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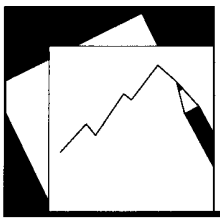

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Breaking the Curse of Sisyphus: An Empirical Analysis of Post-Conflict Economic Transitions

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Abstract

This paper provides a broad empirical analysis of the determinants of post-conflict economic transitions across the world during the period 1960–2010, using a dynamic panel estimation approach based on the system-generalized method of moments. In addition to an array of demographic, economic, geographic, and institutional variables, we introduce an estimated risk of conflict recurrence as an explanatory variable in the growth regression, because post-conflict countries have a tendency to relapse into subsequent conflicts even years after the cessation of violence. The empirical results show that domestic factors, including the estimated probability of conflict recurrence, as well as a range of external variables, contribute to post-conflict economic performance.

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Keywords: Civil conflict, conflict recurrence risk, growth, institutions, geography, structural reforms, dynamic panel estimation

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I. INTRODUCTION

Civil conflicts have catastrophic consequences, including death, displacement of people and destruction of institutional, physical, and social capital. Since the Second World War, intra-state armed conflicts have become the most common type of aggression across the world, according the UCDP/PRIO Armed Conflict Dataset (Figure 1).[1] It is therefore unsurprising to witness the emergence of interdisciplinary research looking into the causes and consequences of civil wars. The theoretical literature has focused on the pivotal question of why conflicts occur in spite of the prohibitively high cost of rebellion, and draws attention to explanations like information asymmetries and the absence of the rule of law (Grossman, 1991; Skaperdas, 1992; Hirshleifer, 1995; Sandler, 2000; Sambanis, 2001; Fearon and Laitin, 2003; Collier and Hoeffler, 2004a). On the empirical side, a burgeoning range of studies has aimed to decipher the causes of conflicts that have persistent and damaging effects on economic development, mainly through the destruction of institutional and physical infrastructure, the loss of human capital, and heightened uncertainty making investment riskier (Collier, 1999; Nafzinger, Stewart, and Vayrynen, 2000; Addison, Chowdhury, and Murshed, 2002; Collier and Hoeffler, 2002; Elbadawi, Hegre, and Milante, 2008). Despite the econometric problems plaguing much of the empirical work, studies tend to link the incidence of civil conflict to low levels of per capita income, slow economic growth, and geographic conditions assisting insurgents.[2] Additionally, while Fearon and Laitin (2003) and Collier and Hoeffler (2004a) argue that vertical income inequality within a country does not increase the risk of conflict, others including Robinson (2001) and Esteban and Ray (2008) show that greater horizontal inequality in the distribution of income could lead to the onset of intra-state wars, particularly in ethnically fragmented societies.

This paper provides a broad empirical analysis of the determinants of post-conflict economic transitions during the period 1960–2010. Countries emerging from a conflict struggle to break the curse of Sisyphus, with 20 percent relapsing into a subsequent conflict in the first year and 40 percent within five years after the end of conflict, primarily because of the economic legacy of conflict and because the factors that trigger violence in the first place—such as dysfunctional institutions and social grievances—remain unresolved.[3]

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[1] This database is a joint project of the Uppsala Conflict Data Program (UCDP) at the Department of Peace and Conflict Research, Uppsala University and the Center for the Study of Civil War at the International Peace Research Institute in Oslo (PRIO). The UCDP/PRIO defines civil conflict as "a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths."

