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Article

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CESifo Forum

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Suggested Citation: Nam, Chang Woon; Schumacher, Jan (2014) : Dynamics and Time Frame of Post War Recovery Required for Compensating Civil War Economic Losses, CESifo Forum, ISSN 2190-717X, ifo Institut - Leibniz-Institut für Wirtschaftsforschung an der Universität München, München, Vol. 15, Iss. 3, pp. 79-87

This Version is available at:

<https://hdl.handle.net/10419/166581>

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DYNAMICS AND TIME FRAME OF POST WAR RECOVERY REQUIRED FOR COMPENSATING CIVIL WAR ECONOMIC LOSSES

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JAN SCHUMACHER²

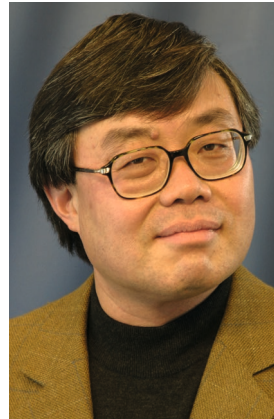
Introduction

Although the number of civil wars has gradually declined over the last twenty-five years, they still significantly threaten the development of some countries and regions, especially in Africa and Asia (World Bank 2011). Civil war is mostly caused by poverty,³ and further destroys existing physical and human capital, while damaging social and political institutions at the same time. The failure of post-war economic recovery, in turn, increases the risk of a poverty-conflict trap recurring and pushing the country back into civil conflict, thus restarting the cycle all over again (Collier 1999; Collier *et al.* 2003).⁴ Following this logic, the vicious circle created by civil war appears to be seriously detrimental to any country's economic development. Moreover, civil wars are deemed contagious, since refugee flows, diseases, lawlessness, and the illicit trading in drugs, arms and minerals generate some negative cross-border spillover effects into neighbouring countries (Murdoch and Sandler 2002 and 2004; Collier *et al.* 2003; Blattmann and Miguel 2010; Bosker and de Ree 2010). Such transnational spreads of negative effects tend to accelerate an economic downturn in the entire region, which, in turn, also makes it difficult for the

initial victim to stage a rapid post-war recovery due to its close economic relationship with its surroundings.

There have been a number of serious empirical investigations into the immediate economic loss sustained during a civil war. Collier (1999) argues that during civil war, countries appear to grow around 2.2 percentage points more slowly than during times of peace. Consequently, after a typical civil war lasting seven years, incomes are approximately 15 percent lower than if the war had not taken place. The cumulative loss of income during the war is equal to around 60 percent of a pre-war year's GDP. According to Stewart *et al.* (2001), fourteen (among the investigated 18) countries suffered from the 3.3 percent reduction in the average annual per capita GNP during the conflict. In other words, the cumulative loss of income during the 7 years of warfare amounted to over 85 percent of a pre-war year's per capita GNP level in these 14 civil war victim countries. Furthermore, the World Bank (2011) estimates the average economic cost of civil war to be over 30 years of GDP growth for a medium-size developing country.

Apart from the destruction of production factors (like human resources, production facilities and physical infrastructure) already mentioned above, some additional reasons for the acceleration of economic decline caused by civil wars include in particular: (a) the crowding out of government expenditures for provision of infrastructure and welfare programmes through the expansion of military spending; and (b) human and capital flight – frightened people escape from their own country and protect their assets by shifting them abroad (Murdoch and Sandler 2004). According to Knight, Loayza and Villanueva (1996) and Collier *et al.* (2003), the GDP share of military expenditure grows from 2.8 percent to 5.0 percent on average, while the additional increase in military spending by 2.2 percent of GDP, sustained over the seven years of civil war, generally leads to a permanent loss of around 2 percent of GDP. For a typical civil-war country, as Collier and Sambanis (2002) suggest, the average share of private wealth held in foreign countries amounts to 9 percent prior to the conflict, but



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³ According to the World Bank (2011), a country that suffered from major violence between 1981 and 2005 has a poverty rate that is 21 percentage points higher than that of a country that does not experience such event at the same period of time.

⁴ “[...] conflicts often are not one-off events, but are ongoing and repeated: 90 percent of the last decade's civil wars occurred in countries that had already had a civil war in the last 30 years” (World Bank 2011, 2).

this share rises to around 20 percent by the end of the civil war.

