ngaruko and Nkurunziza 2003). Moreover, prior to 1993, despite political instabilities and episodes of civil unrests, GDP per capita consistently followed an upward trend up to 1992. This study estimates the economic cost of civil conflicts that Burundi has experienced since independence, paying particular attention to the 1993–2003 civil war period. The estimated costs in this study are found to be substantial and we compare them with costs of conflicts in other countries.

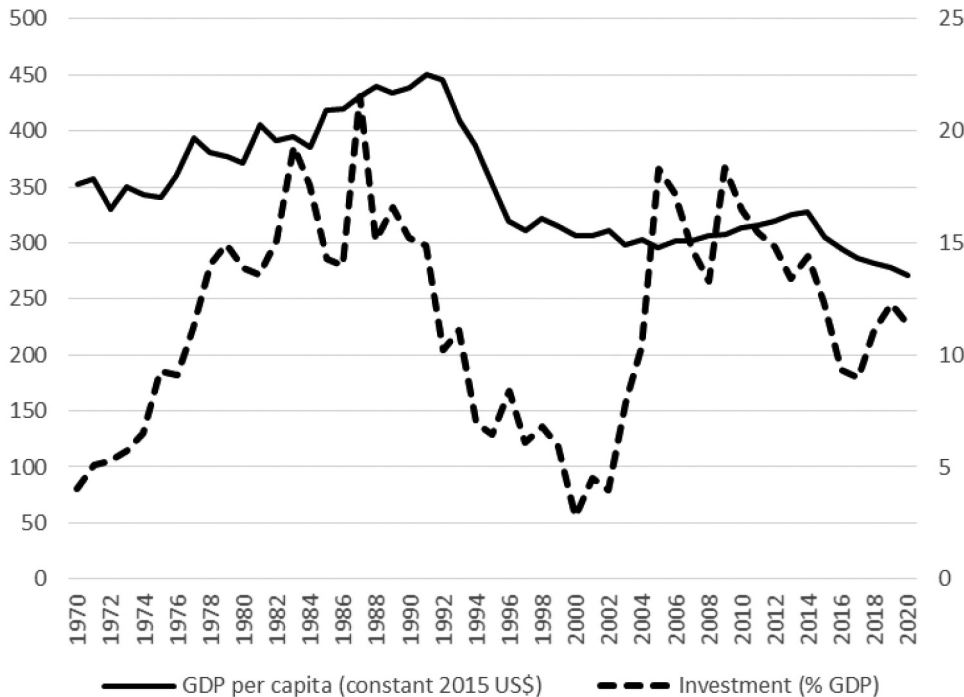
The rest of the paper is organized as follows. Section 2 discusses in detail the Burundian economy performance since independence. Sections 3 and 4 present the theoretical framework and the review of the literature on the economic consequences of conflicts. Section 5 presents our various estimation methods. In Section 6, the empirical results from different estimation methods along with robustness checks, are presented. Section 7 concludes the study.

## Burundian Economic Performance Since Independence

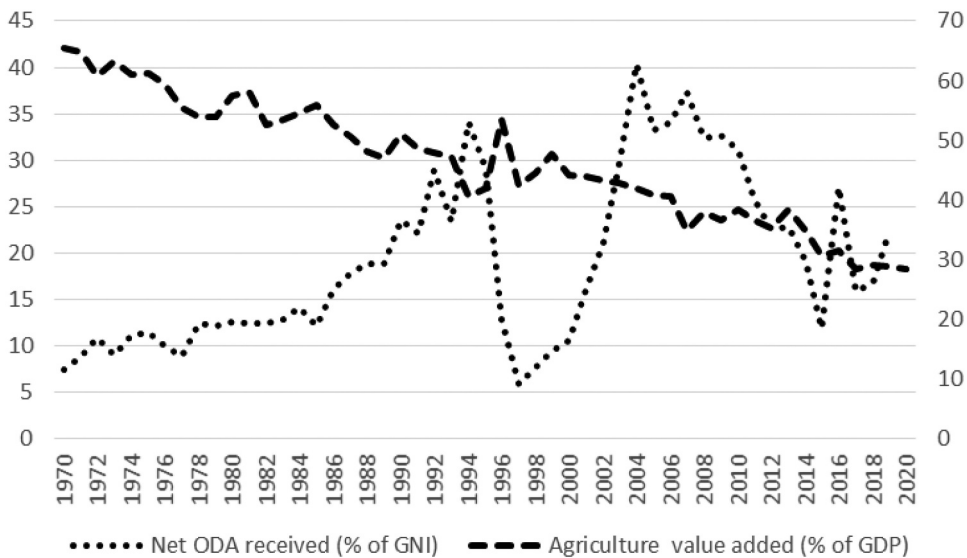
This section analyzes the economic growth patterns of Burundi over five periods according to episodes of civil conflicts experienced. The following categories of periods are considered: from 1961 to 1972, from 1973 to 1992, from 1993 to 1999, from 2000 to 2004, and from 2005 to 2020. The period of 1961–1972 was characterized by high political tensions. In October 1961, Prince Louis Rwagasore, the independence hero of Burundi was assassinated. As Nkurunziza and Ngaruko (2005) point out, although Prince Louis Rwagasore had attempted to unify Burundians, his assassination was followed by political fights amongst political elites. This resulted in several political assassinations and civil conflicts in 1965, 1969 and 1972. Albeit the continued political tensions and sporadic conflicts, the economy grew at an average of 3.7% per year over the period 1961–1972, while real per capita GDP over the same period grew at 1.6% per year. Over the period 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 programs that were undertaken from 1975, financed mostly through foreign resources. While the annual investment ratio stood at only 6.2% during the period 1960-1974, it more than doubled over the period 1975-1992, standing on average at 14.6% (See Figure 1). However, this was also a period of economic difficulties caused by high budget deficits and high debt servicing. The period 1993-1999 was the most chaotic period in Burundian history and was preceded by three decades of military dictatorial regimes (1966-1993). In 1993, the country had its first democratically elected president, Melchior Ndadaye, who was then killed only three months later in a military coup. A civil war erupted following the assassination and lasted almost a decade, resulting in the loss of thousands of lives, displacement of the population and a substantial number of people fleeing into exile. 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 was held in place up to 2001. Consequently, Burundi's economy contracted sharply during that period, recording a positive economic growth only once, in 1998. During the same period, investments fell dramatically, reaching a record low of 3% in 2000, down from an average of 16%<sup>6</sup> in the decade prior to the civil war (see Figure 1). With the 1993 civil war, GDP per capita went on a steady decline, and has continued to follow the same trend three decades later; it is still today very far away from its pre-war level (see Figure 1).