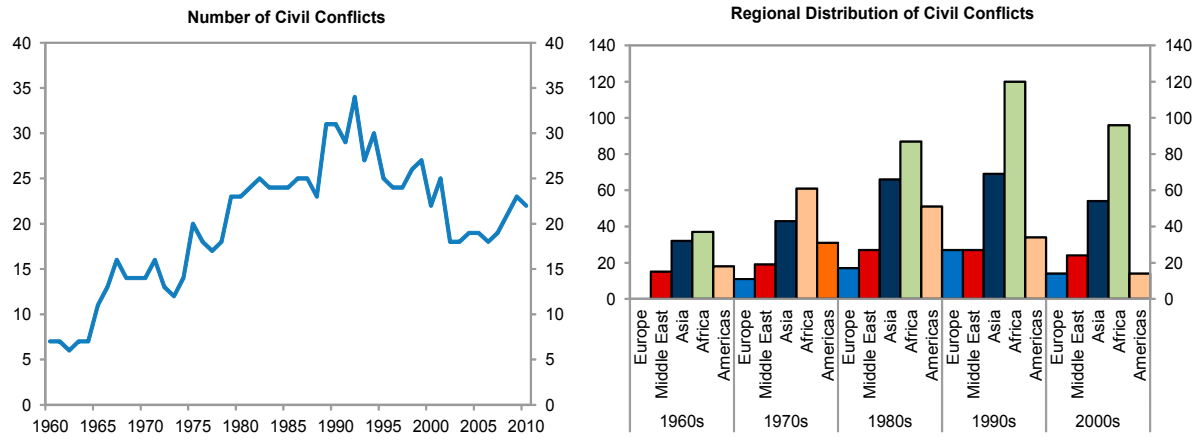
[2] Humphreys (2002) and Blattman and Miguel (2010) provide comprehensive reviews of the literature on the causes and consequences of civil conflicts, which are consistent with the relationship between economic conditions and political coups as identified by Alesina, Ozler, Roubini, and Sawgel (1996), among others.

[3] These estimates are the average of all civil conflicts, not an average of all countries, in our dataset, which may show higher probability because of some countries that have multiple episodes of conflict.

Accordingly, a better understanding of the causes and consequences of intra-state wars remains an important objective in the quest to achieve development and reconciliation, especially in view of the recent wave of popular uprisings across the Middle East and North Africa and long-lasting civil conflicts elsewhere. Though we explore the causes of intra-state wars in modeling the risk of conflict recurrence, our main focus in this paper is on the empirical patterns of post-conflict economic performance by analyzing 146 cases of civil conflict in 94 countries across Africa, the Americas, Asia, Europe, and the Middle East during the period 1960–2010.

Our empirical model captures post-conflict dynamics through an array of variables including an estimated risk of conflict recurrence. From a methodological perspective, we adopt a dynamic panel estimation approach based on the system-generalized method of moments (GMM) that uses pooled cross-country and time-series data and corrects for biases associated with the joint endogeneity of the explanatory variables as well as the problems caused by unobserved country-specific effects. We also use annual data, instead of the five-year averages commonly used in the literature, to fully exploit the time-series dimension of the data. This additional layer of information, provided by the over-time variation in dependent variables and underlying determinants, allows us to obtain more precise estimates. Our empirical model captures the dynamics of post-conflict economic transitions through a core set of explanatory variables including the initial level of per capita income, duration and intensity of the conflict, demographic conditions, measures of human capital, geographic variables and natural resource endowments, macroeconomic conditions, external factors, and measures of political regime and governance quality. Furthermore, because post-conflict countries have a tendency to relapse into subsequent conflicts even years after the cessation of violence, we introduce an estimated measure of the risk of conflict recurrence as an explanatory variable in our econometric analysis of post-conflict growth dynamics.

Figure 1. Civil Conflicts across the World, 1960 - 2010



Source: UCDP/PRIO.

An important contribution of this paper is the estimation of a forward-looking measure of conflict recurrence risk. The strength and sustainability of post-conflict recovery depends considerably on economic agents' perception of the stability of peace, because post-conflict countries have a tendency to relapse into subsequent conflicts and the risk of a new bout of conflict inhibits economic growth. Therefore, it is necessary to estimate a measure of conflict recurrence risk and explore its explanatory power in the growth regression. Using a logistic regression approach, we model the probability of conflict recurrence after the end of conflict with the latest available information in each period. First, we find that there is a high degree of persistence in conflict recurrence risk in countries with a history of civil conflict. Second, we identify that the estimated probability of conflict recurrence has a statistically significant and economically large negative effect on the post-conflict growth experience across all specifications of the model.