As already mentioned above, civil war tends to not only reduce a country's own growth rate, but also to significantly harm economic development across an entire region (Buhaug and Gleditsch 2008). As most countries have several neighbours, the negative neighbourhood effects of civil war have often been seen as a major multiplier of the economic cost caused by the conflict (Easterly and Levine 1998). Apart from the collateral damage to infrastructure and capital caused by the battles fought in neighbouring states, especially when battles take place close to the border, major reasons for the reduction in neighbours' growth rates encompass, for example: (i) immediate economic burdens related to the refugee population; (ii) increases in arms and military expenditure caused by the threat from the civil war country; (iii) disruption of trade and growing international transport costs, especially for landlocked countries; and (iv) the bad reputation gained by the conflict region for (foreign) investors (Murdoch and Sandler 2004). According to Collier *et al.* (2003), having a neighbour at war reduces the annual growth rate by around 0.5 percentage points. In addition "a country making development advances, such as Tanzania, loses an estimated 0.7 percent of GDP every year for each neighbour in conflict" (World Bank 2011, 5). Therefore, policies to bring peace to civil-war-torn countries have a positive return not only for the conflict-ridden country, but also for its neighbours.

The rebound in post-war GDP growth appears to be less surprising. "War disrupts economic activity, contracting income. Thus, the mere resumption of pre-war economic activity would result in a relatively high post-war economic growth rate, given the fact of computing the growth rate over a low base" (Davies 2008, 4). To the extent that civil war's impact is limited to the destruction of capital, Bellows and Miguel (2006) suggest that the neoclassical model predicts the rapid post-war growth in the short-to-medium term (because the marginal productivity of capital would be high due to a reduced capital stock), converging back to steady-state growth. Peace after the civil war may also provide an additional dividend, since it tends to reverse the flight of capital and labour which would, in turn, accelerate economic growth (Collier 1999).

On the other hand, Collier (1999) argues that "the restoration of peace [after civil war] does not necessarily

produce a dividend. Peace does not recreate either the fiscal or the risk characteristics of the pre-war economy, [since] there is a higher burden of military expenditure and a greater risk of renewed war. The desired capital stock is consequently lower than had there been no war, although being higher than that desired during the war. In addition, if a civil war lasts only a year, it was empirically found to cause a loss of growth during the first five years of peace of 2.1 percent per annum, a loss not significantly different from that sustained had the war continued. However, if the war has been sufficiently long, the capital stock will have adjusted to a level below that desired in post-war conditions. In this case, capital repatriation enables the economy to grow more rapidly than during the pre-war period" (Collier 1999, 181).

There are also some alternative views that civil wars may lead to a 'creative destruction' of the traditional economic, social and political system, which eventually leads to higher rapid growth in the long run. Post-civil war developments are often characterised by multiple transition processes – the transition from war to peace generally accompanied by democratisation, decentralisation and market liberalisation (Reychler and Langer 2006). Therefore a success in the timely transformation of war-torn societies into peaceful and stable ones could well provide a foundation for rapid long-term economic growth.⁵ According to Bellows and Miguel (2006), civil war has had a positive long-term impact on institutions in some parts of Sierra Leone. If this were true for the country as a whole, it could imply a higher long-term growth rate than would have occurred in the absence of war (see also Davies 2008). Moreover, according to the popular endogenous growth theory, a country whose capital stock is destroyed by a civil war tends to compensate for its loss with new capital that embodies more modern technology, which, in turn, triggers the long-term growth rates of total factor productivity and GDP per capita (Aghion and Howitt 1998). In this context Kang and Meernik (2005) see a rapid economic recovery in the immediate post-civil war period as absolutely necessary in order to realise stable long-term economic growth, while international aid accelerates a short-term recovery (Flores and Nooruddin 2009). If creative destruction occurs, warfare can also eventually be expected to have positive long-term external effects for neighbouring countries as well.

⁵ Tilly (1975) shows how war promoted state formation and nation building in Europe historically, ultimately strengthening institutions.

