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African Development Bank
Angle de lavenue du Ghana et des rues Pierre de Coubertin et Hédi Nouira
BP 323 -1002 Tunis Belvédère (Tunisia)
Tel: +216 71 333 511
Fax: +216 71 351 933
E-mail: afdb@afdb.org

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Estimating the Economic Cost of Fragility in Africa *

Mthuli Ncube† Basil Jones‡ Zorobabel Bicaba§

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†The Chief Economist and Vice President of the African Development Bank. E-mail: m.ncube@afdb.org

‡Assistant to the Chief Economist and Vice President of the AfDB. E-mail: b.jones@afdb.org

§Economic Researcher in the African Development Bank. E-mail: z.bicaba@afdb.org

Abstract

A fiscally constrained global environment has heightened the interest of development partners in the economic cost of fragility. State fragility and civil war have become a central topic in the development debate and Africa is a continent particularly affected by fragility. A stronger engagement with fragile states is one of three areas of special emphasis in the African Development Banks Ten Year Strategy 2014-2022. This paper evaluates and quantifies the economic costs of fragility using two approaches: a simple convergence model and synthetic counterfactual approach. To the best of our knowledge, this paper is the first to use the synthetic counterfactual approach to evaluate the economic costs of fragility in Africa. Our estimations show that fragile states lose an opportunity to double their initial GDP per capita after a period of 20 years. Second, the synthetic counterfactual shows that in 20 years of fragility, the cumulative economic cost of fragility in Liberia, Sierra Leone and Burundi amounted to US$31.8 billion, US$16.0 billion and US$12.8 billion respectively. Our simulations suggest, for example, that if Central Africa Republic, Liberia and Sierra Leone had growth rates equivalent to those of the synthetic country in the model in 2010, it would take 34.5 years,19.2 years and 20.8 years respectively to recover the level of GDP per capita had these countries not been exposed to fragility.

JEL classification: C21;O10; O55

Keywords: Fragility, economic cost, convergence model, synthetic counterfactual, Africa.

1 Introduction

State fragility and breakdown, along with violent conflict, pose significant risks to global and regional security. Most contemporary armed conflicts take place within states, and the majority of their victims are civilians. Conflict and fragility impede efforts to reduce poverty and the prevention of conflict through development is cheaper than dealing with the aftermath of conflict. When violent conflict breaks out, development is derailed and conflict is development in reverse. Conflicts not only cause a contraction of output, they also destroy infrastructure. Financial and human capital tends to leave countries, but to quantify the phenomenon is hard without a counterfactual.

In the second half of the 20th Century, the African Continent, suffered enormously from violent conflict within and between States. This exacted heavy toll on Africa in terms of human suffering and lost development opportunities with devastating impact on political, social and economic development. The contagion effects on the neighboring states had significant negative consequences. African leaders have recognized the imperative of preventing and tackling conflict and in recent years the continent has become increasingly stable although new forms of instability such as the post 2011 fall of autocracies and the unsteady transition to democracy in North Africa are being observed.

The costs of conflicts are numerous and widespread. Some are direct and can be broadly quantified: deaths, casualties, diseases, internally displaced people, and mass migrations. Some are indirect, with conflicts disrupting economic activity, shifting public expenditures from health and education to the military and reshuffling public revenues. Conflicts can also increase unemployment, especially among young males, increasing the likelihood of crime and the appeal of extremism. Often, after a conflict, and because of less control on the ground, entire regions can be converted to areas of drug cultivation, and drug smuggling is easy (and profitable), so that people might embark on illegal activities rather than return to their (often destroyed) occupations. Some costs of conflict cannot be quantified: citizens are often traumatized long after the end of conflicts, but the costs of psycho-social trauma are not easily measured.

The issue of fragility has been extensively cited in the literature by Paul Collier et al (2007), Abadie and Gardeazabal (2002). The overall objective of this paper is to measure the economic

cost of fragility in terms of loss of per capita GDP and to quantify the value this loss in USD terms. Our contribution is that we are using two methodologies that are being used for the first time to estimate the cost of fragility in Africa. First we use a standard convergence model, and secondly we use a path breaking methodology of Abadie and Gardeazabal (AER 2002) of estimating the economic cost of fragility using a synthetic counterfactual approach. Measuring the cost of fragility is of interest because the amount of aid that is available from donors is coming under increasing fiscal pressure and it will be useful to come up with instruments that can address the resurgence of fragility as has recently been experienced in Mali and the Sahel region as well South Sudan and Central Africa Republic.

In this study, fragility is defined as the consequence of an exposure to a conflict. However, the relationship between fragility and conflict is dynamic and complicated. Conflicts may at the same time be an outcome of fragility and one of its driving forces. Fragile countries are often characterized by social exclusion which can trigger conflicts. Conflicts also undermine the capacity of the state to deliver public services, weakening institutions and slowing economic performance and poverty reduction. The combination of these factors adds to the destabilizing forces. Estimating the cost of fragility is of particular interest in a global environment where the amount of aid that is available from donors is coming under increasing fiscal pressures. Therefore, the first step of understanding fragility is an assessment of the economic cost of fragility. We thus quantify the economic costs of fragility by assuming that these costs could be approximated by the dynamics of GDP per capita. More precisely, we investigate the economic cost of fragility using macroeconomic data from (1980-2010) for some fragile states in Africa based on the Multilateral Development Banks (MDBs) standard classification using the CPIA score of less than 3.2 to distinguish a fragile from a non-fragile state.[1] Our results to a certain extent confirm some of the findings on the estimation of the cost of fragility by Collier et al. (2007). Indeed, we estimate the duration for recovery after an exposure to fragility to be between 12 to 33 years while Collier et al. (2004) claim that it takes around 21 years to return to the prewar income.

Section 2 reviews some of the literature on the cost of conflict. Section 3 presents the methodology. Section 4 presents some descriptive statistics on fragile and non-fragile states from the

[1]Despite its limitations, the CPIA is a serious professional attempt to provide a rating that is comparable and consistent between countries over time.

data. Section 5 discusses the results of the analysis which is divided into three parts (i) the results for the conditional convergence model, (ii) the results using the synthetic counterfactual approach and (iii) estimation of the cost of conflict for selected fragile states by constructing synthetic country counterfactual. Section 6 provides some sensitivity analysis and Section 7 concludes the paper.

2 Literature Review

Most of the empirical literature on the effects of political conflict on economic variables has used cross-sections of country level data. Using a cross-section of countries, Alesina and Perotti (1996) and Venieris and Gupta (1986) concluded that political instability has a negative effect on investment and savings. Also using a cross-section of countries, Alesina et al. (1996), Barro (1991), and Mauro (1995) have argued that political instability has a negative effect on economic growth. Hausken and Ncube (2012), show that elections outcomes in most African countries have been challenged as not having been free and fair. Indeed some of the elections have been violent and also followed by more violence once the outcome is known. Andrimihaja et al (2011) in addressing the fragility trap, suggest that political instability and violence, insecure property rights and unenforceable contracts and corruption, conspire to create slow growth-poverty-governance equilibrium. Abadie and Gardeazabal (2002) investigated the economic effects of conflict, using terrorist conflict in the Basque Country as a case study. They found that, after the outbreak of terrorism, per capita GDP in the Basque Country declined by 10 percentage points relative to the synthetic control region. The result shows that in the late 1990s after 30 years of terrorist and political conflict, the Basque country which was one of the richest regions in Spain occupying the third position in per capita GDP (out of the 17 regions) had dropped to the sixth position in per capita GDP.

A relatively new literature is trying to understand the economic effects of violent conflict through micro studies, Mueller (2014). This literature is able to identify the effects of violent conflict on society in a detailed that was up until now impossible. Acemoglu, Hassan and Robinson (2011), study the effects of the Holocoust on development in Russian cities; Akresh, Bhalotra, Leone and Osili (2012) study the Nigerian civil war in the 1960s; and Besley and

Mueller (2012) study contemporary Northern Ireland. Recent publications from Multilateral Development Banks have highlighted the issue of conflict and fragility.[2] They show that a civil conflict cost the average developing country roughly 30 years of GDP growth and countries in protracted crisis fall over 20 percentage points behind in overcoming poverty. People in fragile and conflict-affected situations are more than twice as likely to be undernourished as those in other developing countries, more than three times as likely to be unable to send their children to school, twice as likely to see their children die before the age of five, and more than twice as likely to lack clean water.[3]

The empirical literature on estimating the cost of fragility in Africa is very thin. In the African context, Chauvet, Collier and Hoeffler (2007), estimated the cost of a failing state. The costs of fragility appear to pay little attention to national boundaries. An estimated 80% of the cost of fragility in forgone economic growth is borne by neighboring countries, which suffer from a substantial bad neighbor effect, with growth about 0.6% a year lower per neighbor. With 3.5 neighbors per country on average, the losses from the bad neighbor effect can add up to about $237 billion a year.[4] This is more than twice what international aid flows would be if the OECD countries actually reach the UN target of giving 0.7 per cent of their GDP in aid.

States do not operate in isolation, and will be affected by events in neighboring countries. The more extreme the event, the more likely it will impact on its neighbors. Given the porosity of national borders, conflicts in one country can spill over neighboring countries notably through refugee flows. The risk is particularly high in cases of ethnic conflicts where similar ethnic groups span across borders of neighboring countries. If a state has weak institutions from the outset, and particularly where there are marked social divisions (compounded with minimal public participation in political processes), external shocks can trigger fragility. In the Mano River region of West Africa, the Horn of Africa, the Sahel region and the Great Lakes region the outbreak of national conflicts created regional security issues. Several factors explain the extent to which bad neighborhood fuels conflicts on the continent: The spill-over effect as a result of proximity; the existence and ease with which roving mercenaries move from one conflict to

[2] African Development Banks African Development Report 2009 and World Banks World Development Report 2011, European Report on Development 2009.

[3] *World Bank (2011) (p.5), World Development Report 2011 Conflict, Security, and Development; Overview April 2011, Washington DC*

[4] 23 failing states were used.

another; the proliferation of small arms and light weapons in one conflict fueling others as a result of the porous borders in Africa and the interest of states in fuelling conflicts by supplying arms and providing havens for fighters. It is in recognition of the negative spillover that the AfDBs Fragile States Framework is focusing on a regional approach to providing support to fragile states with a focus on an assessment that would take into account the regional and sub-regional dimensions of fragility.

3 Methodology

This section describes the general conceptual frameworks used to estimate the cost of fragility. We assess the economic cost of fragility in general and on average for fragile states. We are also drilling down to country specific context highlighting the cost of conflict/fragility. An appropriate framework for an assessment of economic costs of fragility must have three steps. First, a definition of a welfare criterion according to which the economic cost of fragility is calculated. This welfare criterion can be considered as being part of policy objectives defined by policymakers. The welfare criterion considered is GDP per capita growth. Second, an evaluation of the economic costs of fragility requires the definition of a good counterfactual. The counterfactual describes the path of outcome that would have been observed if the fragile states did not experience fragility. A good counterfactual is a non-fragile state that is statistically similar, for some particular structural characteristics, to a specific fragile state before its exposure to fragility. The trajectory path of the outcome of counterfactual (synthetic country) is expected to be different from the outcome trajectory of fragile states after the exposure to fragility. It is this difference in trajectory (or gap) that provides us a way to compute and quantify the economic cost of fragility. Third, the assessment of costs requires the choice of an appropriate econometric method which takes into account the complexity of fragility. In this paper, two methods are subsequently employed: a convergence model and counterfactual approach.

3.1 A simple convergence model

We want to determine the average economic cost of fragility and therefore we make use of a convergence model and expect to bring out the time it takes to transition out of fragility. For

this purpose, a convergence model in which GDP per capita is explained by its past level and by other determinants of GDP per capita is, first, estimated. This kind of model is traditionally employed in growth and convergence literature (see Durlauf et al., 2005). Second, the parameter associated with GDP per capita convergence is derived in order to compute the cumulative growth in non-fragile countries and in fragile countries and the economic costs of fragility are then estimated.

- For non- fragile countries:

The following specification is estimated:

$$Y_{it} = \delta Y_{it-1} + \beta X_{it} + \epsilon_{it} \tag{1}$$

Where Y denotes the level of GDP per capita of country i observed at time t and t-1; X indicates a set of determinants of GDP per capita and ϵ is the unexplained part of GDP per capita. δ is the conditional convergence factor from the initial GDP per capita to the actual level of GDP per capita.