The period 2000-2004 spelt a transition during which peace talks were held and peace agreements signed. The events were as follows: The 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 the economic embargo resumed



**Figure 1.** GDP per capita (left scale) and investment (right scale) from 1970 to 2020.  
Source: Authors, using data from the World Development Indicators.



**Figure 2.** Official Development Assistance (left scale) and agriculture value added (right scale) from 1970 to 2020.  
Source: Authors, using data from the World Development Indicators.

during this period (see Figure 2). Also, the government carried out several policy reforms for economic recovery supported by the World Bank. During this period, despite the relative calm, the economy did not register much growth. However, compared to the previous period (1993-1999), the economy exhibited signs of some recovery (1.9% growth rate) but per capita GDP growth remained negative (−1.1%). The weak recovery in this period was compounded by prolonged droughts that started in 1999 and continued into 2000 resulting in a decline of agriculture value-added by 5.2% (see Figure 2).

The last period we consider is 2005-2020, which is the post-conflict period. Following the peace agreement between the government and the main rebel group (CNDD-FDD) in November 2003, violence in the country reduced considerably. The peace agreement with the last rebel group (Front National pour la Libération, FNL) was signed in May 2008. Therefore, between November 2003 and May 2008, there were still episodes of sporadic violence in some parts of the country, especially in the areas around the capital city Bujumbura. Notably, 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 dividends immediately, as the economy grew on average at only 2.5% per annum during the period 2005-2020 while per capita GDP fell by 0.7%. It is to be noted that, while from 2006 to 2014, the economy grew at an average of 4%, in 2015, the economy contracted by 3.9 percent due to civil unrests that started in April 2015 and lasted for several months. However, as is characteristic of civil unrests, they do not often grind to a sudden halt and immediate transition into peace but rather, the adjustment towards peace following the 2015 unrests was gradual. Several factors can explain the sluggish growth in the post-conflict period. The period was characterized by high corruption and poor governance (Rufyikiri 2016), several financial scandals and embezzlements of public funds (International Crisis Group 2012) and loss of confidence in the domestic economy by both internal and foreign investors. The country has therefore failed to attract substantial foreign direct investment (FDI) in a context of low domestic resource mobilization, thus falling short in the bid to boost growth and exit fragility. For the period 2005-2020, the country attracted an insignificant amount of FDI equivalent to 0.64% of GDP. However, it should be noted that the failure to attract FDI and the observed low domestic resource mobilization has been a general pattern in Burundi and not specific to the post-conflict period only. It is mainly due to

longstanding political and economic uncertainties, among other factors. For the period 1985–2005, the situation was no better, the average level of FDI attracted by Burundi was only 0.13% of GDP.

The other explanation of the sluggish growth in the post-conflict period is related to the level of development aid Burundi received in the post-conflict period. For an aid-dependent country like Burundi, foreign aid can make a difference in terms of development. However, donors usually selectively allocate aid to countries with a certain form of good governance. Thus, the development aid that Burundi received in the post-conflict period is low compared to other post-conflict countries like Rwanda, Sierra Leone, and Mozambique. Per capita development aid amounted to USD 56.9 for Burundi, while it was USD 71.9, USD 76.7, and USD 78.1 respectively for Mozambique, Rwanda, and Sierra Leone (World Bank 2021).

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

## 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 labor-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 (Lucas 1988; Romer 1986, 1990) 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.

Other fundamental sources of growth such as institutions and socio-cultural factors are 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). Similarly, corruption (Pak Hung 2001; d'Agostino 2016), social capital and cohesion (Easterly, Ritzan, and Woolcock 2006; Knack and Keefer 1997) 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, Ritzan, and Woolcock (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 decline, thereby harming 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:

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

Where  $Y$  denotes output,  $K$  is physical capital,  $H$  is the stock of human capital,  $L$  is labor, while  $A$  is the technology parameter.  $\alpha$  and  $\beta$  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:

$$y_t = k_t^\alpha h_t^\beta \quad (2)$$

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).

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

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

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

As indicated in the methodology section, to examine the structural effects of civil conflicts on economic growth, a structural VAR model is used. We consider some growth predictors found in the literature.

## Empirical Literature

Empirical investigations have exposed adverse effects of civil wars (see for example Cerra and Saxena 2008; Collier 1999; Rodrik 1999). 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 implies that for a conflict that lasts 5 years, GDP per capita is expected to fall by roughly 10%. United Nations Development Programme (2008) 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.<sup>7</sup> 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 Gardeazabal 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, Loayza, and Villanueva 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% percentage 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. Pak Hung (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 needs 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 (Blattman and Miguel 2010; Bove, Elia, and Smith 2016; Van, Dirk, and Diehi 1989) 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, Ford, and Nowrasteh (2008) find that the country improved on a few 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, Ford, and Nowrasteh 2008).

Although cross-country studies dominate the empirical literature on the economic cost of conflict, such studies are criticized for not taking into consideration country-specific responses to conflict shocks (Bove, Elia, and Smith 2016). As these last authors argue, conflicts should not be assumed to produce the same outcome in different economies. The cross-country literature is further 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.

## Methodology

This study first examines the structural effects of civil conflicts on economic growth in Burundi, then move on to estimate the counterfactual GDP per capita trajectories using the synthetic control method.



### Examining the Structural Effects of Civil Conflicts on Economic Growth

We examine the structural effects of civil conflicts on economic growth in Burundi by estimating a structural VAR (SVAR) model of the following form, where  $I_K$  is a  $K$ -order identity matrix,  $L$  is a lag operator,  $y$  is a vector of  $K$  endogenous variables,  $A$ ,  $B$ , and  $\Phi_i$  are square matrices of order  $K$ .  $\epsilon_t$  is a vector of innovations with  $\epsilon_t(0, \tilde{\Sigma})$ , where  $\tilde{\Sigma}$  is the variance-covariance matrix, and  $e_t$  is a vector of orthogonalized disturbances, i.e.  $e_t(0, I_K)$ .

$$A(I_K - \Phi_1 L - \Phi_2 L^2 - \dots - \Phi_p L^p)y_t = A\epsilon_t = B e_t$$

The identification of a SVAR model is done by placing restrictions on matrices  $A$  and  $B$ . In this study,  $y_t$  is a vector of the following seven variables: economic growth (*growth*), investment as a percentage of GDP (*invest*), real interest rate (*interest*), net official development assistance as a percentage of GNI (*oda*), government spending as a percentage of GDP (*gspend*), domestic credit to private sector as a percentage of GDP (*credps*), and civil conflicts measured by the number of deaths (*civconf*). In our SVAR model, these variables are ordered as follows, which is consistent with macroeconomic theory:

$$y_t = (\text{civconf}, \text{oda}, \text{gspend}, \text{interest}, \text{credps}, \text{invest}, \text{growth})$$