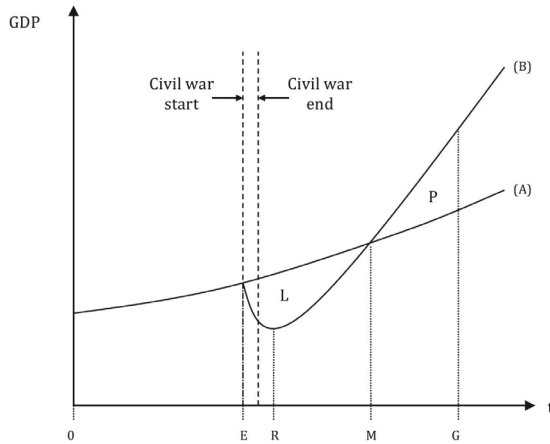
Are civil wars associated with long-term growth optimism? Very little research has been carried out to date aimed at identifying whether and how rapidly victims of civil war recover from such serious negative events in the sense that output losses are reversed (see also Cerra and Saxena 2008). The main aim of this article is to deliver some possible answers to these crucial questions. More precisely, this study attempts to estimate, based on a simple present value model, the time frame and the dynamics of post-war recovery required to compensate for the civil-war GDP losses in several selected countries like Algeria, Angola, Lebanon, Mozambique, Sierra Leone and Uganda. All of them experienced the rebound of GDP growth after the years of continuous economic decline caused by the civil war, but the dynamics of recovery differ from one country to another. Instead of highlighting generalised empirical facts identified based on a large number of country samples, our analysis primarily emphasises the country-specific development trends and characteristics in these survey nations.

This study is structured as follows: section 2 describes the present value model adopted to compare the potential GDP loss caused by a civil war and the potential gain led by the strong post-war economic recovery. The third section delivers some empirical findings explaining different recovery patterns in the investigated victim countries and examines the dynamics and time frames of post-war development needed to compensate for civil war losses. The final section summarises the major findings and offers some conclusions.

Model

This study considers the simple case that a country experiences a civil war only once and has a rebound in economic growth caused by this event at year *R*, whereas the potential post-war economic recovery thereafter is much stronger than the potential growth trend expected in the absence of civil war.⁶ Under the further (*a priori*) assumption that the economy starts to decline simultaneously as the civil war begins, the polynomial function (*B*) in Figure 1 shows the potential GDP growth trend after the civil war beginning at year *E*,⁷ while the polynomial function (*A*) demonstrates the anticipated potential GDP growth trend in

Figure 1
Economic recovery from civil war: a general approach



Source: Authors' conception.

the absence of civil war, which is delivered under the consideration of the GDP changes in the pre-war years. Moreover, Figure 1 illustrates the case that economic decline continues until *R*, although the civil war ends earlier. Consequently the economic rebound emerges immediately after *R*. Since the function (*B*) is expected to run more rapidly than (*A*) after *R*, a break-even point between the two GDP growth functions can be expected at the year *M*. In this case one can calculate the economic loss caused by civil war, which is denoted by the area *L* between the years *E* and *M*, and compare it with the economic gain resulting from the difference between the functions (*B*) and (*A*) as shown by the area *P* between *M* and a given year *G* in Figure 1.

For the measurement of the economic loss, as well as the economic gain mentioned above, we adopt the simple present value model. The present value of a country's GDP loss caused by the civil war on the year that the civil war begins ($t = E$) can be then expressed as

$$(1) PV_{L,t=E} = \int_E^M (A)e^{-r(t-E)} dt - \int_E^M (B)e^{-r(t-E)} dt$$

where *A* = potential GDP growth trend in the absence of civil war over the course of time *t*; *B* = potential GDP growth trend after civil war begins – also as a function of *t*; *r* = discount rate; and *t* = year.

On the other hand, equation (2) shows the present value of economic gain at $t = M$ which results from the difference between the anticipated GDP growth functions (*B*) and (*A*) within the time interval from *M* to *G*.

⁶ To be sure previous experiences, for example those in Liberia, show that the post-war peace is very fragile, the fact that has often led to the multiple civil wars.

⁷ Here we assume that the economic downturn starts as the civil war begins.

$$(2) PV_{P,t=M} = \int_M^G (B)e^{-r(t-M)} dt - \int_M^G (A)e^{-r(t-M)} dt$$

Hence, measured in terms of the present value at $t = E$, a complete compensation for the economic loss caused by the civil war takes place by the rapid economic recovery within a given period of time from M to G^* , when

$$(3) PV_{L,t=E} - \frac{1}{(1+r)^{M-E}} PV_{P,t=M} \\ = \int_E^M (A)e^{-r(t-E)} dt - \int_E^M (B)e^{-r(t-E)} dt - \frac{1}{(1+r)^{M-E}} \left\{ \int_M^{G^*} (B)e^{-r(t-M)} dt - \int_M^{G^*} (A)e^{-r(t-M)} dt \right\} = 0$$

where $G^* - M$ denotes the time period required for the full compensation of the GDP losses.