From (2), the expected GDP per capita conditional on X is $E\left(Y_{it}|Y_{it-1}, X_{it}\right) = \hat{\delta} Y_{it-1} = \left(1+\hat{a}\right) Y_{it-1}$, where $\hat{a}$ is the estimated growth rate of GDP per capita. Lets assume that the GDP per capita evolves geometrically over time, we can re-write the expected value of GDP per capita at time t as : $E\left(Y_{it}|Y_{it-1}, X_{it}\right) = \hat{\delta}^t Y_{i0} = \left(1+\hat{a}\right)^t Y_{i0}$ and the cumulative growth, g_t is such as $1 + g_t = \left(1+\hat{a}\right)^t$, therefore $g_t = \left(1+\hat{a}\right)^t - 1$.

- For fragile states:

The same methodology is applied to the case of fragile states. We estimate the following simple convergence model:

$$Y_{it} = \delta^F Y_{it-1} + \beta^F X_{it} + \epsilon_{it} \tag{2}$$

Similarly, the dynamics of GDP per capita are derived by assuming that the expected level of GDP per capita at period t is geometrically related to the initial GDP per capita as $E\left(Y_{kt}|Y_{kt-1}, X_{it}\right) = \hat{\delta}^F Y_{k0} = \left(1+\hat{a}^F\right) Y_{k0}$ and, thus, the cumulative growth is equal to $g_t^F = \left(1+\hat{a}^F\right)^t - 1$. . By specifying two different models for fragile and non-fragile states, we are assuming that the process of

convergence is probably different in fragile countries (if $\delta \neq \delta^F$) and that the other determinants of the level of GDP per capita impacts fragile states differently ($\beta \neq \beta^F$).

We expect that $\delta < \delta^F$, in this case the growth cost of fragility is equivalent to its "opportunity" cost in terms of growth. If we assume that the initial real GDP per capita in the "non-fragile" country "i" is equal to fragile state k initial real GDP per capita in the steady state ($Y_{k0} \cong Y_{i0}$), therefore

$$Opportunity\ \ Cost\ = g_{it} - g_{it}^F = (1+\hat{a})^t - \left(1+\hat{a}^F\right)^t \tag{3}$$

So far, we consider risk neutral policymakers who allow the same weight to the future and present values of growth. We now assume that policymakers are not risk neutral, they are interested in the discounted economic cost of fragility. This quantity can be discounted. Let ρ_{it} denote the discount rate of country i at time t and $\theta_{it} = \dfrac{1}{1+\rho_{it}}$ a discount factor. We assume a heavier discount rate for fragile states i.e. $\rho_t^F > \rho_t$. The rationale underlying this assumption is the following. In fragile states, there is a higher uncertainty about the future so that risk-averse policymakers allow a high weight to the present GDP per capita growth compared to growth occurring in the future.

The discounted opportunity cost of fragility is computed as follow:

$$Discounted\,Opportunity\ \ Cost\ = g_{it}^{discounted} - g_{it}^{F,discounted} = \beta_i^{t-1}(1+\hat{a})^t - \beta_{iF}^{t-1}\left(1+\hat{a}^F\right)^t \tag{4}$$

The parameters of models (1) and (2) are estimated using the Generalized Moments Method estimator. This method allows us to deal with the autoregressive properties of these models.

3.2 A synthetic counterfactual approach

A precise estimation of the economic costs of fragility requires an appropriate description of what would have been the growth path of fragile states if they had not experienced fragility, i.e. a good description of the counterfactual. In this section, a synthetic counterfactual approach is used to provide a rigorous method of identification of the counterfactual. This approach was introduced by Abadie and Gardeazabal (2003) in their study of the economic impacts of terrorism

in the Spanish Basque country.[5] The idea behind the synthetic counterfactual approach is that a combination of non-fragile countries often provides a better comparison for the country exposed to the fragility than a single non-fragile country. Because a synthetic control (counterfactual) is a weighted average of the available non-fragile countries, the synthetic control method makes explicit: (i) the relative contribution of each control country to the counterfactual of interest; and (ii) the similarities (or lack thereof) between the country affected by the fragility and the synthetic control, in terms of pre-fragility outcomes and the predictors of post-fragility outcomes. As the weights can be restricted to be positive and sum to one, the synthetic control method provides a safeguard against extrapolation (Abadie et al, 2010). The subsequent evolution of the counterfactual Country without fragility is compared to the actual experience of each fragile country.

There are three main advantages of using synthetic counterfactual approach. First, this method is designed for case-study, so it can allow for the evaluation of the effects of an exposure to fragility independently from: i) the number of fragile states at hand; ii) the number of non-fragile countries; iii) the timing of the exposure to fragility. Second, compared with the traditional inferential techniques for impact evaluation (for example, difference-in-difference estimator), this approach allows the study of the dynamic effects. Third, the synthetic counterfactual approach efficiently tackles the issue of uncertainty about the counterfactual evolution of outcome . This type of uncertainty is not reflected by traditional inferential techniques for comparative case studies. Formally, suppose that we observe $J + 1$ countries and for sake of simplicity, suppose also that only one country is exposed to fragility, so that we have J remaining countries as potential controls (comparison countries). Let T_0 be the number of pre-fragility periods, with $1 \leq T_0 < T$.

Table 1: Time of exposure to fragility

	$t < T_0$	$t > T_0$	$t > T_1$
Fragile state i	No exposure to fragility	Exposure to fragility	Escape fragility?
Non-fragile states	No exposure to fragility	No exposure to fragility	

[5]They used a combination of two Spanish regions a synthetic control region which resembles many relevant characteristics of the Basque country before the outset of political terrorism in the 1970s to approximate the economic growth that the Basque country would have experienced in the absence of terrorism.

Let Y_{it}^N be the outcome that would be observed for country i at time t in the absence of fragility, for units $i = 1...J+1$, and time periods, $t = 1...T$.

Let Y_{it}^F be the outcome that would be observed for unit i at time t if unit $i = 1$ is exposed to fragility in periods $T_0 + 1$ to T. Let $\alpha_{it} = Y_{it}^F - Y_{it}^N$ be the effect of fragility for unit i at time t, and let D_{it} be an indicator that takes value one if unit i is exposed to fragility at time t, and value zero otherwise. Therefore, the observed outcome for unit i at time t is

$$Y_{it} = Y_{it}^N + \alpha_{it} D_{it} \tag{5}$$

In synthetic counterfactual approach, the aim is to estimate $(\alpha_{iT_0}, ..., \alpha_{iT})$. For $t > T_0$,

$$\alpha_{1t} = Y_{1t}^F - Y_{1t}^N = Y_{1t} - Y_{1t}^N$$

Recall that Y_{1t}^F is observed, so, to estimate α_{1t} we need to estimate Y_{1t}^N.

3.2.1 Construction of the counterfactual

Since counterfactual path of outcome is unknown, we suppose that Y_{it}^N can be estimated using a factor model (see Abadie et al. 2010). The synthetic counterfactual is constructed, first by allowing a specific weight (w_j) to each potential candidate country and then, we compute what would have been the outcome path of fragile countries if these countries were not exposed to fragility (Y_{it}^N).The synthetic control approach provides the best vector of weights $W^* = \left(w_2^*, ..., w_{J+1}^*\right)$ allowing the outcome path of the counterfactual to be the same with the outcome path in each fragile state before the exposure to fragility. ?

3.2.2 Estimated cost of fragility

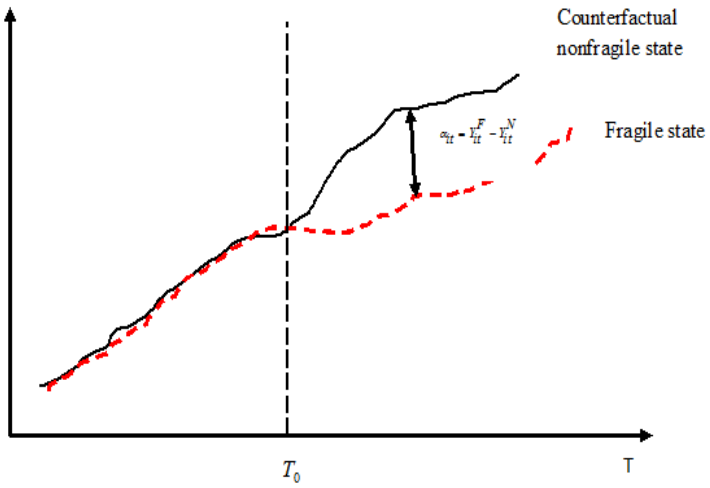
Finally, if the counterfactual is identified (i.e. Y_{it}^N is well identified), therefore the cost of fragility at time t is equal to

$$\alpha_{1t} = Y_{1t}^F - Y_{1t}^N = Y_{1t}^F - \sum_{j=2}^{N+1} w_{J+1}^* Y_{jt} \quad for \;\; t > T_0 \tag{6}$$

And the cumulative economic cost of fragility is given by

$$Opportunity \;\; cost_i = \sum_{t=T_0+1}^{T} \alpha_{it} \tag{7}$$

Figure 1: Cost of fragility: Illustration



4 Data and descriptive statistics

The sample considered in the study includes 91 countries observed over the period 1980-2010. This sample comprises 45 African countries, 15 developing Asia countries, 20 from Latin America and 11 other Asian and European transition countries. These data are taken from different sources including the World Development Indicators (2013) database, UCDP Conflict Termination dataset and Database on Political Institutions (World Bank, DPI 2012) and the World Economic Outlook database (2013).

Because of the data availability issue, we restrict our sample so that 2010 is the end of sample period. This issue has also led us to consider the following sub-sample of fragile states in our study: Burundi, Central African Republic, Eritrea, Guinea-Bissau, Liberia, Sierra Leone, Togo and Zimbabwe for the convergence model (GMM) and for the synthetic counterfactual estimations, we exclude Togo and Zimbabwe because of data availability.

In this section, the analysis is performed using the sub-group of African countries. However,

the estimations (GMM or synthetic counterfactual) will be performed using the whole sample.

Table 2: Descriptive statistics

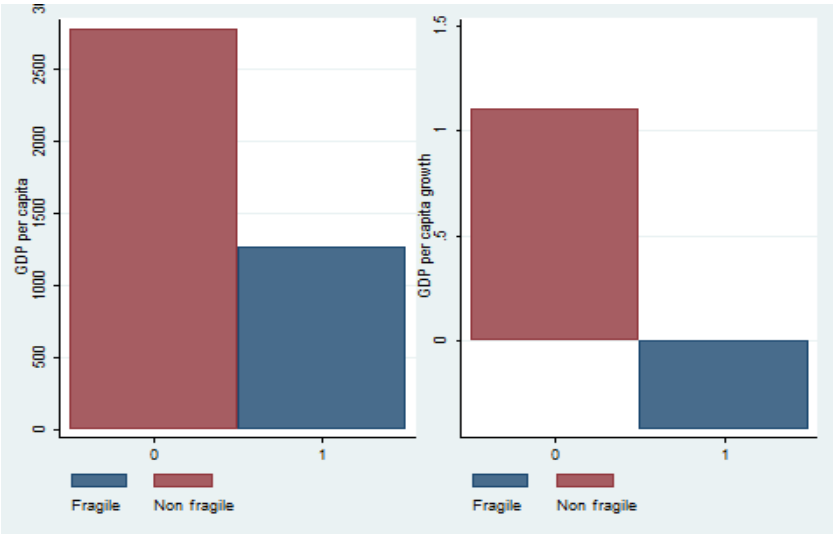
	Not fragile		Fragile states		**Mean difference test**
	Mean	Standard deviation	Mean	Standard deviation	
Real GDP per Capita	1104.97	41.27	328.77	9.95	776.20***
Under-5 Mortality Rate (per 1,000 Live Births)	123.00	59.71	170.57	59.04	-47.57***
Regime Durability	39.54	13.34	13.18	19.48	0.35
Voice and Accountability	-0.522	0.674	-0.992	0.601	0.47***
Gini Index	44.34	7.77	44.64	8.84	-0.30
GDP per capita growth	1.11	5.11	-0.423	9.48	1.53***
Saving (%GDP)	16.51	12.94	8.19	7.72	8.32***
Investment (%GDP)	21.67	10.37	17.37	9.79	4.30***

Source: World Bank, World Development Indicators (2013). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The data in Table 2 shows that over the sample period (1980-2010), GDP per capita in non-fragile states was more than triple the GDP per capita in fragile states. The per capita GDP growth over the period for non-fragile states was 1.1% whilst that for fragile states was negative 0.4%.Under 5 mortality rates were lower in non-fragile states and in terms of regime durability, fragile states score was almost a third lower than that of non-fragile states. For voice and accountability which is a component that measures good governance and where in general African countries scores are weak, fragile states performance is worse than that of non-fragile states. It is of interest to note that income inequality as measured by the Gini coefficient is not statistically significant between fragile and non-fragile states. The mean difference test shows that apart from the Gini index and regime durability, all the other variables are statistically significant.