We impose the Cholesky restrictions on the system by assuming the following constraint

$$\text{matrices: } A = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ . & 1 & 0 & 0 & 0 & 0 & 0 \\ . & . & 1 & 0 & 0 & 0 & 0 \\ . & . & . & 1 & 0 & 0 & 0 \\ . & . & . & . & 1 & 0 & 0 \\ . & . & . & . & . & 1 & 0 \\ . & . & . & . & . & . & 1 \end{bmatrix}, B = \begin{bmatrix} . & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & . & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & . & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & . & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & . & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & . & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & . \end{bmatrix}$$

The dots in matrices  $A$  and  $B$  represent the coefficients to be estimated. The imposed structural constraints in matrix  $A$  imply an assumption that all shocks can affect economic growth contemporaneously; only shocks to *civconf*, *oda*, *gspend*, *interest*, *credps* can affect investment (*invest*) contemporaneously; only shocks to *civconf*, *oda*, *gspend*, *interest* can affect domestic credit to private sector (*credps*) contemporaneously; only shocks to *civconf*, *oda*, *gspend*, can affect real interest rate (*interest*) contemporaneously; only shocks to *civconf*, *oda* can affect government spending (*gspend*) contemporaneously; only shocks to *civconf* can affect official development assistance (*oda*) contemporaneously; and civil conflicts (*civconf*) is not contemporaneously affected by shocks in either of the other variables.

### 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, Diomond, and Hainmuller (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  $W = (w_2, \dots, w_{J+1})'$ , with  $0 \leq w_j \leq 1$  for  $j = 2, \dots, J$  and  $w_2 + \dots + w_{J+1} = 1$ .<sup>8</sup> 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, Moretti, and Pischedda 2017), that is, before the 1993 civil war for our case. As Abadie, Diomond, and Hainmuller (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, Diomond, and Hainmuller (2015), the synthetic control is chosen by minimizing the following difference  $\|X_1 - X_0 W\|$ ,<sup>9</sup> 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, Diomond, and Hainmuller (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,<sup>10</sup> etc.

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

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

Subject to:  $w_2 + \dots + w_{J+1} = 1$ . and  $0 \leq w_j \leq 1$ , where  $v_m$  is the weight showing the importance assigned to the  $m^{th}$  variable when measuring the  $\|X_1 - X_0 W\|$ . 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.

To determine the appropriate donor pool countries, we started from the list of low-income countries in 1992 as indicated by the World Bank, specifically, countries possessing a gross national income per capita equal to or below \$610 in 1992 (World Bank 1992, p. XI). The countries encompassed within this list are Bangladesh, Burkina Faso, Central African Republic, Chad, Equatorial Guinea, Eritrea, Ethiopia, Guinea, India, Lesotho, Madagascar, Malawi, Mali, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone, Tanzania, Togo, and Uganda.

We posit that it would be excessively speculative to presume that, in the absence of the civil conflict that beset Burundi from 1993 to 2003, the country would have followed a developmental trajectory analogous to that of South Asian countries. This is because different continents tend to be characterized by distinct historical, cultural, political, and socio-economic contexts, which in turn shape their respective developmental trajectories. Consequently, we removed Bangladesh, India, Myanmar, and Nepal from the donor pool.

Moreover, we excluded countries from the donor pool that underwent armed conflict between 1993 and 2003, in accordance with the UCDP<sup>11</sup>/PRIO<sup>12</sup> database (see Gleditsch et al. 2002).<sup>13</sup> All African countries previously enumerated experienced conflict during this period, except for Burkina Faso, Madagascar, Malawi, Mozambique, Tanzania, and Togo. The Stable Unit Treatment Value Assumption (SUTVA) may be compromised in the case of Tanzania, a neighboring country that accommodated over 500,000 refugees from Burundi between 1993 and 2003, as reported by the United Nations High Commissioner for Refugees (UNHCR<sup>14</sup>). The other comparison countries are too far away to violate the assumption, which is reflected in the low numbers (less than 100) of refugees from Burundi that they hosted.

As indicated in the introduction, Burundi experienced four episodes of conflict, each lasting less than a year, prior to 1993. Consequently, we did not condition the donor pool to being conflict free before 1993. On the contrary, we chose donor pool countries that did not experience armed conflict between 1993–2003, as our aim is to estimate the counterfactual GDP of Burundi had the country remained peaceful.

We used annual country-level data spanning the period from 1970 to 2003, which gives a pre-intervention period of 23 years and a post-intervention period of 10 years. The relatively long pre-intervention period is the main strength of our synthetic control design in comparison with previous studies which have used this method. In fact, the fundamental assumption of the synthetic control approach is that if it has closely approximated the treated unit over an extended period prior to the intervention, our confidence in its ability to represent the counterfactual trajectory during the post-intervention period is reinforced.

Nonetheless, our careful selection of the donor pool, which prioritizes comparators bearing resemblance to Burundi, introduces limitations. The restricted size of the final donor pool precludes the computation of p-values as shown in Abadie, Diomond, and Hainmuller (2015) and impedes the implementation of the relatively recent Augmented Synthetic Control method (Ben-Michael, Feller, and Rothstein 2021).

## Presentation of the Findings

Dickey-Fuller and Zivot-Andrews unit root tests<sup>15</sup> were used to check the properties of the variables. They indicate that real GDP growth, real interest rate, and the civil conflicts proxy variable are stationary processes. The rest of the variables are found to be non-stationary variables but became stationary after one differentiation. Non-stationary variables are considered in first difference in the regressions.

## Structural VAR Estimation Results

After estimating the SVAR, we analyze how economic growth responds to civil conflict shocks, using the impulse response function represented in Figure 3. Figure 3 clearly shows a negative effect of a civil conflict shock on economic growth in Burundi. The results indicate that, the contemporaneous response from a civil conflict shock, is a 1.05% decrease

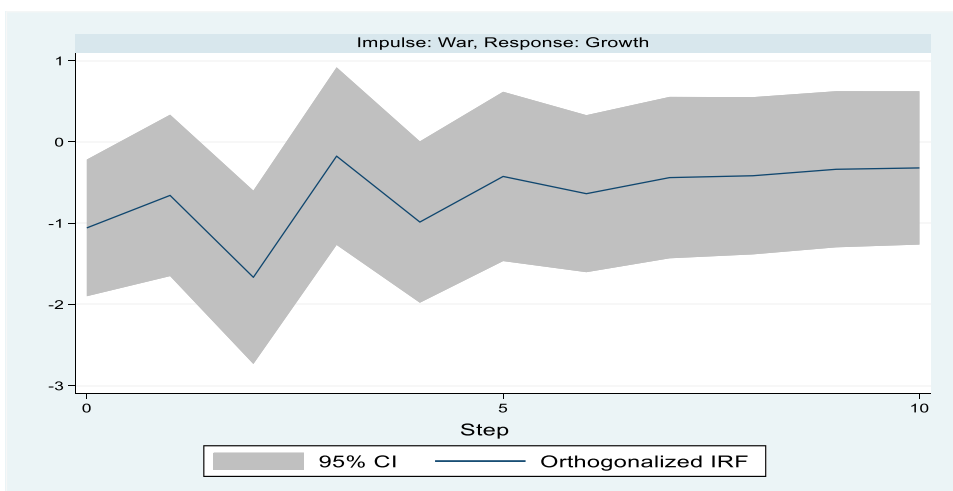


Figure 3. Impulse response function of a civil conflict shock on economic growth.