Empirical findings

For the empirical analysis GDP data expressed in terms of the ‘1990 international dollars’ from 1950 to 2008 are used. Such internationally comparable GDP data have been collected, estimated and systematically compiled by A. Maddison – see <http://www.ggd.net/maddison/>. This database enables the identification of those Asian and African countries that experienced a civil war in the observed time period that had a particularly serious negative impact on GDP development. As already mentioned above, civil wars not only destroy physical capital, but also tend to reduce population size significantly since such wars kill people and, at the same time, cause massive cross-border human flights. For this reason it appears to be more sensible to consider the total GDP change than that in

GDP per capita, when examining the negative economic effects of such wars.

As was the case in Figure 1, the two vertical lines in Figure 2 indicate the start and the end of the civil war (see different civil war durations in the investigated countries in Table 1), while the gray line illustrates the changes in actual GDP values between 1950 and 2008. In the following country figures the year 1950 is set as the year 0, and in the selection of survey countries it was borne in mind that the pre-war GDP trend function (A) and the GDP trend function (B) since around the outbreak of the civil war were estimated based on sufficient observations. A decline in GDP started one-year prior to the beginning of the war in most investigated African countries (Algeria, Angola, Mozambique and Uganda), because there was already considerable unrest in the country, which significantly impeded economic development (Table 1). Therefore, when identifying the GDP trend function (B) and calculating the civil-war economic loss, the GDP reductions occurring in the year before the warfare began should also be adequately considered. Yet Lebanon appears to be an exception: in this country the economic downturn did not emerge until five years after the civil war started in 1974.

Contrary to the conventional wisdom that an economic upturn cannot be expected to emerge until the post-war years, Table 1 and Figure 2 clearly suggest that in all of the investigated countries, except for Lebanon, such GDP rebounds took place within the civil war period (i.e. while the conflict was still in process). For example, in Algeria – the country experienced a civil war between 1991 and 2002 – GDP started to decline in 1990 and reached a trough point R (with a GDP level of 71.9 billion 1990 international