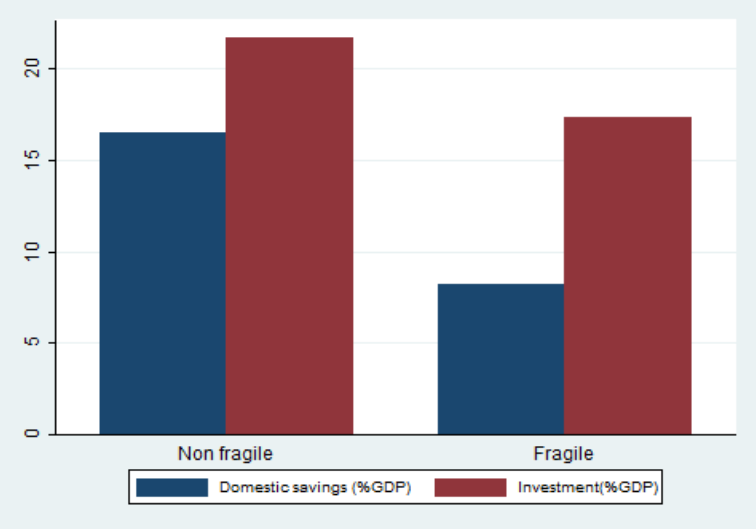
Figure 2a clearly shows that GDP per capita over the sample period for fragile states is almost half that for non fragile states. GDP per capita growth, whilst positive at about 1% per annum, the GDP per capita growth for fragile states recorded a negative 0.4% per annum growth in the sample period, (Figure 2b).Violence is the ultimate manifestation of fragility. However, it is not just an outcome of fragility, it can also be a driving factor of fragility due to reduced levels of GDP and increased strains on political institutions and social tensions.

Figure 2: GDP per capita (Level and growth) for fragile vs. non fragile African countries (1980-2010)



Source: Authors calculations based on International Monetary Fund, WEO (2013) and World Bank, World Development Indicators (2013)

Figure 3: Fragile vs. Non Fragile: Economic Characteristics

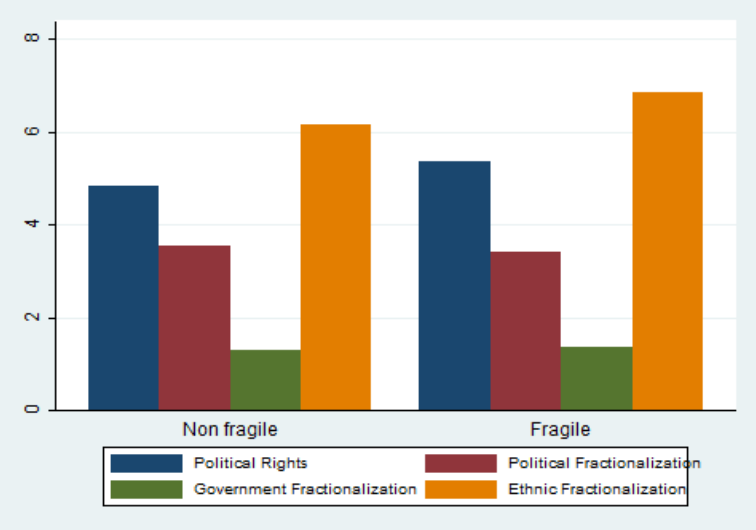


Source: Authors calculations based on International Monetary Fund, WEO (2013) and World Bank, World Development Indicators (2013)

In terms of economic characteristics, Figure 3 shows that both savings and investment rates are much higher in non-fragile states.

Figure 4 charts some political variables and Table 3 shows that political rights and ethnic fractionalization are statistically significant between fragile and non-fragile states. The data do

Figure 4: Fragile vs. Non fragile: Political Characteristics



Source: Authors calculations based on International Monetary Fund, WEO (2013) and World Bank, World Development Indicators (2013)

not show any significant difference between political fragmentation and government fragmentation in fragile and not fragile countries. These variables in themselves do not drive fragility, rather it is their political manipulation that can impact on a states stability. This manipulation is likely in states with weak institutions.

Table 3: Descriptive statistics: Political variables

	Student test: Mean (Non fragile) - Mean(Fragile)
Political rights	-0.5447***
Government fractionalization	-0.0618
Political fractionalization	1 0.1343
Ethnic fractionalization	-0.6921***

Source: Source: Authors calculations based on World Bank, Database of Political Institutions 2012. Note: * p < 0.10, ** p < 0.05, *** p < 0.01.

5 Results and Analysis

In this section, we are going to estimate the costs of fragility performing GMM estimation on the whole sample, followed by a restricted sample of non-fragile Africa states and then using the frontier (emerging) African economies. We will also use a synthetic counterfactual to derive the costs of fragility for a selected sample of fragile states and conduct some sensitivity analysis. We

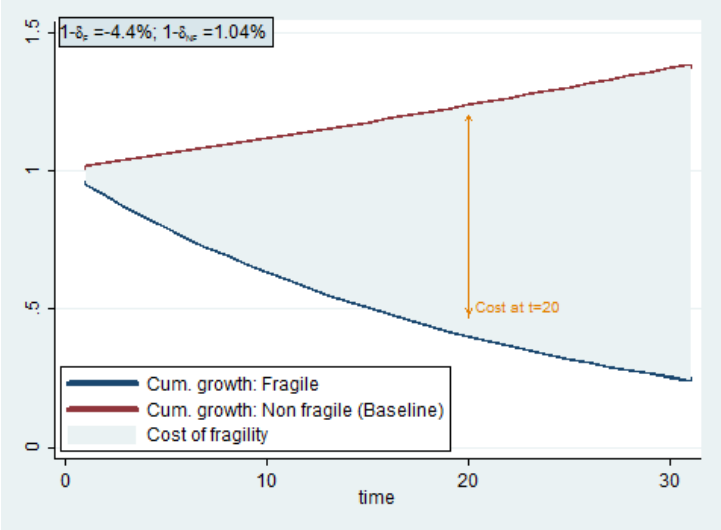
use a sample of 91 countries observed over the period 1980-2010.

5.1 Estimating the costs using a convergence model

5.1.1 Whole sample

Estimating the economic costs of fragility using specification 1, the baseline model suggests that on average the GDP per capital is equal to 1.04% for the non-fragile country considered in sample period, conversely the average growth rate in fragile countries is negative and is equal to -4.4% (Table A2 in Annex). Figure 5 plots the cumulative growth for fragile and non-fragile countries at each time t. The grey area represents the difference between the cumulative growth rate of non-fragile states (red line) and the cumulative growth of fragile states (blue line). For instance, the economic cost in terms of growth for a country which stays in fragility over the entire sample period can be observed at t=31. According to the baseline model, this cost is equal to 110.14%, which means that the fragile states could have potentially doubled their initial GDP per capita level in 1980 if they had not been in fragility (Table 4 and Figure 5).

Figure 5: GDP per capita growth : Opportunity cost of fragility



Source: Authors calculations.

Now we extend the baseline convergence model including the dynamics of capital accumulation (i.e. the variable investment over GDP) and some structural characteristics of countries amongst which are the size of the government (measure as government expenditures over GDP),

civil liberties, political rights and cultural diversity. The estimation of the new model suggests that on average the GDP per capita is equal to 1.2% for the non-fragile countries considered in the sample; conversely, the average growth rate in fragile is negative and is equal to -2.2% per annum (Table A2 in Annex).

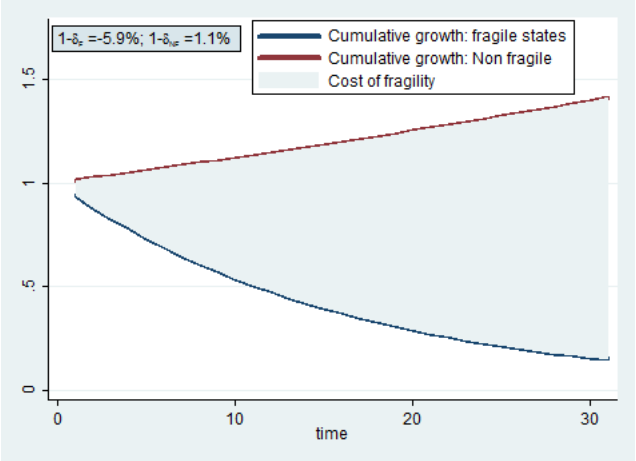
Table 4: Summary economic costs of exposure to fragility during t years

Comparison Sample	Whole sample		Non fragile Africa	Frontier markets
Specification	Baseline	Augmented	Augmented	Augmented
T=10 years	47.02%	57.448%	37.27%	53.92%
T=20 years	82.18 %	95.333%	54.33%	87.57%
T=30 years	112.89%	125.89%	60.96%	112.5%

Source: Source: Authors calculations

Figure 6 plots the cumulative growth for fragile and non-fragile countries at each time t for the augmented model. From this figure, we can observe that dispersion of economic costs of fragility is lower. In particular, staying in fragility for 31 years involves a lower GDP per capita growth and a potential cumulative growth loss equals to 125.89%, which means that fragile states lose an opportunity to double their initial GDP per capita because of fragility (Table 4).

Figure 6: GDP per capita growth : Opportunity cost of fragility (Augmented specification)



Source: Authors calculations.

These numbers shown in figure 6 are particularly high because of the exponential evolution of GDP per capita. For example, assume that the gap between the convergence speeds is equal to a%, thus, it will take t^* years to double its GDP per capita or to lose an opportunity to increase

its GDP per capita by one initial GDP per capita. Let denote t^* the time required to double the initial GDP per capita, thus

$$(1+a)^{t^*} = 2 \;\; thus \quad t^* = \frac{log\,(2)}{log\,(1+a)}$$

Therefore, if a=10%, it will take only 7.3 years to lose a GDP per capita increase equal to one initial GDP per capita, while for a=5% this duration will be equal to14.20 years.

In our case, these exponential dynamics are particularly accentuated, they work in an opposite sense depending whether the country is fragile or not. Indeed, as $\delta^F = 1+a^F < 1 < \delta = 1+a$ i.e. $a^F < 0 < a$, the asymptotic properties for cumulative growth are the following: $\lim_{t\to\infty} \delta^t \longrightarrow \infty$, while $\lim_{t\to\infty} \left(\delta^F\right)^t \longrightarrow \infty$.

Therefore, the opportunity cost (gap) $\alpha_t = (1+\hat{a})^t - \left(1+\hat{a}^F\right)^t$ will increase exponentially as we advance in time.

5.1.2 Sample restrictions

This section compares the performance of African fragile states to less heterogeneous group of countries. Even if our estimation strategy i.e., GMM estimations, takes into account this heterogeneity by controlling for the invariant specificities of countries through the inclusion of country fixed effects, we suspect that there may remain a residual heterogeneity (regional specificities and common factors) not captured by these estimations. For this purpose, we compare the process of convergence in several subgroups of country in Africa and the process of convergence in fragile states. We successively use the sub-samples of non-fragile African countries and of frontier market countries.

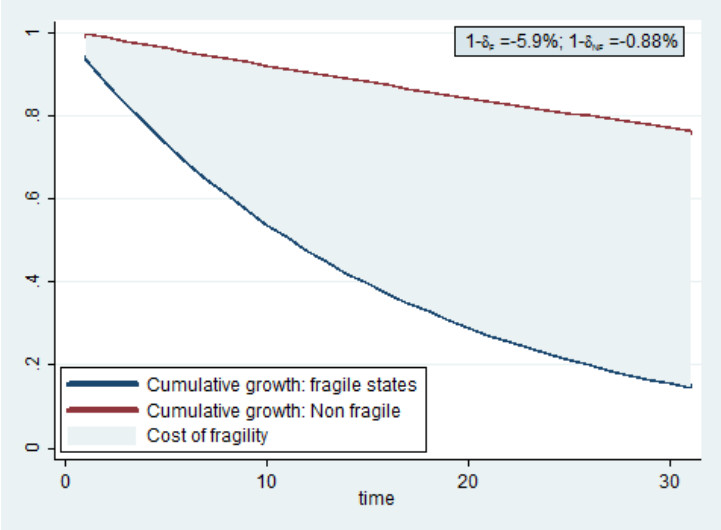
- Non fragile African countries

The first sub-sample of comparison considered is the group of non-fragile African countries.[6] Figure 7 shows that the costs of fragility are lower when the group of comparison is restricted to Africas sub-sample and to the sub-sample of frontier markets. The economic cost associated

[6] Angola, Benin, Burkina Faso, Botswana, Côte d'Ivoire, Cameroon, Congo, Republic of, Comoros, Cape Verde, Djibouti, Algeria, Egypt, Gabon, Ghana, Gambia, The, Kenya, Lesotho, Morocco, Madagascar, Mozambique, Mauritania, Mauritius, Malawi, Niger, Nigeria, Rwanda, Sudan, Senegal, Swaziland, Chad, Tunisia, Tanzania, Uganda, South Africa, Zambia.

with staying in fragility during t=31 years is equal to a potential GDP per capita cumulative growth loss of 60.96%. They miss an opportunity to increase their initial GDP per capita by more than one quarter because of the exposure to fragility.