**Table 1.** GDP per capita predictors and their weights.

GDP per capita in 1992	0.141
Inflation	0.091
Population Growth	0.054
Exchange Rate	0.007
Trade	0.044
Investment	0.011
Primary School Enrolment	0.060
ODA received	0.076
Foreign Direct Investment	0.063
External Debt	0.215
Domestic Credit	0.225
Manufacturing Value Added	0.012
Services Value Added	0.002
Agriculture Value Added	0.000

Source: Authors' computations.

in economic growth. The effect decreases after one year, increases in the second year then decreases again. An important thing to note is the long-lasting effect of a civil conflict shock on economic growth in Burundi. After 10 years, the effect on economic growth is still noticeable. After 10 years, the cumulative effect of a civil conflict shock is a 7.1% decrease in economic growth.

### ***Estimating<sup>16</sup> 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,  $v_m$ , attributed to the growth predictors. These  $v_m$  weights reflect the importance assigned to the different growth predictors. Table 1 shows the weights attributed to different predictors in our baseline specification. As robustness checks, we first conduct the analysis with different specifications where we progressively include all outcome lags, keeping the other covariates in the model (see, Figure 8). For the second robustness check, the sensitivity of our primary findings is tested against variations in the donor pool countries (see, Figure 9). These different specifications do not meaningfully change our initial results.

The following country weights were obtained by solving the optimization problem presented in section 5.2 using the command 'synth' available in STATA software. Burkina Faso (0.835), Mozambique (0.165), Togo (0), Madagascar (0) and Malawi (0). Therefore, the constructed synthetic Burundi is a weighted average of Burkina Faso and Mozambique. The country with the largest weight, Burkina Faso, indeed resembles Burundi in many respects. Below, we discuss the economic and political evolution of Burkina Faso, as well as Mozambique, from 1970 to 2003.

Table 2 compares the means of growth predictors of the actual, the synthetic Burundi and averages of comparison countries over the period 1970 to 1992. These results suggest that in most cases, 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 average of the countries. Particularly, the synthetic control is closer to Burundi with respect to the three most important predictors: GDP per capita in 1992, inflation and population growth. In other words, characteristics of Burundi before the 1993 civil war are better reproduced by the synthetic Burundi.

**Table 2.** Economic growth predictors before the Burundian 1993 – 2003 civil war.

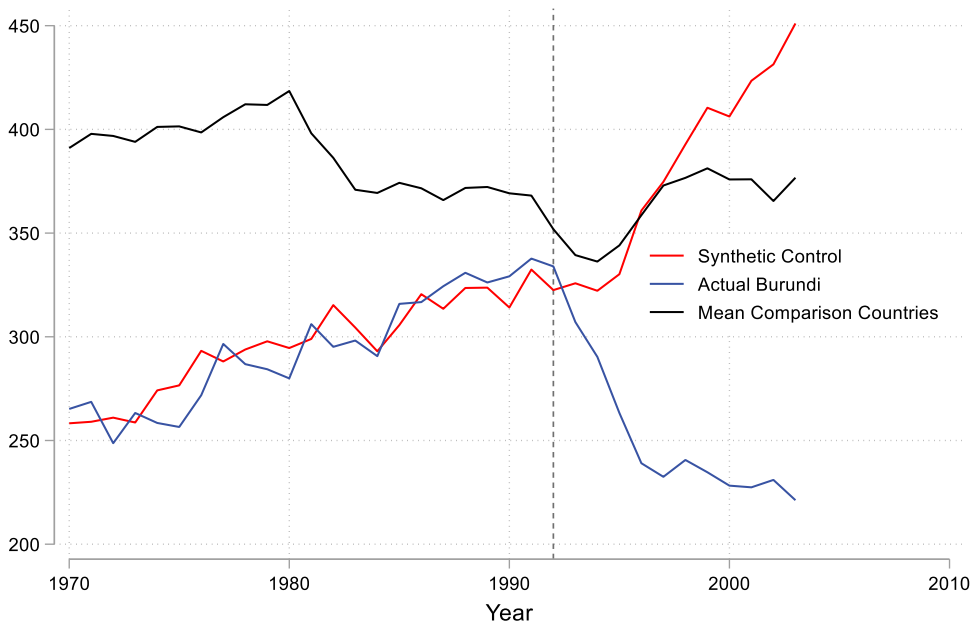
	Actual Burundi	Synthetic Burundi	Average of Comparison Countries*
GDP per capita in 1992	333.943	322.529	351.873
Inflation	9.070	10.229	14.554
Population Growth	2.227	2.211	2.608
Exchange Rate	111.195	238.438	135.531
Trade	32.037	36.057	49.024
Investment	12.489	18.323	17.417
Primary School Enrolment	40.391	30.438	59.274
ODA received	14.153	13.061	13.639
Foreign Direct Investment	0.154	0.140	.496
External Debt	33.392	43.536	71.018
Domestic Credit	6.233	11.934	12.850
Manufacturing Value Added	8.794	17.745	14.760
Services Value Added	22.177	43.258	38.119
Agriculture Value Added	55.559	30.650	38.152

Note: \*Burkina Faso, Madagascar, Malawi, Mozambique, and Togo.

### *GDP per Capita Cost of the 1993-2003 Civil War*

Figure 4 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 is very close to the pre-1993 path of Burundi,<sup>17</sup> 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.

On average, GDP per capita fell by approximately 138 dollars per annum during the civil war period, compared to what it would have been in the absence of war. The average annual loss as a percentage of the counterfactual GDP per capita is 34%. Considering that GDP per capita stood at roughly 221 USD at the end of the conflict in 2003, this means that, on average, Burundians saw their annual income reduced by almost a half because of the conflict. In 2003, GDP per capita of Burundi was 221.2 while GDP per capita of synthetic Burundi was 451.0. This implies that in 2003 alone, the

**Figure 4.** Evolution of GDP per capita of actual Burundi, synthetic Burundi, and the average of comparison countries.

conflict cost in terms of GDP per capita is estimated at 50%. The total monetary cost of the war during the 1993-2003 period is estimated at USD 1514 per person and almost 10 billion USD for the whole country.