The empirical results show that domestic as well as international factors contribute to post-conflict economic performance. According to our dataset of 146 cases of internal armed conflict in 94 countries during the period 1960–2010, real GDP per capita growth barely accelerates after the end of a conflict, with an average of 1.5 percent a year over the subsequent five years, and shows significant cross-country variation, ranging from -10 percent in Liberia to 20 percent in Bosnia and Herzegovina. We find a statistically significant negative coefficient on the initial level of real GDP per capita, confirming conditional convergence after the end of conflict. Although the duration of conflict is statistically significant with a negative impact on post-conflict per capita income growth, we could not identify the effects of conflict intensity or the depth of economic contraction during the conflict. Human capital and institutional factors, however, appear to contribute positively to post-conflict growth, while resource-dependent countries suffer from a double curse of higher risk of conflict recurrence and lower post-conflict growth. We also ascertain landlocked status as a statistically and economically significant factor; however, other geographical variables such as the variability in climatic conditions, do not appear to be important. Ethnic fractionalization seems to have a statistically significant negative effect on post-conflict growth, even when we control for the risk of conflict recurrence. We find that global real GDP growth and net foreign direct investment (FDI) flows are statistically significant factors, with economically large effects on the post-conflict growth process. Contrary to popular expectations, however, the results show that UN peacekeeping operations, foreign aid, and IMF-supported economic programs do not appear to have a significant influence on post-conflict growth in our sample of countries.

Growth-enhancing policies and institutional reforms are necessary to improve economic growth prospects after the end of conflict. The empirical findings presented in this paper suggest a strategy for reconciliation and recovery centered on three main pillars—implementing growth-enhancing policies, reforming dysfunctional institutions, and addressing urgent social needs—to reduce the risk of conflict recurrence and pave the way to broad-based, sustainable growth in real GDP per capita after the end of a conflict. Sound

macroeconomic management helps to sustain the pace of economic recovery and prevent a relapse into conflict; strengthening institutional capacity is necessary for addressing longstanding grievances, reducing the risk of future civil conflicts, and raising the economy's growth potential over the medium term.

The remainder of this paper is organized as follows. Section II provides a brief survey of the growth literature, with a view to identifying the key factors that contribute to the strength of post-conflict performance. Section III covers data-related issues, followed in Section IV by an explanation of the theoretical model and econometric methodologies used in this paper. Section V presents the empirical findings, while the robustness of the results is discussed in Section VI. Concluding remarks are offered in Section VII.

II. A Brief Survey of Growth and Conflict Literature

Deciphering the determinants of cross-country differences in growth remains one of the most important pursuits in economics. The neoclassical growth models, developed by Ramsey (1928), Solow (1956), Swan (1956), Cass (1965), and Koopmans (1965), predict that the steady-state level of income is determined by the existing technology and the exogenous rates of saving, population growth, and technological progress. Accordingly, low-income countries with lower stocks of physical capital are expected to build up a capital base at a faster rate and converge towards the income level of high-income countries. Although the absolute convergence and the steady-state equilibrium envisaged in the neoclassical growth theory hinge on the principle that countries are comparable in every respect except for the initial level of physical capital and income, empirical studies indicate that convergence is actually conditional upon other steady-state parameters including saving and investment rates, human capital, government policies, population growth, fertility preferences, and the state of technology.[4] Therefore, the hypothesis of conditional convergence implies that countries with different steady-state parameters are highly likely to converge to different steady-state levels.