Figure 7: GDP per capita growth : Opportunity cost of fragility (Augmented specification: Non fragile Africa)



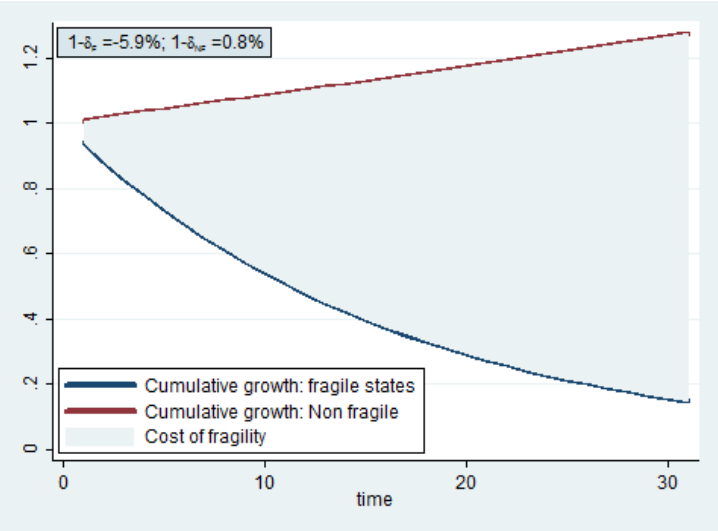
Source: Authors calculations.

- Frontier market countries

The group of frontier markets is composed of the emerging African economies.[7] The aim of sub-section is to compare the performance the fragile states with the best performing economies in Africa. Even if the comparison could probably result in an overestimation of the potential costs of fragility, it has the merit of emphasizing the gap that fragile states must fill in order to reach the economic development level in frontier markets. Figure 8 depicts the opportunity cost of fragility in terms of growth. As expected, the opportunity cost is higher when fragile states are compared to the frontier market countries. Indeed, the cumulative opportunity cost (112.5%), when evaluated at the end of the period (t=31) is 3 times more important than when fragile states are compared to the other African non-fragile states.

[7]Benin, Burkina Faso, Botswana, Cameroon, Cape Verde, Egypt, Ghana, Kenya, Lesotho, Mozambique, Mauritius, Rwanda, Senegal, Tunisia, Tanzania, Uganda, South Africa, Zambia.

Figure 8: GDP per capita growth : Opportunity cost of fragility (Augmented specification: Frontier markets)



Source: Authors calculations.

5.1.3 Costs in terms of GDP per capita

In this subsection, the economic costs in terms of GDP per capita growth, computed in Table 4, are translated into costs in terms of GDP per capita. The following formula derived from A1 is used to evaluate this cost:

$$\tau_{T'} = \sum_{j=1}^{N_F} w_j Y^F_{1980,j} \left(g_{T'_j} - g^F_{T'_j} \right) \tag{8}$$

where w_j are the share of each fragile state GDP per capita in the total GDP per capita of the group of fragile states.

In other words, the total opportunity cost of fragility is equal to the average opportunity cost in terms of growth $g_{T'_j} - g^F_{T'_j}$ multiplied by the weighted initial level of GDP per capita of each fragile states in 1980: $w_j Y^F_{1980,j}$. The quantity $\tau_{T'}$ provides the gap between the actual GDP per capita of fragile states (predicted by our model) and what would have been the GDP per capita level in fragile states if these countries had grown at an average rate similar to non-fragile countries. These costs are computed while assuming that the effects of exposure to fragility are not perpetual. For this purpose, we impose some restrictions on the duration of exposure to fragility. We estimate the cost of fragility for the period that the country was in active conflict (i.e. before the signing of a peace agreement).

Table 4 shows that after the first 10 years of exposure to fragility, fragile states experienced a cumulative growth loss of 32.18% (for the augmented specification). According to our simulations (shown in table 5), the equivalent cost per capita goes from US$54 to US$ 78.97 depending on the specification considered. This cost increases exponentially reaching a loss in terms of GDP per capita comprised between US$116.16 and US$206.71 when the simulations are extended until the end of our sample.

Table 5: : Summary economic costs (GDP per capita in $) of exposure to fragility during t years

Comparison Sample	Whole sample		Non fragile Africa	Frontier markets
Specification	Baseline	Augmented	Augmented	Augmented
T=5 years	-66.0285	-78.971	- 54.0148	- 74.7619
T=10 years	-119.8647	-137.837	-89.038	-129.269
T=15 years	- 164.7636	- 180.581	-109.435	-167.575
T=21 years	-178.958	-206.706	-116.1649	-189.4268

Source: Source: Authors calculations

The evaluation of economic costs of fragility using GMM estimations, even if it provides some plausible estimates of the costs of fragility, has some drawbacks. First, this approach considers a homogenous convergence parameter for all fragile states. In practice, the economic costs of fragility can be different for each fragile state. Second, this approach does not account for the fact that countries are exposed to fragility during different periods. Third, this approach assumes that all fragile states have the same group of comparison (counterfactual). Finally, this method is based on the assumption that countries grow at a constant geometric average growth rate during the sample period. Even if the expected (average) growth rate is not fully deterministic,[8] it does not account for potential structural breaks that could significantly affect the path of growth after the beginning of exposure to fragility. The second methodology of the counterfactual approach will allow us to fill these gaps.

[8]This average growth rate is estimated and in that sense it is also random. It approximately follows a normal distribution: $\hat{a} \rightarrow N(a, \hat{\sigma}_a)$, where 'a' is the true value of the average growth and $\hat{\sigma}_a$ is the estimated variance of 'a'.

5.2 Synthetic counterfactual approach

5.2.1 Description

A rigorous assessment of the economic cost of fragility for some selected fragile states in Africa requires a good description of what would have been the situation of each fragile country if this country was not exposed to fragility. The underlying idea behind the synthetic control method is related to the fact that it is impossible to observe what would have been the evolution of the situation of each fragile state if these were not exposed to fragility. This evolution is called 'counterfactual evolution"' and our starting assumption is thus that the counterfactual evolution of each fragile state is unobservable. The synthetic country is a weighted average of a group of countries that display similar characteristics to the fragile state before it became fragile. In practice, the counterfactual is identified as the 'not fragile' countries which are identical to fragile states regarding a set of structural characteristics, except for the criteria of fragility (governance, institutions, political instability). The synthetic country is constructed as a weighted average of a group of countries that display similar characteristics to the fragile state before it became fragile. For each fragile state, we identity the starting date of the exposure to fragility as corresponding to the beginning of the civil war (See Table 6 for identification of the starting dates). We use the starting date of conflicts (domestic or inter-states) as corresponding to the starting date of countries exposure to fragility. These dates are identified according to UCDP Conflict Termination dataset.[9] This dataset provide information on specific start- and end- dates for conflict activity and means of termination for each conflict episode.

Table 6: Start and End Dates of Fragility

Country	Starting date	End date
Liberia	1990	2003
Burundi	1991	2008
Sierra Leone	1991	2000
Central Africa Republic	2002	
Eritrea	1997	2003
Guinea Bissau	1997	2000

Source: http://*www.pcr.uu.se/research/ucdp/datasets/ucdp_conflict_termination_dataset/*

[9] http://www.pcr.uu.se/research/ucdp/datasets/ucdp_conflict_termination_dataset/

Then, a counterfactual evolution of GDP per capita is simulated for the pre- and post fragility period.[10] This counterfactual evolution is called synthetic counterfactual. It is worth noting that the construction this evolution gives rise to a trade-off. On the one hand, a good counterfactual must match the fragile state according to a large set of variables; on the other hand, using a large set of criteria in the choice of the counterfactual reduces the probability to find a counterfactual. We consider the following set of characteristics: political rights, civil liberties, number of phone lines per 1000 habitants, GDP per capita before the exposure to fragility, trade openness, investment share of GDP and the degree of ethnic fractionalization. Relying upon this set of characteristics we allocate a weight to each non-fragile country in our sample, depending on the degree of similarity with the fragile state during the pre-fragility period (displayed in Table 7).

Table 7: Construction of synthetic counterfactual with weights for each fragile state

Candidates for counterfactual	Burundi	Sierra Leone	Central African Republic	Eritrea	Guinea Bissau	Liberia
Bangladesh	0.447					
Burkina-Faso			0.014		0.111	
Chad	0.215		0.174			0.176
China, PR Mainland					0.099	
Cameroon			0.184			
Congo, Rep.						0.118
Gambia						0.10
Guyana					0.013	0.146
Lesotho					0.098	
Madagascar			0.205			
Malawi	0.130	0.267			0.60	
Mozambique	0.208			0.459		
Nepal		0.296	0.183	0.541	0.08	
Nigeria		0.437				0.04
Sudan			0.170			
Uganda	1.000	1.000	1.000	1.000	1.000	0.418
Sum weights	1.000	1.000	1.000	1.000	1.000	1.000

Source: Authors calculations

[10]The data is from Uppsala Conflict Data Program (UCDP), Uppsala University.

5.2.2 Case Studies

We apply successively synthetic counterfactual approach to the case of Liberia, Sierra Leone, Guinea, Guinea-Bissau, Eritrea, Central Africa Republic and Burundi. This first step allows us to find the right counterfactual for each country. The economic cost of exposure to fragility is then estimated. Table 8 presents the list of countries in the synthetic fragile states.

- The case of Liberia

Liberia is a country previously ravaged by wars and counter wars which began with a military coup in 1980. This was followed by an authoritarian regime with relative peace which allowed for an election in 1997, although fighting resumed in 2000 and a peace agreement was reached in 2003 to usher in a transitional government followed by national elections. Liberia is still considered fragile, however it has made steady progress in transitioning from fragility. Liberias per capita GDP is estimated to have declined by 90 percent from US$1269 in 1980 to US$163 in 2005.

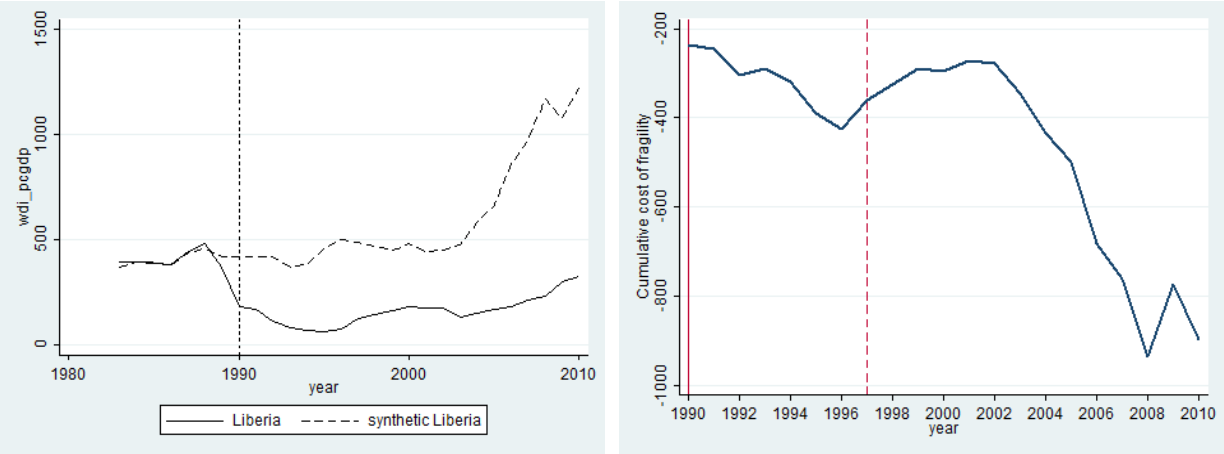
For our treated unit (namely Liberia), we identity the starting date of the exposure to fragility as corresponding to the beginning of the civil war in 1990. Therefore, the pre-fragility regime covers the period 1983-1989, while the exposure to fragility covers the period 1990-2010.