To put these figures into perspective, we compare them with cost estimates of civil conflicts which have occurred in other countries. We first compare Burundi to its neighboring country Rwanda. More specifically, we compare the cost of the Burundian civil war to the Rwandan Genocide against the Tutsi. The Rwandan conflict cost between 25% and 30% of the GDP per capita (Lopez and Wodon 2005) compared to 50% in Burundi. Although the overall cost of the Rwandan Genocide is lower than that of the Burundian civil war, the Rwandan conflict was relatively shorter, lasting only around 100 days. Therefore, the economic burden per day during the Rwandan Genocide was much higher than that of the Burundian civil war.

The Libyan civil war which began in 2011 following the ousting of Muammar Gaddafi has led to significant economic disruptions, with an estimated cost of USD 56 548 in terms of GDP per capita and a cumulative reduction in the overall real GDP amounting to USD 350.5 billion (Echevarría and García-Enríquez 2019). While the total cost of the Libyan conflict is higher than that of Burundi, Libya's larger economy and population size should be taken into consideration when comparing the economic costs of these conflicts. Similarly, the Syrian Civil War, which has been ongoing since 2011, cost of USD 200 billion in the first five years of the conflict (United Nations and World Bank 2021), much higher than the USD 10 billion for the case of Burundi. The experiences of Syria and Libya suggest that costs of conflict tend to be proportional to the sizes of the economies. Similarly, Bilgel and Karahasan (2019) find that Turkey's per capita GDP would have been 21.4% higher on average over the period 1955-2008, had it not been exposed to conflicts.

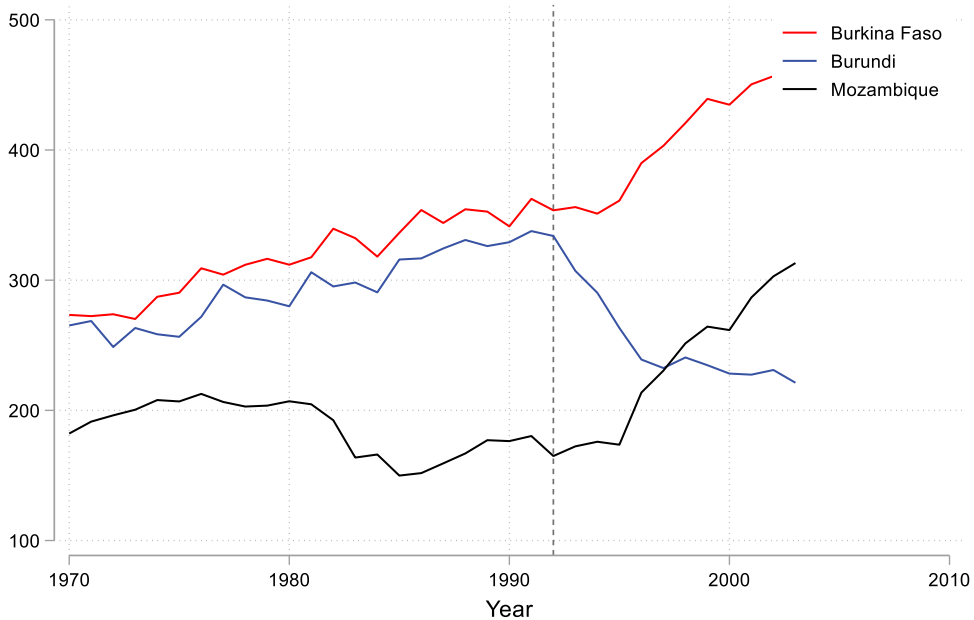
More generally, Costalli, Moretti, and Pischedda (2017) applies the synthetic control method to assess the economic consequences of civil war using a sample of 20 countries. Their findings revealed an average annual reduction in local GDP per capita of 17.5%, although the extent of this impact varied significantly among the countries studied.

### ***Burkina Faso and Mozambique from 1970 to 2003***

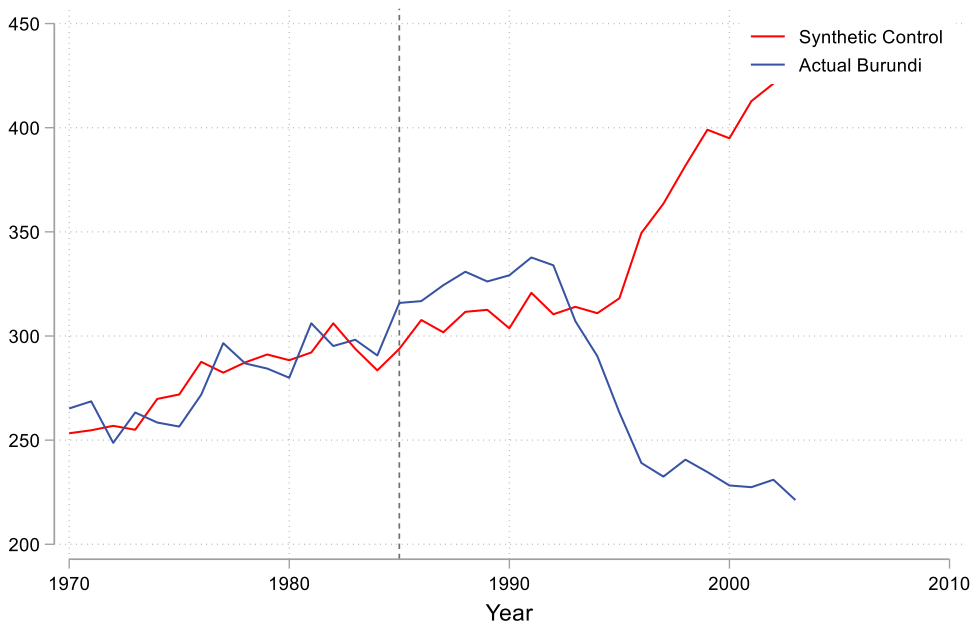
We previously determined that a good counterfactual for the GDP per capita path of Burundi from 1970 to 1993 is a weighted of Burkina Faso and Mozambique, with almost all the weight on Burkina Faso (0.835). Since the synthetic control mostly resembles Burkina Faso, the following discussion mainly concerns the comparison of this country to Burundi. There are indeed many similarities between Burundi and Burkina Faso, even though differences naturally exist.