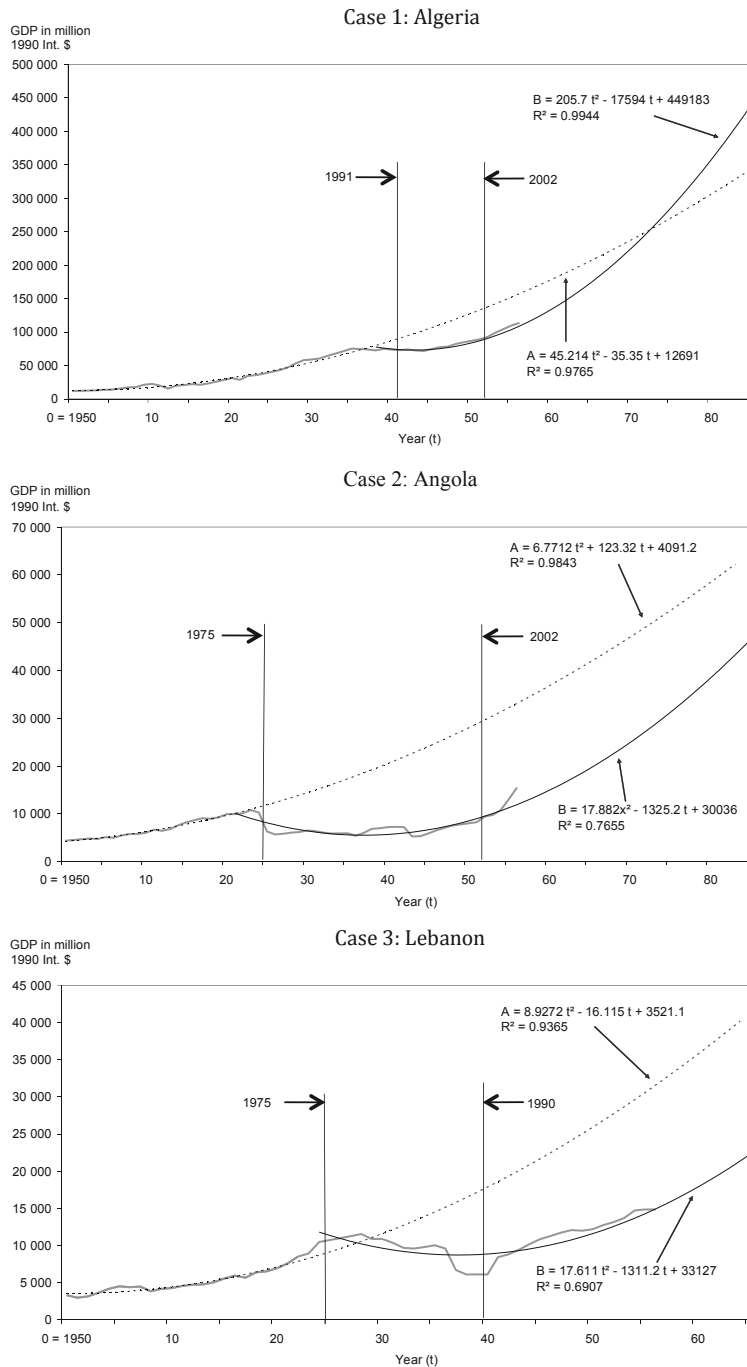
Table 1

Civil war duration and some immediate economic consequences

| | Civil war duration | Start of economic down-turn caused by civil war | | Actual economic trough led by civil war | | Actual GDP in 2008 (billion 1990 intern. dollars) | Estimated break-even point | |
|--------------|--------------------|---|--|---|--|---|----------------------------|--|
| | | Starting year (E) | Actual GDP at E (billion 1990 intern. dollars) | Trough year (R) | Actual GDP at R (billion 1990 intern. dollars) | | Year (M) | Number of years taking between civil war end and M |
| Algeria | 1991–2002 | 1990 | 73.9 | 1994 | 71.9 | 118.9 | 2022 | 19 |
| Angola | 1975–2002 | 1974 | 10.2 | 1993 | 5.2 | 21.1 | 2059 | 57 |
| Lebanon | 1975–1990 | 1979 | 8.9 | 1988 | 6.1 | 17.7 | 2071 | 81 |
| Mozambique | 1977–1992 | 1976 | 13.6 | 1985 | 12.0 | 46.0 | 2034 | 42 |
| Sierra Leone | 1991–2002 | 1991 | 4.3 | 1999 | 1.9 | 4.3 | 2010 | 8 |
| Uganda | 1979–1986 | 1978 | 8.3 | 1980 | 7.1 | 31.6 | 1997 | 11 |

Source: World Bank (2011); Collier *et al.* (2003); historical statistics compiled by A. Maddison (<http://www.ggd.net/maddison/>); authors' own calculation.