Empirical dissatisfaction with the neoclassical growth theory led to the emergence of alternative models of economic growth. Challenging the neoclassical assumption of exogenously determined technology, the new growth models—an augmented version of the standard neoclassical approach—imply that technological progress is endogenous and that physical capital is not the only kind of capital important for economic growth; they hold that the definition of capital should also include human capital as well as intangible capital such as knowledge. Accordingly, the "endogenous" growth theory explains cross-country differences in growth with differences in resources devoted to research and development

[4] See, for example, Barro (1989; 1991; 1996), Barro and Sala-i-Martin (1992), Levine and Renelt (1992), and Mankiw, Romer, and Weil (1992).

(Grossman and Helpman, 1989) and the initial stocks of human capital (Lucas, 1988; Becker, Murphy, and Tamura, 1990; Rebelo, 1991) and human capital specifically devoted to research and development (Romer, 1986). In fact, Barro (1991) shows that the growth rate of real GDP per capita is positively related to the initial level of human capital, while Levine and Zervos (1993) and Sachs and Warner (1997) find that an increase in human capital results in faster transitional growth, mainly through an improvement in productivity.

Institutional characteristics contribute to the variations in cross-country economic performance. While differences in technology and physical and human capital certainly matter for economic performance, cross-country income disparities can only partially be explained by the variation in factor endowments (Lucas, 1990). Over the past several decades, alternative theories on potential sources of cross-country income differences have started incorporating factors such as history and institutions that have been ignored by the standard neoclassical growth model. Institutions signify various characteristics of the socioeconomic and political organization of a country and form an underlying infrastructure of incentives—the "rules of the game" in economic, political and social interactions—that may hinder or facilitate economic activity. As argued by Coase in a seminal paper (1937) and expanded by North (1990; 1991) and Olson (1993), institutions and the way they are structured provide the basic guidelines for economic interactions and help explain why some countries are more developed than others. Several empirical studies have shown a significant relationship between the quality of institutions and overall economic performance, and have argued that weak institutions interfere with economic growth by encouraging economic agents to participate in redistributive endeavors rather than productive economic activity.[5]

Political institutions influence economic outcomes, mainly through the process of institutional change and economic reforms. One of the most important institutions that underscore every transaction is the political regime. Although the empirical evidence on the economic impact of political institutions remains mixed, the democratic transition appears to be associated with industrialization and modernization over the long run. Barro (1996) finds a nonlinear effect of democracy, with an initial increase in growth and a negative relation once some level of democracy has been reached. Tavares and Wacziarg (2001) uncover a positive effect of democracy on human capital accumulation and a negative effect on physical capital accumulation, while Rodrik and Wacziarg (2005) identify a positive short-term effect of democratization on economic growth, but no effect over a longer horizon and no effect when democracy is sustained for long periods. On the other hand, Murtin and Wacziarg (2011) suggest that the level of per capita income is more likely to be a determinant of the level of democracy than the other way around, once income persistence is

[5] For example, Knack and Keefer (1995), Engerman and Sokoloff (1997), Hall and Jones (1999), Acemoglu, Johnson, and Robinson (2001), Acemoglu, Johnson, and Robinson (2004), and Acemoglu and Johnson (2005), among other scholars, demonstrate that institutions are one of the most important sources of cross-country differences in economic growth.

controlled for in the empirical estimation, and that the level of democracy has not been a significant determinant of economic growth over the course of the past century. Nonetheless, democracy may still influence economic performance through the process of institutional change and economic reforms. Using a dataset on economic reforms for 150 countries over the period 1960–2004, Giuliano, Mishra, and Spilimbergo (2012) show that democracy has a positive and significant impact on the adoption of economic reforms in the financial and banking sectors, and in product markets, agriculture, and trade. There is also a large literature on the relationship between political institutions and the incidence of civil conflict, with findings similar to the relationship between political institutions and economic growth. Among others, Sambanis (2001), Hegre et al. (2001) and Reynal-Querol (2002) find that partial democracies are more prone to civil conflicts than full democracies and autocracies.[6]