Focusing on characteristics that make Burkina Faso close to Burundi in the pre-treatment period that are not present in our data, we find some similarities in fundamental determinants of growth, namely geography, institutions, and integration (or international trade) (Rodrik 1999). With respect to geography, both countries are landlocked and possess relatively limited natural resources. In relation to international trade, it can be observed that they each exhibit narrow export bases. The primary exports of Burundi consist of coffee and tea, while Burkina Faso's principal exports include cattle, cotton, and gold. Concerning institutional factors, the military has emerged as the most influential group in both countries since the 1960s. Analogous to the situation in Burundi, transitions in leadership from the time of independence (1960 for Burkina Faso and 1962 for Burundi) until the early 1990s have predominantly occurred through coup d'états. Furthermore, both nations transitioned to electoral democracy in the early 1990s, notably under the influence of France, after the 'Discours de la Baule,' wherein the French President declared that France would henceforth exclusively support democratic nations (National Security Archive 1990). The economic trajectories of the two countries began to diverge significantly shortly after the 1993 general election in Burundi, which marked the onset of the civil war (refer to Figure 6).

Considering geography, the two countries are landlocked and have relatively scarce natural resources. In relation to international trade, it can be observed that both countries exhibit 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 military has emerged as the most



**Figure 5.** Trends in GDP per capita: Burkina Faso, Burundi, and Mozambique.



**Figure 6.** Placebo civil war 1985 - Trends in per capita GDP: actual Burundi and synthetic Burundi.

influential group in both countries 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'états*. 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 at the start of the civil war that the economic paths of the two countries started to diverge substantially (see Figure 5).

Since synthetic Burundi is mainly a weighted average of Burkina Faso and Mozambique, it is important to check whether there have been any unusual positive or negative shocks in the two countries between 1993 and 2003, which would be unlikely to occur in Burundi. 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 free fall in the 1990s, Figure 5 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

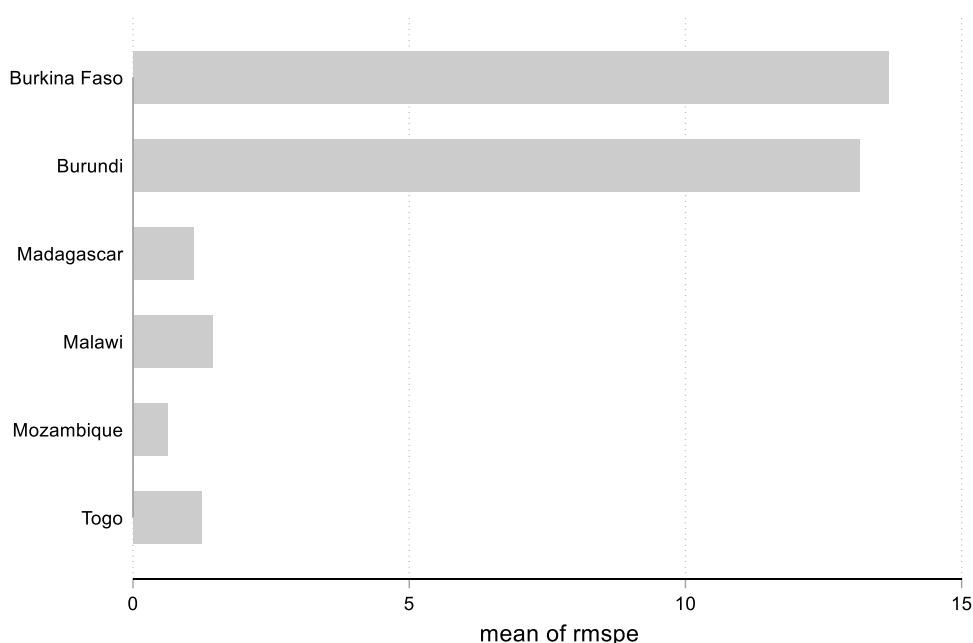
To evaluate the credibility of our results, we conduct two placebo studies. We first assign the treatment (civil war) to a year other than 1993. Following Kešeljević and Spruk (2021), this is identified using the structural break test of Zivot and Andrews (1992). The identified breakpoint year is 1985.<sup>18</sup> In other words, we calculate country weights (the synthetic control) using data from the period 1970 to 1985 (instead of 1970 to 1992). In the period after the placebo treatment (1986-1992), the path of the synthetic Burundi should not diverge substantially from that of the actual Burundi, otherwise the results presented in Figure 4 would be indicative of a potential lack of predictive power after 1993.

Figure 6 shows the results of using 1985 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 1985. 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 1985 to 1993, and starts to move away substantially thereafter. The gap observed between 1985 and 1993 is always between 9 and 30 USD, which is not a substantial difference economically.

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. 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 7 presents results of this placebo test. All the control countries have a much lower RMSPE ratio compared to Burundi except for Burkina Faso because the two countries had very similar characteristics in the pre-treatment period.

### Robustness Checks

In this section, we provide results of two robustness checks. First, we show estimation results of model specifications which differ on the covariates incorporated into the model. We pay a particular attention to remarks of Kaul et al. (2022) on using outcome lags as predictors. This robustness



**Figure 7.** Ratio of post-civil war RMSPE to pre-civil war RMSPE: Burundi and control countries.

examination facilitates the visualization of the degree to which the main results are influenced by specific specifications. Subsequently, we probe the sensitivity of our primary findings to variations in the donor pool countries as a second robustness check. We do this by iteratively re-estimating the baseline model to construct a synthetic Burundi, excluding one of the countries in the donor pool during each iteration. This sensitivity assessment enables us to appraise the extent to which our findings are driven by any particular control country.

The outcomes of the initial robustness in [Figure 8](#) suggest that our primary findings are indeed robust across different specifications. With respect to the second robustness check, [Figure 9](#) confirms our expectation that synthetic Burundi primarily mirrors the trajectory of Burkina Faso, given that this country received a weight of 0.835 within the synthetic control with all donor pool countries. Furthermore, if the synthetic control is constructed with Burkina Faso or without Mozambique, it becomes much less close to actual Burundi.