Figure 2
Economic recovery from civil war: country cases

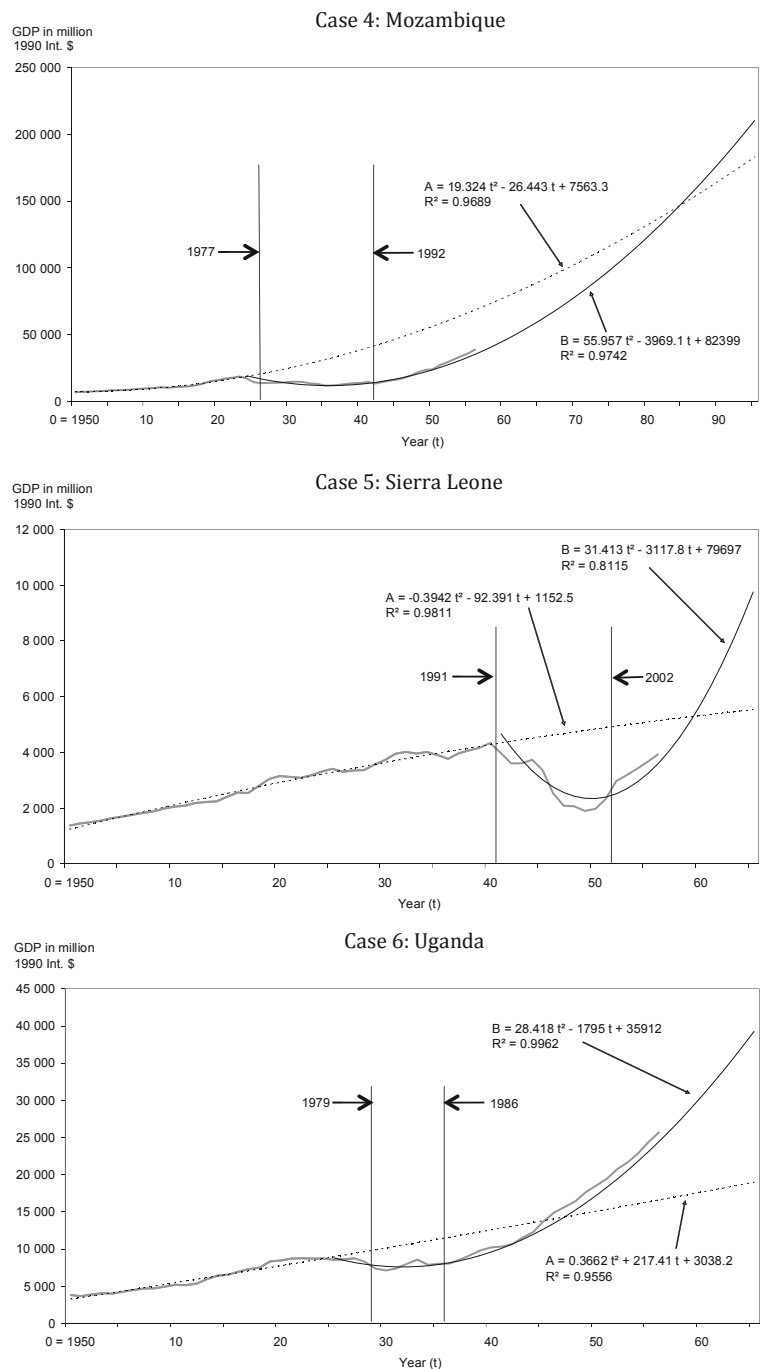


dollars) in 1994. In other words, GDP has gradually grown since 1995 in this country (see Table 1). This interesting finding indicates among others that, as a civil war starts to lose intensity and slowly heads towards a ceasefire, the extent of additional damage to production factors in a year tends to gradually decrease, and that the adjustment and responsiveness of economic activities to the emergence of a political thaw and/or the signs of possible peace appear to be extremely speedy within periods of civil war.

To compare the time frame and the dynamics of post-war recovery required to compensate for the civil-war GDP losses in selected six countries, the identification of the break-even-year M appears to be the first task, where the anticipated two GDP growth trend functions (A) and (B) intersect each other. Regardless of the investigated countries, a uniform interest rate of 5 percent is adopted as the discount rate for the purpose of computing the present value of GDP losses and gains at the initial year of the economic downturn. Repeatedly, apart from the speed and scope of economic decline led by the civil war, the variation in the growth dynamics of the trend functions (A) and (B), particularly after the rebound, determines such break-even-years in the individual countries.

Firstly, in countries like Angola, Mozambique and Lebanon the actual (i.e. observed until 2008) and also anticipated GDP development thereafter – expressed in terms of the function (B) – appears far too weak to return to the pre-war growth trend (A) in the foreseeable future: the intersecting between the two trend functions is not anticipated to occur in Mozambique until 2034, in Angola until 2059, and in Lebanon until 2071. In other words, such a break-even point will not be reached until 81 years after the end of civil war in Lebanon, while the comparable time frame will be 57 years in Angola and 42 years in Mozambique (see Table 1). After all these individual years, the aforementioned countries can start to slowly compensate for their economic losses. With the adopted interest rate of 5 percent for discounting future GDP level, the present value of total GDP loss at the starting year of the economic downturn caused by the warfare is estimated to reach approximately 150.7, 220.8 and

Figure 2 (continued)



Note: Two vertical lines indicate the start and the end of the civil war. The gray line shows the actual GDP values between 1950 and 2008.

Source: Table 2; historical statistics compiled by A. Maddison (<http://www.ggd.net/maddison/>); authors' own calculation.

346.2 billion 1990 international dollars in Lebanon, Angola and Mozambique respectively (see Table 2). The huge size of GDP loss in these countries is clearly highlighted by comparing such a loss in a country with the annual GDP level of the same country at the starting year of the economic downturn. For example,

Lebanon's GDP amounted to 8.9 billion 1990 international dollars in 1979, compared to Angola's 10.2 and Mozambique's 14.6 billion 1990 international dollars in 1974 and 1975, respectively (see Table 1). Namely, at the starting year of the economic downturn caused by the civil war, the share of actual annual GDP measured in terms of the calculated present value of total GDP loss ranges solely from 4 percent to 6 percent in these countries. From these less favorable empirical facts, one can easily expect the fatal consequences of large scale GDP losses caused by the civil war in these countries: the compensation of civil war economic loss is hardly possible in the foreseeable future (see Table 2).