We consider the following set of characteristics: political rights, civil liberties, number of phone lines per 1000 habitants, GDP per capita before the exposure to fragility, trade openness, investment share of GDP and the degree of ethnic fractionalization. We observe that these characteristics for both the treated and synthetic are somewhat similar to each other, showing that on average the pre-fragility characteristics of actual Liberia are very similar with those of the synthetic Liberia constructed statistically (Annex A3), even if there seems to be a small difference between Liberia and synthetic Liberia regarding the following variables: number of phone lines per 1000ht and openness to trade. The weights reported in Table 7, indicate that growth trends in Liberia prior the exposure to fragility is best reproduced by a combination of Nigeria, Uganda, Guyana, Gambia, Chad and Congo.

Figure 9a displays GDP per capita growth for Liberia and its synthetic counterpart during the period 1983-2010. It indicates that GDP per capita growth in synthetic Liberia very closely tracks the trajectory of Liberia for the pre-fragility period (1983-1989). We observe that after

the beginning of civil war in 1990, there was a significant divergence with a slower growth path for fragile Liberia compared to synthetic Liberia. The difference between the growth trajectory of fragile Liberia and synthetic Liberia after 1990 provides an estimation of the economic cost of an exposure to fragility in Liberia. Figure 9b show the cumulative loss of per capita GDP as a result of fragility of Liberia since 1990.

Figure 9: Path of GDP per capita: Liberia vs. synthetic Liberia



(a) (b)

Source: Authors calculations

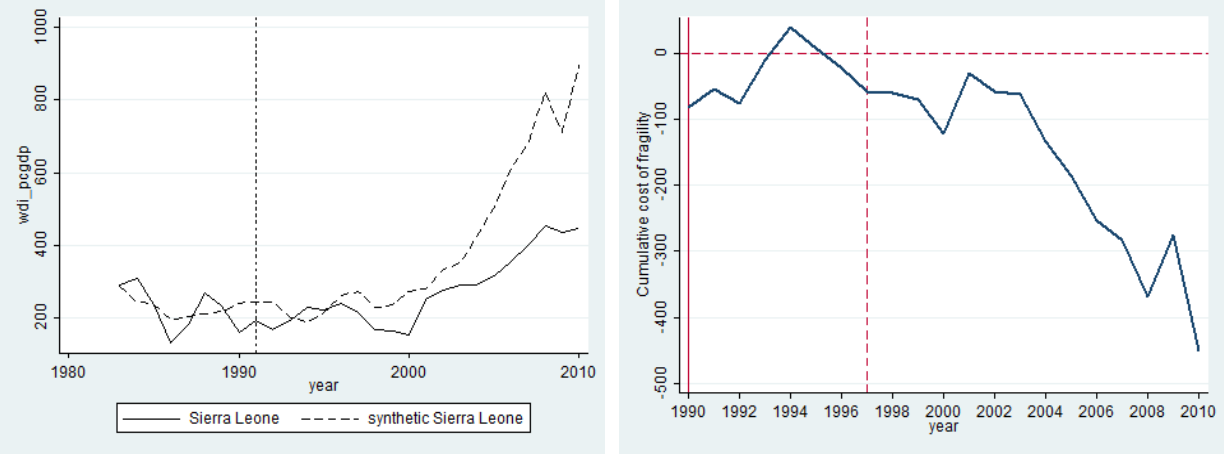
In Liberia after five years of the conflict, the loss in per capita GDP amounted to US$318 increasing to a loss of US$897 after 20 years of fragility. In actual GDP terms, the cost of fragility in Liberia after 20 years amounted to US$31.8 billion.

- The case of Sierra Leone

According the identification carried out by Uppsala Univeristy (UCDP Conflict Termination dataset), the starting date of exposure to fragility in Sierra Leone is 1991. Performing the first step of the synthetic counterfactual approach allows finding that the weights of the best combination of countries for a synthetic Sierra Leone would be 0.437 for Nigeria, 0.296 for Nepal and 0.267 for Malawi (see table 7). As shown in Figure 10, the fit for Sierra Leone is good in the pre-fragility period. The second step is to estimate the gap between GDP per capita paths of Sierra Leone and its synthetically constructed counterpart Sierra Leone. Table 7 shows the weight of each control country in the synthetic Sierra Leone. The weights reported in this table

indicate that growth trends in Sierra Leone prior the exposure to fragility is best reproduced by a weighted average combination of Nigeria, Nepal and Malawi. Figure 10(b) the GDP growth path for Sierra Leone and synthetic Sierra Leone and Figure 10(b) shows the cumulative loss of per capita GDP for Sierra Leone as a result of the exposure to fragility.

Figure 10: Path of GDP per capita: Sierra Leone vs. synthetic Sierra Leone



(a) (b)

Source: Authors calculations

We estimate the loss of GDP for Sierra Leone since the conflict. For Sierra Leone the potential loss in GDP per capita after 20 years of fragility is US$450 and in terms of GDP the total cost of fragility amounted to US$16.0 billion over the same period.

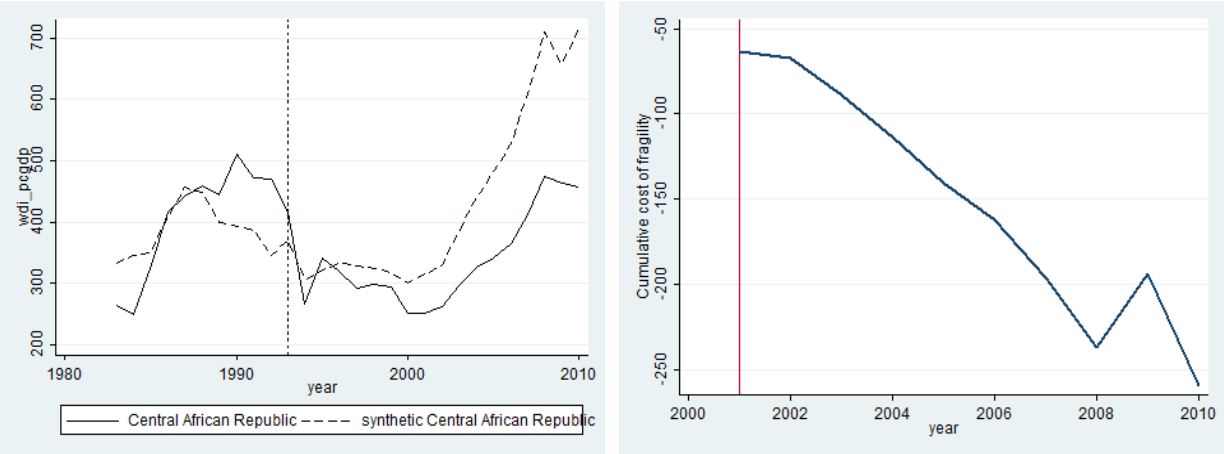
- The case of Central African Republic (CAR)

The Central African Republic (CAR) has been unstable since its independence from France in 1960 and has had one peaceful transfer of power, in 1993. The legacy of coup and past conflict in the CAR are the root cause of the conflict in the country today. Some progress towards stabilizing the country was made between 2008 and 2012. However in March 2013 a coalition of rebel groups Selka led a violent coup in CAR, ousting the former President Franois Boziz from ten years in power and installing the new President Michel Djotodia. CAR is now in the midst of a deepening humanitarian and economic crisis compounded by violence and widespread human rights violation. Linked to the history of coup is the weakness of state capacity and authority in many core state functions. State authority is weak in many parts of CAR and especially in the

northern regions and outside of the capital Bangui. Internal problems have been compounded by the destabilizing effects of regional politics. Given its history and geography (a landlocked country surrounded by several conflicts affected countries), CAR is particularly vulnerable to fluctuating regional developments. The crisis in the CAR needs to be dealt with.

Table 7 displays the weights of each of the control country in the synthetic Central Africa Republic. The weights reported indicate that growth trends in CAR prior the exposure to fragility is best reproduced by a weighted average combination of Burkina Faso, Cameroon, Chad, Madagascar, Nepal, Sudan and Uganda.

Figure 11: Path of GDP per capita: Central African Republic vs. synthetic Central African Republic



(a) (b)

Source: Authors calculations

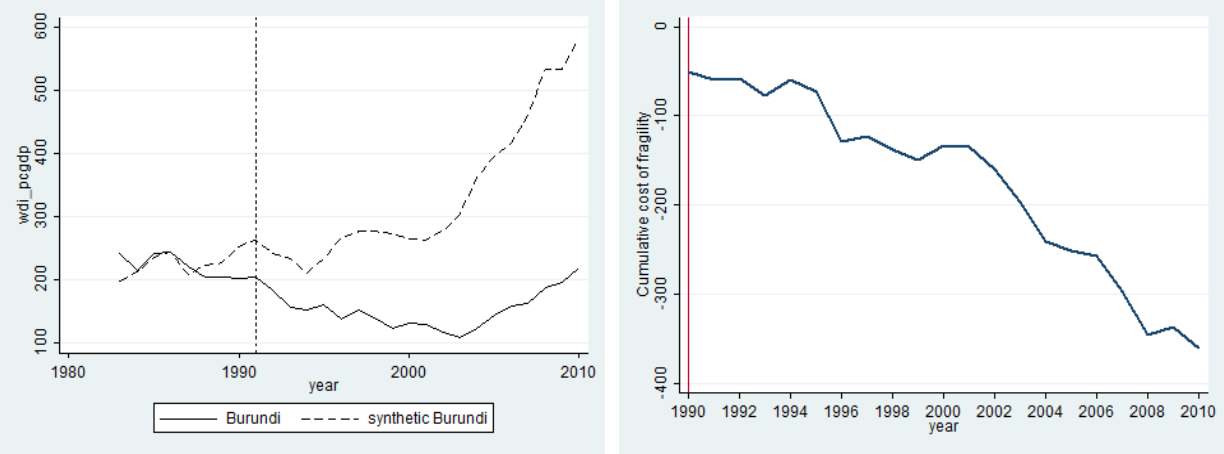
Figure 11a) shows that the growth path of CAR and synthetic CAR after 10 years of fragility, the loss in GDP amounted to US$9.18 billion and the per capita GDP loss was US$259.0

- The case of Burundi

In Burundi the beginning of the period of exposure to fragility corresponds to 1991. Based on this date, we identify the subset of countries whose characteristics were very similar to Burundi during the period 1984-1990 and allow a specific weight to each country according to the degree of similarity between Burundi and the synthetic country. Table 8 displays the weight of each control country in the synthetic Burundi. The weights reported in this table indicate that growth trends in Burundi prior the exposure to fragility is best reproduced by a weighted average

combination of Bangladesh, Chad, Malawi and Mozambique. Figure 12a) shows that if Burundi was not exposed to fragility, the Burundis economy would have been growing at the same rate of synthetic Burundi. The average GDP per capita was US$203.0 in 1991. According to our results, had Burundi experience similar growth to the combination of Bangladesh, Chad, Malawi and Mozambique, the GDP per capita would have increase by US$318.34 (or by 121.32%) reaching US$580.73 in 2010. Instead, because of fragility GDP capita grew by US$16.5 (or by 0.0812%) reaching US$219.5 in 2010.

Figure 12: Path of GDP per capita: Burundi vs. synthetic Burundi



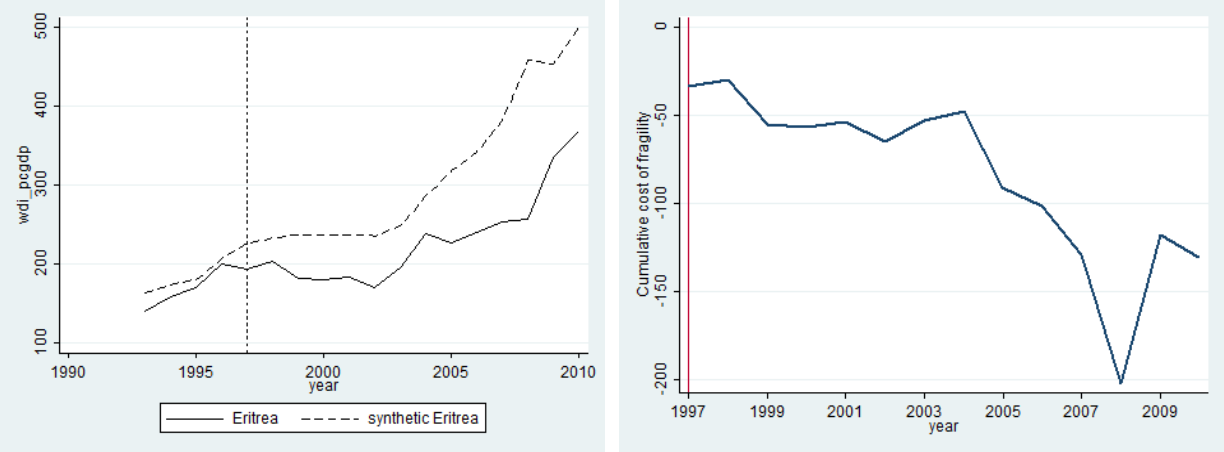
(a) (b)

Source: Authors calculations

- The case of Eritrea

We identify 1997 as the starting date of fragility in Eritrea. Table 7 suggests that the weights of the best combination of countries for a synthetic Eritrea would be 0.459 for Mozambique and 0.541 for Nepal. As shown in Figure 14, the fit for Eritrea is fairly good in the pre-fragility period. After 1997, Figure 13 stresses a significant divergence in GDP per capita paths of Eritrea and synthetic Eritrea. Interestingly, the process of divergence starts one year before the exposure to fragility. The most important gap is observed in 2007 (US$201.57), this gap illustrates a delay in the adjustment of GDP per capita in Eritrea compared to synthetic Eritrea. This gap emphasizes the idea that the opportunity cost of fragility depend not only on the business cycle in the fragile state but also on the economic developments in the synthetic Eritrea.