### ***How Important is the Estimated Cost?***

If one considers that the GDP of Burundi was less than US\$ 2 billion just before the 1993 conflict, by losing nearly US\$ 10 billion, the country paid a high price for the war especially considering that the calculated cost may be underestimated because it does not take into account 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 37<sup>th</sup> out of 47 SSA countries (in 2003) instead of its observed position of 45<sup>th</sup>.<sup>19</sup> 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 sectorial dimension being an important one. For instance,

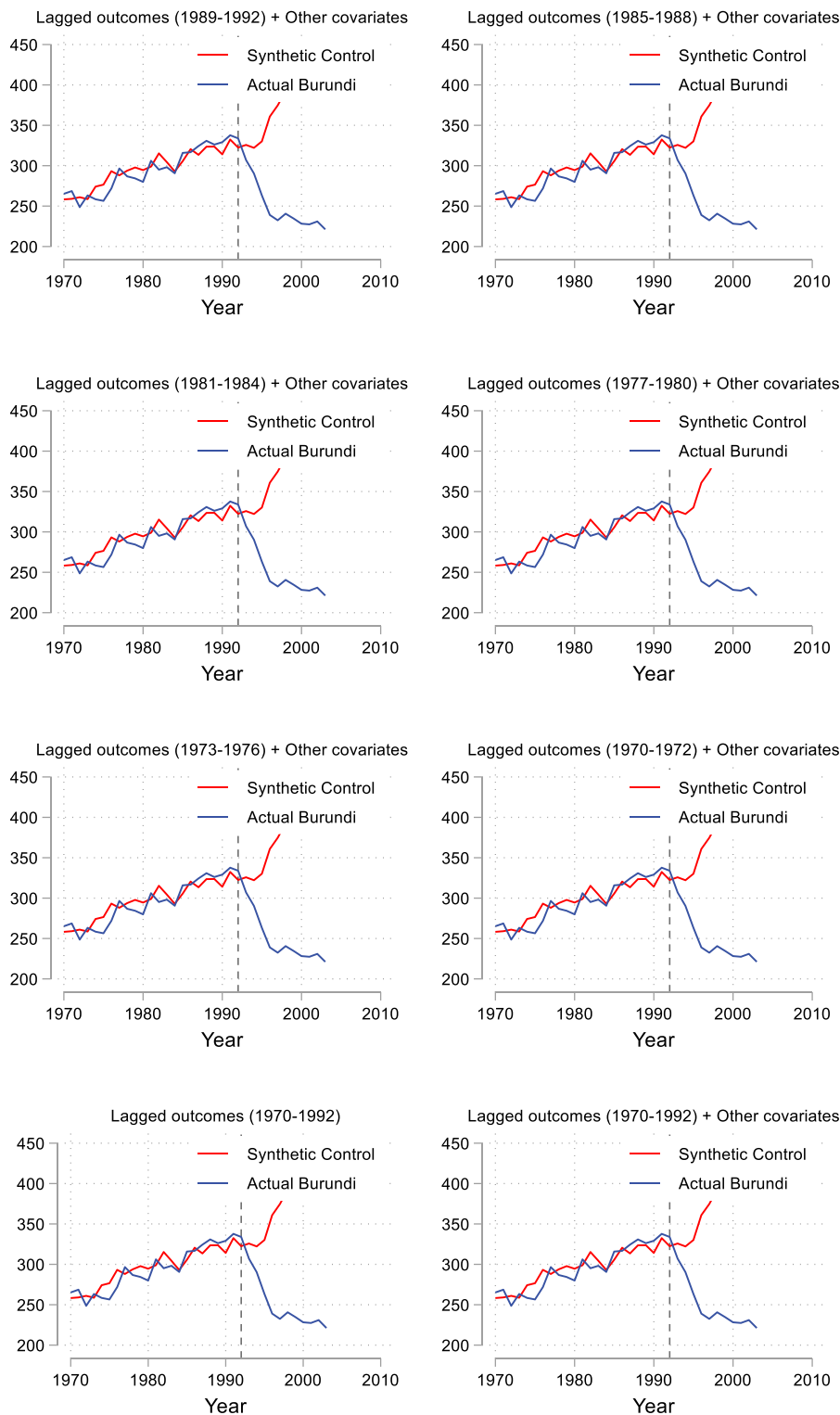


Figure 8. Constructing the synthetic control using different combinations of predictors.

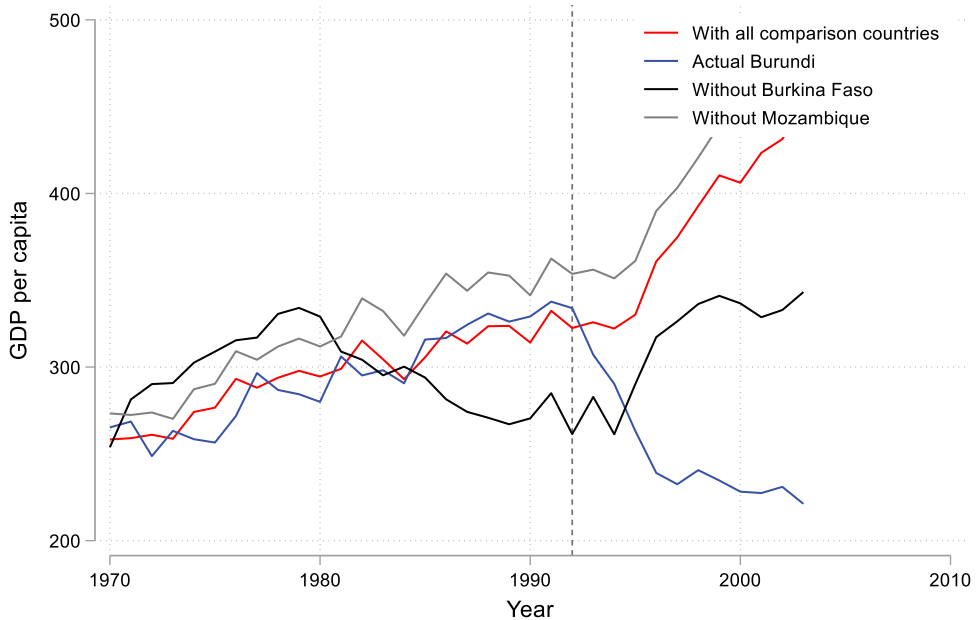


Figure 9. Leave-one-out distribution of synthetic controls.