On the other hand, countries like Algeria, Sierra Leone, and Uganda experienced significantly stronger GDP growth in function (B) after the rebound, compared to that demonstrated by the trend function (A) in the absence of civil war. As a result, a shorter time frame is required to reach the break-even-year *M*, which prevails in Uganda in 1997 and in Sierra Leone in 2010, while such intersection is likely to take place in Algeria in 2022. In other words, such a break-even point will be given 19 years after the end of civil war in Algeria, while the comparable time-frame is anticipated to reach 8 years in Sierra Leone and 11 years in Uganda (see also Table 1). In addition, the present value of total GDP loss at the starting year of economic downturn appears to be rather low, amounting to approximately 17.6 and 27.8 billion 1990 international dollars in Sierra Leone and Uganda, respectively. Algeria is an exception partly due to its relatively large economic power: the country's present value of total GDP loss caused by the civ-

Table 2

Size of civil war loss calculated based on two potential GDP growth trends

| | Algeria | Angola | Lebanon |
|--|--|--|---|
| Potential GDP growth trend in the absence of civil war (A) | $A = 45.214t^2 - 35.35t + 12691$ $R^2 = 0.9765$ $\frac{dA}{dt} = 90.428t - 35.35$ | $A = 6.7712t^2 + 123.32t + 4091.2$ $R^2 = 0.9843$ $\frac{dA}{dt} = 13.5424t + 123.32$ | $A = 8.9272t^2 - 16.115t + 3521.1$ $R^2 = 0.9365$ $\frac{dA}{dt} = 17.8544t - 16.115$ |
| Potential GDP growth trend after the civil war begin (B) | $B = 205.7t^2 - 17595t + 449183$ $R^2 = 0.9944$ $\frac{dB}{dt} = 411.4t - 17595$ | $B = 17.882t^2 - 1325.2t + 30036$ $R^2 = 0.7655$ $\frac{dB}{dt} = 35.764t - 1325.2$ | $B = 17.611t^2 - 1311.2t + 33127$ $R^2 = 0.6907$ $\frac{dB}{dt} = 35.222t - 1311.2$ |
| Estimated present value of civil war loss (L) in billion 1990 International \$ | 455.0 | 220.8 | 150.7 |
| Break-even-year (M) | 2022 | 2059 | 2071 |
| Number of years after M required to compensate the civil war loss | 42 | ∞ | ∞ |
| | Mozambique | Sierra Leone | Uganda |
| Potential GDP growth trend in the absence of civil war (A) | $A = 19.324t^2 - 26.443t + 7563.3$ $R^2 = 0.9689$ $\frac{dA}{dt} = 28.648t - 26.443$ | $A = -0.3942t^2 - 92.391t + 1152.5$ $R^2 = 0.9811$ $\frac{dA}{dt} = -0.7884t - 92.391$ | $A = 0.3662t^2 + 217.41t + 3038.2$ $R^2 = 0.9556$ $\frac{dA}{dt} = 0.7324t + 217.41$ |
| Potential GDP growth trend after the civil war begin (B) | $B = 55.957t^2 - 3969.1t + 82399$ $R^2 = 0.9742$ $\frac{dB}{dt} = 111.914t - 3969.1$ | $B = 31.413t^2 - 3117.8t + 79697$ $R^2 = 0.8115$ $\frac{dB}{dt} = 62.826t - 3117.8$ | $B = 28.418t^2 - 1795t + 35912$ $R^2 = 0.9962$ $\frac{dB}{dt} = 56.836t - 1795$ |
| Estimated present value of civil war loss (L) in billion 1990 International \$ | 346.2 | 17.6 | 27.8 |
| Break-even-year (M) | 2034 | 2010 | 1997 |
| Number of years after M required to compensate the civil war loss | ∞ | 13 | 18 |

Source: Authors' own calculation.

il war reaches around 455.0 billion 1990 international dollars. The share of the annual GDP level – e.g. Sierra Leone: 4.3 billion 1990 international dollars (in 1990); Uganda: 8.3 billion 1990 international dollars (in 1978); and Algeria: 73.9 billion 1990 international dollars (in 1990) – expressed in terms of the present value of total GDP loss at the corresponding starting year of economic downturn amounts to approximately 25 percent and 30 percent in Sierra Leone and Uganda, respectively, while the same share reaches around 16 percent in Algeria.