Figure 13: Path of GDP per capita: Eritrea vs. synthetic Eritrea



(a) (b)

Source: Authors calculations

- The case of Guinea Bissau

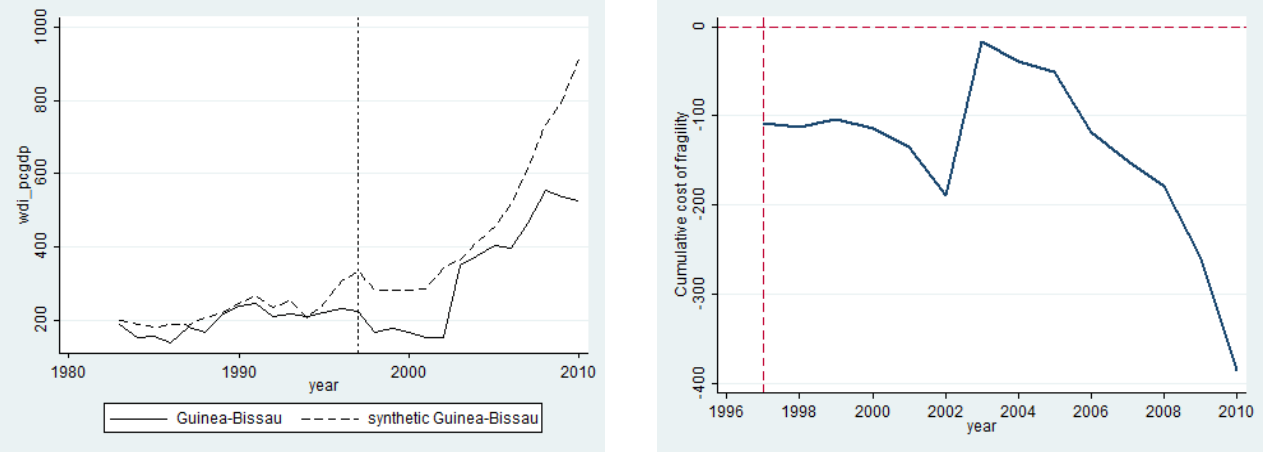
By examining the history of Guinea Bissau and according to the UCDP Conflict Termination dataset, we selected 1997 as the year in which the civil war occurred in Guinea Bissau. Then, the synthetic Guinea Bissau is constructed. Our results suggest that the weights of the best combination of countries for a synthetic Guinea Bissau would be 0.6 for Malawi, 0.111 for Burkina Faso, 0.099 for China, 0.098 for Lesotho, 0.08 for Nepal and 0.013 for Guyana (see Table 7).

Figure 14 reports the results for the synthetic control method. As in the the cases studied above, we find that the paths of Guinea Bissau and of its synthetic counterpart country diverge after the exposure to fragility in 1997.

The divergence in GDP per capita paths persists from 1997 to 2003. After 2003, GDP per capita has grown steadily at 6.37%, however this growth rate was not enough to catch up with the Guinea Bissaus synthetic counterfactual which, at the same time, has grown at an average rate of 1.79%.[11] In consequence, in spite of a significant decrease in 2003, the gap between Guinea Bissau and its counterfactual is still deepening after 2003 reaching US$-386.32 in 2011.

[11] x% $= \frac{1}{T}\sum_{t=2003}^{2011}\sum_{j=1}^{5} w_j * g_{jt}$, where $w_{Malawi} = 0.6$; $w_{China} = 0.099$; $w_{Burkina} = 0.111$; $w_{Lesotho} = 0.098$; $w_{Nepal} = 0.08$ (taken from table 7)

Figure 14: Path of GDP per capita: Guinea Bissau vs. synthetic Guinea Bissau



(a) (b)

Source: Authors calculations

5.3 Summary results: Synthetic Counterfactual

In this section, we compute the average cost of fragility expressed in terms of GDP per capita over different time horizons (5, 10, 15 and 20 years). Then, the overall cost of fragility, for the whole population, is estimated for each fragile state.

Table 8 shows the potential loss in GDP per capita for selected fragile states. Eg. In Liberia (Figure 9) after five years of the conflict, the loss is US$318 per capita increasing to a loss of US$897 per capita GDP, compared to the synthetic evolution after 20 years. Similarly for Sierra Leone the potential loss in GDP per capita after 20 years is US$450 and in Burundi it was US$361. In countries with a shorter duration of conflict the commulative lost of per capita GDP after 10 years in Eritrea and CAR amounted to US$691, US$101 and US$259 respectively.

Table 8: Cumulative cost of fragility after T years of exposure to fragility (in terms of US$ per capita)

Duration of exposure	Liberia	Sierra-Leone	Guinea Bissau	Eritrea	Central africa	Burundi
T=5 years	-318.35	0	-134.38	-53.51	-140.34	-59.52
T=10 years	-288.99	-69.68	-119.24	-101.19	-259.05	-148.90
T=15 years	-433.73	-134.30	-386.32			-240.50
T=20 years	-897.04	-450.38				-361.21

Source: Authors calculations

The comparison of results obtained using synthetic counterfactual approach (table 9) and

convergence model (table 5). For instance, the average cost of an exposure of 10 years to fragility amounts US$120per capita for convergence model (Baseline specification) while fragility costs on average US$186 when the second method is used.[12] Our preferred estimations are those provided by the synthetic counterfactual, since they are more precise than those provided by the convergence model. Indeed, recall that the convergence model is based on the strong assumption that fragility affects homogeneously all the fragile states contrary to the synthetic counterfactual approach which is designed for case-study.

Table 10 shows the evolution of cumulative cost of fragility in USD. The numbers displayed are obtained by multiplying the costs per capita (table 9) by the size the population of the corresponding fragile state. Recall that the potential economic costs of fragility are computed as the difference between the paths of GDP per capita of each fragile state and its counterfactal after the exposure to fragility. For this reason, their fluctuations will depend upon not only on the fluctuations of GDP per capita in the fragile state but also in the counterfactual. Worsening economic conditions in the counterfactual will yield a lower cost of fragility. Consersely, positive economic developments in the counterfactual will lead to a higher cost of fragility. These developments could explain why the cumulative cost of fragility (sometimes) evolves non-monotonically (e.g. in Guinea-Bissau).

Table 9: Cumulative cost of fragility after T years of exposure to fragility (in billion of US $)

Duration of exposure	Liberia	Sierra-Leone	Guinea Bissau	Eritrea	Central africa	Burundi
T=5 years	-8.75	0	-4.16	-1.66	-4.61	-1.64
T=10 years	-8.66	-2.09	-3.98	-3.37	-9.18	-4.46
T=15 years	-14.0	-4.35	-13.7			-7.78
T=20 years	-31.8	-16.0				-12.8

Source: Authors calculations

Table 9 that shows in 20 years of fragility, the cumulative economic cost of fragility in Liberia, Sierra Leone and Burundi amounted to US$31.8 billion, US$16.0 billion and US$12.8 billion respectively. Whereas in Guinea Bissau, CAR and Eritrea, after 10 years of fragility the loss is US$3.98 billion, US$3.37 billion and US$9.18 billion respectively.

[12] -186 $= \sum_{j=1}^{N} c_{kj} w_j$, where c_{kj} are the costs reported in table 8 and are the share of each fragile state GDP per capita in the total GDP per capita of the group of fragile states.

6 Sensitivity analysis

6.1 Restrictions on the date of termination of exposure to fragility

In this paragraph, we re-estimate the cost of fragility taking into account the fact that the effects of civil wars are not persistent over an infinite horizon after the exposure to fragility. The termination dates of exposure to conflict given in Table 10 are taken from the UCDP Conflict Termination dataset.[13]

Table 10: Estimated termination dates of conflict

Country	Date
Liberia	2003
Burundi	End 2008
Sierra Leone	End 2000
Central Africa Republic	?
Eritrea	2003
Guinea Bissau	Mid 2000

Source: UCDP Conflict Termination dataset

Table 11: Cumulative cost of fragility after T years of exposure to fragility for selected fragile states (in billion of US$)

Duration of exposure	Liberia	Sierra-Leone	Guinea Bissau	Eritrea	Central africa	Burundi
Cumulative Costs	- 11.0	-3.7	- 3.49	-3.00	-9.18	-11.9

Source: Authors calculations

Our results show the economic cost to the country when they were in active conflict, i.e. before the signing of a peace agreement or resolution of the conflict situation. The duration of the conflict in Liberia from 1990-2003, cost the economy a total of US$11.0 billion and in the case of Sierra Leone 1991-2000, the economic cost was US$3.7 billion. The conflict in Central

[13]Seven (7) different types of termination are included in this dataset: (a) Peace Agreement: Agreement, or the first or last in a series of agreements, concerned with resolving or regulating the incompatibility completely or a central part of which is signed and/or accepted by all or the main parties active in last year of conflict. (b) Ceasefire Agreement with conflict regulation: Agreement between all or the main parties active in last year of conflict on the ending of military operations as well as some sort of mutual conflict regulatory steps. (c) Ceasefire Agreement: Agreement between all or the main parties active in last year of conflict on the ending of military operations. The agreement is signed and/or accepted either during the last year of active conflict or the first year of inactivity. (d) Victory; (e) Low Activity: Conflict activity continues but does not reach the UCDP threshold with regards to fatalities; (f) Other: Conflict does not fulfill the UCDP criteria with regards to organization or incompatibility. (g) Joining alliance: The rebel side continues to fight but ceases to exist as an independent organization.

Africa Republic is costing the economy US$9.18 billion and this is set to increase given the recent developments in the country that is increasing its fragility.

6.2 Determination of the potential duration for recovery

Collier et al. (2004) claim that civil wars last about seven years on average but that it takes around 21 years to return to the prewar income. The total cost of civil war is calculated at almost $3 billion a year. The costs depend critically upon what is assumed about subsequent recovery. They suggest that there is reasonable evidence that in the typical post-conflict situation the economy has a phase of above-normal growth (Collier and Hoeffler, 2004a). It is thus of interest to determine the time required for fragile states to recover their potential level of GDP in 2010. This potential level of GDP is theoretically equal to GDP per capita of their synthetic counterfactual in 2010. We try to respond to the following question: if the growth rate of fragile states was equal to the growth rate observed at 2010 what would be the duration necessary for them to reach the actual GDP per capita if they had not been exposed to fragility (i.e. the GDP per capita of their counterfactual in 2010)?

Let denote the synthetic counterfactuals GDP per capita level in 2010 by $Y_{2010}^{C_i}$ and by g_{2010}^{i} and Y_{2010}^{i} the level of GDP per capita and the growth rate of a specific fragile state in 2010, the time necessary to recover is derived as follow:

$$Y_{2010}^{C_i} = Y_{2010}^{i}\left(1+g_{2010}^{i}\right)^{t} \quad \Rightarrow \quad t_i = \frac{log\left(\frac{Y_{2010}^{C_i}}{Y_{2010}^{i}}\right)}{log\left(1+g_{2010}^{i}\right)} \tag{9}$$

where $Y_{2010}^{C_i} = \sum_{j=1}^{K} w_j Y_{j,2010}^{C_i}$ and $\sum_{j=1}^{K} w_j = 1$.