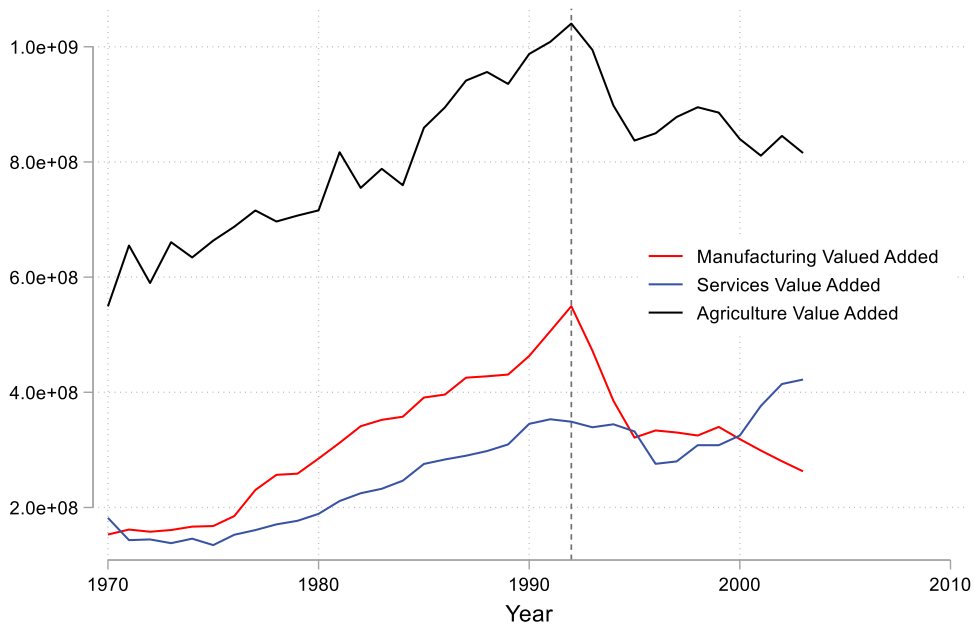


Figure 10. Evolution of agriculture, industry and services value added (Constant 2010 USD).

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 (United Nations Development Programme 2006), in a country where livestock is one of the main forms of capital accumulation. The industry sector<sup>20</sup> suffered a comparable loss (Figure 10). On the other hand, despite a dismal business climate, the services sector was relatively resilient.

## Concluding Remarks

Unlike previous papers that studied the economic performance of Burundi, this study examined the economic costs of the civil 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 the conflict has ended, we have focused the analysis on the economic impact of the Burundian civil war which occurred in the period 1993 to 2003. The calculated costs are found to be substantial. The analysis of the structural effects using a structural VAR model has shown that the effects of a civil conflict shock on economic growth in Burundi are long-lasting. After 10 years, the effects on economic growth are still noticeable. The cumulative effect of a civil conflict shock is found to be a 7.1% decrease in economic growth over a horizon of 10 years. Moreover, estimates from the synthetic control method indicate that the 1993-2003 civil war cost each Burundian approximately US\$ 1514, leading to a total cost close to US\$ 10 billion. After 2003, Burundi has struggled to make up for the negative impact of the civil war. 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, too often less impacted by adverse effects of conflicts, to the importance of peacebuilding. 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.'<sup>21</sup> In this study we have attempted to show the '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. This is according to data from the World Development Indicators (WDI).
5. According to the Human Development Index, Burundi ranked 178 out of 186 in 2012, and 180 out of 187 countries in 2013. In 2019, it ranked 185/189 with a HDI index of 0.433.
6. 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.
7. 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).
8. Note that the subscript 1 corresponds to the treated unit. In our case Burundi.
9. The distance can be measured in different ways (using the concept of Euclidean distance for example).
10. The description and descriptive statistics of the variables used, are in Tables A1 and A2, in the Appendix.
11. Uppsala Conflict Data Program.
12. Peace Research Institute Oslo.
13. 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.
14. See data on refugee numbers here: <https://www.unhcr.org/refugee-statistics/download/?url=6vn8FR>
15. Results are not presented but are available upon request.
16. The replication materials can be obtained from the website upon request.

17. The largest difference between the two variables is only USD 30.5 in 1976, which is insignificant considering how imprecise GDP estimates are, particularly in low-income countries (Jerven 2013).
18. See estimation results in Figure A1 in the Appendix.
19. The rankings are based on World Bank's World Development Indicators' GDP per capita data in constant 2010 US\$.
20. Comprising value added in mining, manufacturing, construction, electricity, water, and gas.
21. Please find the complete speech here: [http://www.mandela.gov.za/mandela\\_speeches/2003/0304\\_burundi.htm](http://www.mandela.gov.za/mandela_speeches/2003/0304_burundi.htm)

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Statement of Informed Consent

There are no human subjects in this article and informed consent is not applicable.

## Data availability statement

The data used in this study are available upon request <https://sites.google.com/view/arcadendoricimpa/research/publications?authuser=0>.

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## Appendix

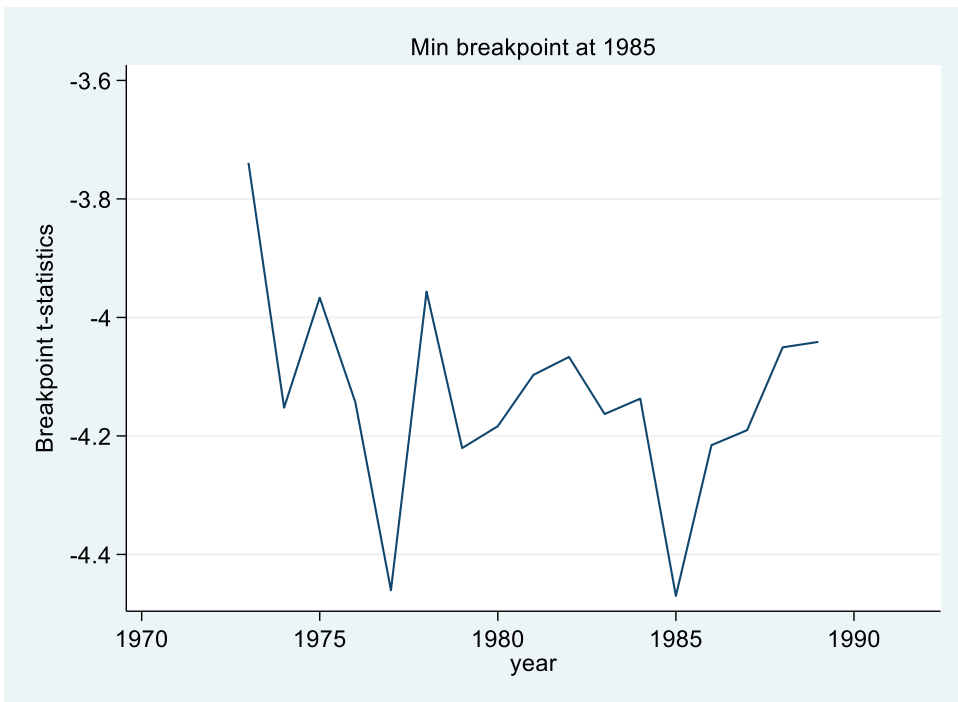
**Table A1.** Variables descriptions.

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 taken into account (Gross value added)	World Bank, World Development Indicators (WDI)
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)
Investment (% of GDP)	It is captured by gross fixed capital formation. 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 taken into account (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)
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.



**Figure A1.** Zivot-Andrews structural break test for pre-treatment GDP per capita of Burundi.