All of these conditions appear to make compensation for GDP loss rather ‘manageable’ in these countries within a foreseeable period of time after the break-even year mentioned above. Full-scale compensation for GDP loss is expected to take place in Algeria in 2064 (i.e. 62 years after the end of civil war in 2002), Sierra Leone in 2022 (i.e. 20 years after the end of civil war in 2002), and Uganda in 2014 (i.e. 28 years after the end of civil war in 1986). Nevertheless, compared to the civil war durations of 7 to 11 years in these countries (i.e. from 1979 to 1986 in Uganda; and from 1991 to 2002 in Algeria and Sierra Leone), those computed ‘much-longer’ time periods that are required to compensate for the GDP losses again indicate the fact that an economic recovery from such wars is an expensive and painful process and constitutes a serious challenge for the victims.

Conclusion

Based on a simple present value model and taking into account the nation-specific pre and post-war development trends in the selected countries (Algeria, Angola, Lebanon, Mozambique, Sierra Leone and Uganda), this study delivers some novel empirical findings related to the time frame and the dynamics of post-war recovery required to compensate for the civil-war GDP losses. At first glance, all these victims have achieved a more favorable post-war GDP growth level compared to their pre-war economic development, but this is not the end of story for several reasons.

Firstly, contrary to the widely accepted notion that an economic upturn should not be expected until the years after the end of warfare, this study clearly demonstrates the possibility of a GDP rebound emerging in many countries *within* the civil war period. Apart from the fact that, as the civil war starts to lose intensity and heads towards a ceasefire, the extent to which

the production factors get additionally damaged in a year tends to decrease, this finding also suggests the speedy adjustment and responsiveness of economic activities to the emergence of political thaw and/or the signs of possible peace within the civil war periods.

In this study the size of GDP loss caused by civil war is measured on the basis of differences between the (estimated) potential GDP growth trend since 1950 under the assumed absence of civil war and the (estimated) potential GDP growth trend after the beginning of civil war, while the GDP decline usually starts one-year prior to the war start in survey countries. More precisely, apart from the conflict duration, and the speed and scope of immediate economic decline caused by civil war, the variation in the GDP growth dynamics of both trends mentioned above (i.e. also the post-war recovery trend after the rebound), as well as the expected intersect year of these two growth functions (break-even-year), determine the economic loss in the individual victim countries. In addition to a discount rate of 5 percent, GDP data expressed in terms of 1990 international dollars from 1950 to 2008 are used to calculate the present value of civil war loss at the starting year of economic downturn, which is then compared to that of economic gain triggered by the more rapid post-war recovery in the same year.

According to our calculations, the intersection between the two GDP growth functions will occur 81 years after the end of civil war in Lebanon, while the comparable time frame amounts to 57 years in Angola and 42 years in Mozambique. The present value of GDP loss reaches around 150.7, 220.8 and 346.2 billion 1990 international dollars in Lebanon, Angola and Mozambique, respectively: such computed civil war losses are 16.9, 21.6 and 25.5 times higher than the annual GDP level of the year of economic decline in the countries in the same order. In these countries such extremely huge civil war economic losses can hardly be compensated for by the post-war recovery in the foreseeable future.

By comparison Algeria, Sierra Leone and Uganda experienced a stronger GDP growth after the rebound. Consequently, the break-even between the two potential growth trend functions will take place 19 years after the end of the civil war in Algeria, while the comparable time frame will span 8 years in Sierra Leone and 11 years in Uganda. The computed present value of total GDP loss at the starting year of economic decline is also lower, amounting to around 17.6 and

27.8 billion 1990 international dollars in Sierra Leone and Uganda respectively, compared to 455.0 billion 1990 international dollars in Algeria. Such civil war economic losses are 3.3, 4.1 and 6.2 times higher than the annual GDP level of the year of economic decline in Uganda, Sierra Leone and Algeria respectively. All of these pre-conditions appear to make compensation for the GDP loss achievable within a foreseeable period of time: such an event is likely to occur in Algeria in 2064 (62 years after the end of the civil war in 2002), in Sierra Leone in 2022 (20 years after the end of the civil war in 2002), and in Uganda in 2014 (28 years after the end of the civil war in 1986). Yet, compared to the civil war durations of 7 to 11 years in these countries, those longer time frames required for to compensate for war-based losses demonstrate again that a successful post-war economic recovery is not only a painful, but also an extremely challenging process for the victim countries.

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