The results of this scenario are displayed in Table 12. The simulations suggest that if Central Africa Republic had grew at same rate as its growth rate in 2010, it would take 34.5 years to recover the level of GDP per capita that it would reach if it has not been exposed to fragility. Burundi and Sierra Leone economies would take respectively 19.2 years and 20.75 to recover the GDP per capita levels of their synthetic counterfactuals in 2010. The case of Burundi is exceptional since the simulations suggest that this country will take over 280 years to recover. The main explanation of this result is that the growth rate of GDP per capita of Burundi is close

to 0 (specifically 0.0034) in 2010. This first scenario provides some fairly optimistic prospects for recovery since the average duration for recovery is evaluated to be roughly equal to 24.82 years (the duration for recovery in Burundi is not taken into account).

Table 12: Durations before recovery

Country	Scenario 1		Scenario 2		Scenario 3	
	Duration (years)	Growth rate in 2010 (%)	Duration (years)	Growth rate (%)	Duration (years)	Growth rate (%)
Burundi	282.13	0.3454	102.66	0.9521	11.93	8.50
Central Africa Republic	34.47	1.3129	45.64	0.9902	12.90	3.542
Liberia	19.22	7.1150	17.30	7.934	17.57	7.81
Sierra Leone	20.76	3.4102	22.71	3.111	7.79	9.349
Eritrea	NA	-1.068	NA	-3.93	3.14	10.12
Guinea Bissau	NA	-.5715	45.28	1.222	18.86	2.961

Source: Authors calculations. Note: we are not able to compute the duration for Eritrea and Guinea Bissau because their growth rates in 2010 are negative.

Under the second scenario, the growth projects are assumed to be best described by the growth dynamics of each fragile state during the last five (5) years. The annual growth rate after 2010 is thus assumed to follow the same pattern with the growth trends during the last five years. This scenario provides the most pessimistic recovery durations. Indeed, the average duration for recovery after an exposure to fragility is estimated to be 32.73 years.

Finally, we consider that the dynamics of economic growth in fragile states and in their respective counterfactuals is best described by the IMFs growth prospects for the period 2010-2018. Based upon this assumption, what would be the duration for recovery? This last scenario provides more optimistic recovery durations. Indeed, under this scenario, the average duration of recovery is equal to 12.03 years. These simulations emphasize how fragility affects the path of GDP per capita of fragile states.

7 How Much Have Fragile States Been Receiving in Development Aid?

Table 13: Net ODA Disbursements to fragile states (billions US$)

Country	Cumulative Total 2002-2011	Cumulative ODA (in % of Costs)
Burundi	4.92	90.65%
CAR	1.84	20.04%
Eritrea	2.48	73.59%
Guinea Bissau	1.28	32.16%
Liberia	5.94	68.59%
Sierra Leone	4.71	225%

Source: OEDC/DAC; www.aidflows.org. The ratio is obtained by dividing the cumulative ODA by the cumulative cost over the first 10 years of fragility.

Table 13 gives the cumulative total of aid flows to the selected fragile states in this study in the last ten years (2002-2011). Comparing these total aid flows to the calculated economic cost of fragility (table 5) shows that the cost of conflict is significantly higher than the total aid flows from 2002-2011 when most of these countries were in the post conflict and reconstruction phase.

The continuing financial crisis and the Eurozone turmoil have led several donor countries to tighten their budgets which will have a direct impact on development and especially in fragile countries. This is compounded by the shift in Aid allocation from the poorest countries towards middle income countries (OECD).

According to the OECD, Aid has declined by 2.4 percent in 2011 and will continue its downward trend. At the same time the share of the worlds poor found in fragile states is set to rise to half by 2018. Yet the aid they receive is shrinking, and they have limited access to alternatives sources for financing development such as remittances and foreign direct investment. The domestic revenues they raise are not enough. Of the seven countries that are unlikely to meet a single MDG, six are fragile.

8 Conclusion

This paper has used empirical analysis to demonstrate that fragility is very costly and the cost of fragility runs into billions of dollars. We have also shown that the speed of growth of fragile states is lower when compared to a synthetic group of countries that display similar characteristics before the onset of conflict/fragility. Our results also show that it take about 12 to 33 years depending on the scenario for an average fragile states to return to their potential level of GDP had these countries not experience fragility. The result of the report serves well the Banks direction in supporting fragile states with a long term and sustainable perspectives.

The past few years have seen increasing international engagement in fragile states as well as a growing convergence of development, security, peace-building, state-building and related agendas. What seems to unite international opinion is that the risks of failing to engage in these contexts both for the countries themselves and for the international community outweigh most of the risks of engagement. The question is not whether to engage but how to do so in ways that do not cause harm and do not come at an unacceptable cost.

Fragile states are, by their nature, changeable environments given their weak institutions, proneness to internal shocks and low levels of resilience. Evidence shows that early attention to the fundamentals of economic growth increases the likelihood of successfully preventing a return to conflict and moving forward with renewed growth.

Inclusive economic growth programs in fragile and post conflict states reduces the risk of return to conflict and accelerate the well-being for everyone particularly the conflict affected population. Economic issues may have contributed to the outbreak of conflict and fragility in the first place, through an inequitable distribution of assets and opportunities or simply through a widely held perception of inequitable distribution. Economic intervention need to be an integral part of a comprehensive restructuring and stabilization program. While economic growth is not the sole solution to resolving post conflict issues, it can clearly be a significant part of the solution.

Fragile and post-conflict economic growth programs must address as directly as possible the factors that led to the conflict, taking into account the fragility of the environment. Planning has to be based on much more than narrow technical consideration of economic efficiency and growth stimulation. Programs also must be effective at opening up opportunities and increasing

inclusiveness; they should be judged in part on the basis of whether or not they help mitigate political factors that increase the risk of a return to hostilities.

A lot of progress has been made in resolving conflict in Africa but more effort is needed to accelerate progress such as:

- Prioritizing and mainstreaming peacebuilding and statebuilding strategies in national development plans.
- Investing in under resourced areas, including security and justice and employment creation.
- Invest in prevention and local conflict management and resolution mechanisms.
- Develop regional approaches to conflict and violence that spillover across borders.
- Act to reduce global stresses that precipitate violence, such as trafficking in drugs, small arms and natural commodities.

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A Appendices

A.1 Description variables

Table A.1: Data description

Variables	Definition	Sources
Gross domestic product per capita, constant prices	GDP is expressed in constant national currency per person. Data are derived by dividing constant price GDP by total population.	World Economic Outlook (April 2013)
Total Investment (Percent of GDP)	Expressed as a ratio of total investment in current local currency and GDP in current local currency. Investment or gross capital formation is measured by the total value of the gross fixed capital formation and changes in inventories and acquisitions less disposals of valuables for a unit or sector. [SNA 1993]	World Economic Outlook (April 2013)
Gross national savings (Percent of GDP)	Expressed as a ratio of gross national savings in current local currency and GDP in current local currency. Gross national saving is gross disposable income less final consumption expenditure after taking account of an adjustment for pension funds. [SNA 1993]	World Economic Outlook (April 2013)
Government Share of GDP (%)	The share of government spending as a percentage of GDP.	The Quality of Governments (QOG) Basic Dataset (2012)
Political rights	include the right to speech and expression, the right to assembly and association, and the right to political participation. Each country and territory is assigned a numerical ratingon a scale of 1 to 7. A rating of 1 indicates the highest degree of freedom and 7 the lowest level of freedom.	Freedom House
Civil liberties	Civil rights include (but are not limited to) personal integrity rights such as the right to life, liberty and personal security; the right to equality before the law; and the right to religious freedom and worship. Each country and territory is assigned a numerical ratingon a scale of 1 to 7. A rating of 1 indicates the highest degree of freedom and 7 the lowest level of freedom.	Freedom House
Debt crises	Sovereign debt crises are reported in the case of sovereign defaults to private lending and in a year of debt rescheduling.	Laeven and Valencia (2012)
Currency crises	A currency crisis is defined as a nominal depreciation of the currency of at least 30 percent, which is also at least a 10 percent increase in the rate of depreciation compared to the year before. It also comprises large devaluations by countries under fixed exchange rate regimes.	Laeven and Valencia (2012)
Banking crises	The existence of a banking crisis is evaluated on the basis of a number of quantitative and subjective criteria, such as a large number of defaults and a high quantity of nonperforming loans.	Laeven and Valencia (2012)

Table A.3: Data description

Variables	Definition	Sources
Total Fractionalization	Measure the probability that two random draws would produce legislators from different parties.	Database of Political Institutions 2012 (updated Jan. 2013)
Government Fractionalization	Measure the probability that two random draws would produce legislators from different parties.	Database of Political Institutions 2012 (updated Jan. 2013)
Ethnic Fractionalization	Average value of five different indices of ethonolinguistic fractionalization. Its value ranges from 0 to 1. The five component indices are: (1) index of ethonolinguistic fractionalization in 1960, which measures the probability that two randomly selected people from a given country will not belong to the same ethonolinguistic group(the index is based on the number and size of population groups as distinguished by their ethnic and linguistic status); (2) probability of two randomly selected individuals speaking different languages; (3) probability of two randomly selected individuals do not speak the same language; (4) percent of the population not speaking the official language; and (5) percent of the population not speaking the most widely used language.	
Gini index	Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.	WDI (2013)
Number of phone line/100 ht	Telephone lines are fixed telephone lines that connect a subscriber's terminal equipment to the public switched telephone network and that have a port on a telephone exchange. Integrated services digital network channels and fixed wireless subscribers are included.	WDI (2013)
Under-5 Mortality Rate (per 1,000 Live Births)	Under-five mortality rate is the probability per 1,000 that a newborn baby will die before reaching age five, if subject to current age-specific mortality rates.	WDI (2013)
Trade openness	Exports plus imports as percentage of GDP. Measured at constant 1990 prices. (United Nations Statistics Division National Accounts)	The Quality of Governments (QOG) Basic Dataset (2012)
Voice and Accountability	Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	World Bank Governance Indicators (2013)

A.2 Additional Results

Table A.5: Estimations of convergence model

	Whole sample		Whole sample		Non fragile Africa	Frontier markets (Africa)
	Baseline model		Extended model			
	Non fragile	Fragile	Non Fragile	Fragile		
	(1)	(2)	(3)	(4)	(5)	(6)
$Log\,(GDP\_CAP_{t-1})$	1.010***	0.956***	1.011***	0.941***	0.991***	1.008***
	(0.013)	(0.010)	(0.010)	(0.133)	(0.007)	(0.033)
Total Investment (% GDP)			0.002	0.004	-0.000	0.004***
			(0.002)	(0.007)	(0.001)	(0.001)
Government share of GDP (%)			-0.003**	0.001	-0.001	-0.001
			(0.001)	(0.01)	(0.001)	(0.004)
Political Rights			0.007*	-0.122	0.009	0.017**
			(0.004)	(0.257)	(0.006)	(0.007)
Civil liberties			-0.019***	0.170	-0.026***	-0.026**
			(0.006)	(0.424)	(0.006)	(0.013)
Cultural diversity			0.352***	0.839	0.127	-0.070
			(0.127)	(1.148)	(0.119)	(0.525)
Debt crises (episodes)			-0.004	-0.006	0.003	0.003
			(0.014)	(0.014)	(0.017)	(0.028)
Banking crises (episodes)	-0.011	-0.017	-0.001	0.074	0.004	-0.019
	(0.011)	(0.062)	(0.010)	(0.829)	(0.014)	(0.019)
Currency crises (episodes)	-0.031***	0.003	-0.021**	0.000	-0.012	-0.007
	(0.008)	(0.023)	(0.007)	(.)	(0.011)	(0.020)
Constant	-0.093	0.508***	-0.142	0.000	0.162**	-0.067
	(0.136)	(0.092)	(0.120)	(.)	(0.077)	(0.303)
Obs	1967	190	1824	170	864	440
Arellano-Bond test for AR(2)	0.052	0.627	0.082	0.756	0.695	0.927
Hansen test	0.006	0.719	0.140	1.000	0.297	0.267
Average growth rate : $100*\left(Coef_{GDP\_CAP_{t-1}} - 1\right)$	1%	-4.4%	1.1%	-5.9%	-0.1%	0.8%

Note: Standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01

Table A.6: Predictor balance Liberia and Sierra Leone

	Liberia		Sierra Leone	
	Treated	Synthetic	Treated	Synthetic
GDP per capita	405.7923	405.9755	228.0155	230.6445
Political rights	5.285714	5.294286	5.125	5.092125
Civil liberties	5	4.992286	5	5.103125
Number of phone line/1000 ht	.3621428	.5254079	0.3534235	0.235126
Ethnic Fractionalization	.908388	.8483452	0.81909	0.7486927
Investment Share of GDP	11.78651	10.94871	7.753188	10.17761
Openness to Trade, Constant Prices (%)	74.68092	69.27032	28.71676	52.98696

Table A.7: Predictor balance Burundi and Guinea Bissau

	Liberia		Sierra Leone	
	Treated	Synthetic	Treated	Synthetic
GDP per capita	221.5058	224.8625	199.3564	224.9927
GDP per capita growth	1.057139	1.049199	1.695269	1.750012
Political rights	-	-	5.428571	5.312857
Civil liberties	6	5.885	5.5	5.5025
Number of phone line/1000 ht	-	-	0.5823092	0.4490135
Ethnic Fractionalization	.295144	.4375034	0.808214	0.5878554
Investment Share of GDP	6.126172	7.272993	24.86163	16.23109
Openness to Trade, Constant Prices (%)	35.60298	34.04314	35.77753	63.31832

Table A.8: Predictor balance Burundi and Guinea Bissau

	Liberia		Sierra Leone	
	Treated	Synthetic	Treated	Synthetic
GDP per capita	357.5201	357.2163	166.784	181.016
Political rights	4.894737	4.893895	-	-
Civil liberties	5	4.995368	4.5	4.2295
Number of phone line/1000 ht	.1975339	.2906299	0.5063968	0.3887618
Ethnic Fractionalization	.82951	.8282083	0.6524	0.6769893
Investment Share of GDP	8.32556	8.266083	23.96366	13.31915
Openness to Trade, Constant Prices (%)	40.74956	40.80291	121.3764	55.38409

A.2.1 Falsification (or placebo) tests

To which extent the estimated impacts are attributable to fragility? Following Abadie et. Al. (2003), Abadie et al. (2010) and Bertrand et al. (2004), we perform placebo tests by applying the synthetic control method to states that did not experience fragility during the sample period of our study.

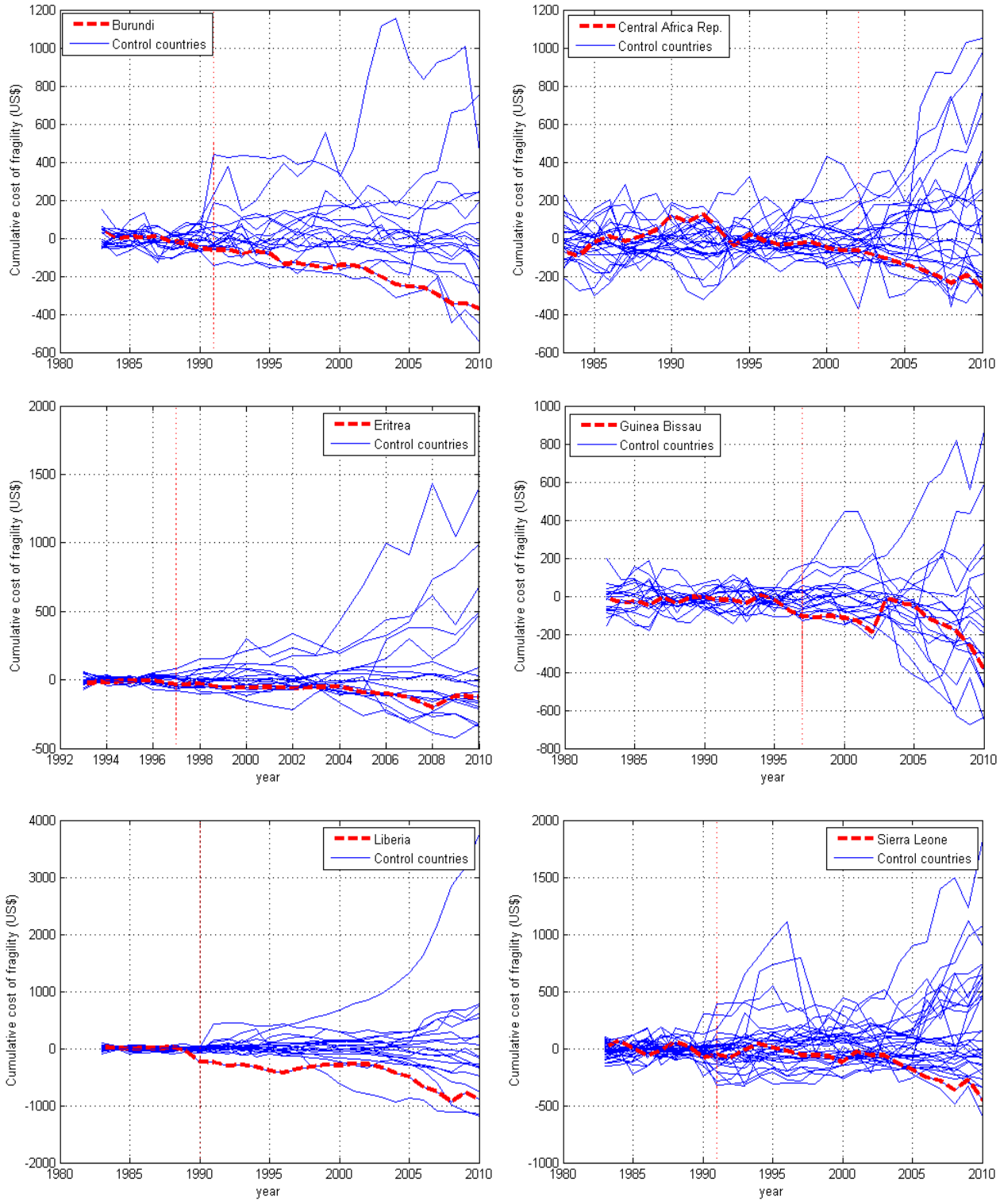
In practice, these tests are conducted by iteratively applying the synthetic control method used to estimate the effect of fragility to every other country in the donor pool. In each iteration, a fragility shock control is reassigned to one of our sample country, shifting each fragile country to its potential control group. That is, we proceed as if one of the countries in the potential control group would have been exposed to fragility, instead of the actual fragile country. We then compute the estimated effect associated with each placebo run. This iterative procedure provides us with a distribution of estimated gaps for the countries where no fragility took place.

The results of the falsification (placebo) tests are displayed in Figure 15. In this figure, we show only the placebo tests for which the synthetic control method provides an excellent fit. In that order of ideas, we exclude all countries that had a pre-fragility mean squared prediction error (MSPE) of more than three times the MSPE of the considered fragile country. The blue lines represent the gap associated with each of the N runs of the placebo test. That is, the blue lines show the difference in GDP per capita between each country in the donor pool and its respective synthetic version. The red dash line denotes the gap estimated for the considered fragile country.

Evaluated against the distribution of the gaps for the 19 remaining control countries to the placebo runs, the gaps observed for Liberia and Burundi (and to a lesser extent for Eritrea) exhibit an unusual pattern after the exposure to fragility, suggesting that the gap in GDP per capita observed in the post fragility period could reasonably be attributed to fragility.

For Guinea Bissau, we also observe a particularly important gap during the first five years of exposure to fragility and after this period the results are mixed (at least 5 countries exhibit a deeper gap). Finally, for Sierra Leone and Central African Republic, the falsification tests show that the gap is deeper in more than 75% of the cases after the exposure of these countries to fragility.

Figure 15: : Falsification tests for a selected list of fragile states



A.2.2 List of countries

Non fragile states : Angola, Albania, Argentina, Benin, Burkina Faso, Bangladesh, Bulgaria, Belarus, Bolivia, Brazil, Bhutan, Botswana, Chile, China,P.R.: Mainland, Cte d'Ivoire, Cameroon, Congo, Republic of, Colombia, Cape Verde, Costa Rica, Djibouti, Dominican Republic, Algeria, Egypt, Fiji,Gabon, Ghana, Gambia, The, Guatemala, Guinea, Guyana, Honduras, India, Iran, Islamic Republic of, Jamaica, Jordan, Kenya, Cambodia, Lebanon, Sri Lanka, Lesotho, Morocco, Madagascar, Mexico, Myanmar, Mongolia, Mozambique, Mauritania, Mauritius, Malawi, Malaysia, Niger, Nigeria, Nicaragua, Nepal, Pakistan, Panama, Peru, Philippines, Papua New Guinea, Paraguay, Russia, Rwanda, Sudan, Senegal, El Salvador, Swaziland, Chad, Thailand, Tunisia, Turkey, Tanzania, Uganda, Ukraine, Uruguay, Venezuela, Rep. Bol., Yemen, Republic of, South Africa, Zambia.

Fragile states: Burundi, Central African Republic, Eritrea, Guinea-Bissau, Liberia, Mali, Sierra Leone, Togo, Zimbabwe.

A.2.3 Technical appendix:

Construction of the synthetic counterfactual (Following Abadie et al. 2010)

Since counterfactual path of outcome is unknown, we suppose that is given by the following factor model:

$$Y_{it}^{N} = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \epsilon_{it} \tag{10}$$

where δ_t is an unknown common factor with constant factor loadings across units, is a $(r \times 1)$ vector of observed covariates (not affected by fragility), is a $(1 \times r)$ vector of unknown parameters, is a $(1 \times F)$ vector of unobserved common factors, is an $(F \times 1)$ vector of unknown factor loadings, and the error terms are unobserved transitory shocks at the region level with zero mean.

The synthetic counterfactual is constructed, first by allowing a specific weight (w_j) to each potential candidate country and then, we compute what would have been the outcome path of fragile countries if these countries were not exposed to fragility (Y_{it}^{N}). Consider a $(J \times 1)$ vector of weights $W^* = \left(w_2^*, ..., w_{J+1}^*\right)$ such that $w_j^* \geq 0$ for $j = 2...J+1$ and $w_2^* + ... + w_{J+1}^* = 1$. Each particular value of the vector W represents a potential synthetic control, that is, a particular weighted average of control countries. The value of the outcome variable for each synthetic

control indexed by W is, thus, equal to:

$$\sum_{j=1}^{J+1} w_j Y_{jt} = \sum_{j=1}^{J+1} w_j \delta_t + \sum_{j=1}^{J+1} w_j \theta_t Z_j + \sum_{j=1}^{J+1} w_j \lambda_t \mu_j + \sum_{j=1}^{J+1} w_j \epsilon_{jt} \tag{11}$$

A synthetic control such that

$$\sum_{j=1}^{J+1} w_j Z_{ij} = Z_1 \quad and \quad \sum_{j=1}^{J+1} w_j \mu_j = \mu_1 \tag{12}$$

would provide an unbiased estimator of (Y_{it}^N).

Table A.9: Recent Publications in the Series

n	Year	Author(s)	Title
196	2014	Guy Blaise Nkamleu and Bernadette Dia Kamgnia	Uses and Abuses of Per-diems in Africa: A Political Economy of Travel Allowances
195	2013	Mthuli Ncube, John Anyanwu and Kjell Hausken	Inequality, Economic Growth, and Poverty in the Middle East and North Africa (MENA)
194	2013	Amadou B. Diallo	The Impact of Community Development Works Programs (CWP) on Households Wellbeing in Albania
193	2013	Issa Faye, Ousman Gajigo, and Emelly Mutambatsere	Large Scale Agribusiness Investments and Implications in Africa: Development Finance Institutions' Perspectives
192	2013	Adeleke Salami and Damilola Felix Arawomo	Empirical Analysis of Agricultural Credit in Africa: Any Role for Institutional Factors?
191	2013	Cisse Fatou and Ji Eun Choi	Do Firms Learn by Exporting or Learn to Export: Evidence from Senegalese Manufacturers Plants
190	2013	Giovanni Caggiano, Pietro Calice, and Leone Leonida	Early Warning Systems and Systemic Banking Crises in Low Income Countries: A Multinomial Logit Approach
189	2013	Eliphas Ndou, Nombulelo Gumata, Mthuli Ncube and Eric Olson	An Empirical Investigation of the Taylor Curve in South Africa
188	2013	Mthuli Ncube and Zuzana Brixiova	Remittances and Their Macroeconomic Impact: Evidence from Africa
187	2013	Zuzana Brixiova, Balzs gert, and Thouraya Hadj Amor Essid	The Real Exchange Rate and External Competitiveness in Egypt, Morocco and Tunisia

African Development Bank

Angle de l'avenue du Ghana et des rues Pierre
de Coubertin et Hédi Nouira
BP 323 –1002 Tunis Belvédère (Tunisia)
Tel.: +216 71 333 511 – Fax: +216 71 351 933
E-mail: afdb@afdb.org – Internet: www.afdb.org