Geographical circumstances can affect economic growth, both directly and indirectly, through various channels. While the quality of institutional arrangements is among the fundamental determinants of cross-country differences in macroeconomic performance, institutions may well be shaped by a broad range of factors including geographic conditions, demographic composition, and the structure of factor endowments. A number of studies led by Hall and Jones (1997), Gallup, Sachs, and Mellinger (1998), and Sachs and Warner (1998) take into account geographic variables and find that countries located in the tropics tend to grow at a slower pace than those in more temperate climates. The variability of climatic conditions such as temperature and precipitation appears to have significant effects on the growth rate of real GDP per capita and thereby on the incidence of intra-state conflicts (Miguel, Satyanath, and Sergenti, 2004; Hendrix and Glaser, 2007). On the other hand, other scholars argue that the impact of geographic factors on economic development comes indirectly through historical conditions (Diamond, 1997; Olsson and Hibbs, 2005) or through the legacy of institutions (Engerman and Sokoloff, 1997; Acemoglu, Johnson, and Robinson, 2001; Easterly and Levine, 2003).

Demographic conditions, including ethnic fractionalization, may well affect economic growth through various channels. The size and composition of population are significant factors in determining human capital formation and overall productivity by influencing savings, investments, and technological change, while population density and the extent of urbanization potentially support greater economies of scale. As a result, changes in the demographic structure tend to have substantial effects on economic performance over time. While a young and growing population provides a demographic dividend with far-reaching spillovers throughout the economy, a youth bulge could also become a threat to stability and a source of civil unrest (Urdal, 2004). Ethnic fractionalization is also considered to be an important factor in explaining the cross-country differences in economic growth as well as

[6] Reynal-Querol (2005) shows that there is a negative relationship between inclusiveness of political institutions and the risk of civil war, as inclusive institutions increase the opportunity cost of rebellion.

the variation in social tensions that tend to heighten the risk of civil conflict. While Fearon and Laitin (2003) argue that ethnic—or religious—heterogeneity has no bearing on the incidence of civil conflict, after controlling for per capita income, Easterly and Levine (1997) find that, at least in the case of sub-Saharan Africa, a higher degree of ethnic fractionalization explains a significant amount of the variation in growth rates through political instability, underdeveloped financial systems, and distorted foreign exchange markets. Likewise, utilizing a dataset of 138 countries over the period 1960–2008, Esteban, Mayoral, and Ray (2012) show that measures of ethnic and social fragmentation are significant correlates of the occurrence of civil conflict. As shown by Easterly (2001), however, institutions hold a critical role in determining the impact of ethnic polarization on economic growth and the risk of intra-state conflict. On the whole, we reason that the growth experience, regardless of conflict incidence, depends on a complex interaction of geography, institutions, policies, factor endowments, and developments beyond the control of a country.

External factors such as terms of trade, global demand, remittances, and foreign capital and aid flows can also be influential. Global growth is expected to have a considerable effect on domestic economic activity, especially in natural resource-dependent countries.[7] Another important factor is the terms of trade, which measure the price of a country's exports relative to its imports. As noted by Mendoza (1995), changes in the terms of trade affect export revenues and overall economic growth. Their impact could be particularly magnified in resource-dependent economies, resulting in greater volatility in output and the real exchange rate. Likewise, workers' remittances and foreign capital flows can be a significant source of foreign exchange and influence the evolution of economic growth; the extent will depend on the size of the population that has migrated abroad and the magnitude of inflows relative to the domestic economy. While workers' remittances are typically stable over time and do not result in claims on assets or other contractual obligations, certain types of capital flows, such as FDI, can set the stage for knowledge and technology transfer and, in so doing, help expand the economy's production frontier. The impact of foreign aid on growth, on the other hand, is more controversial. While some studies, such as Hansen and Tarp (2000) and Dalgaard, Hansen, and Tarp (2004), identify a positive effect, others find a negative impact of foreign aid on growth, once the quality of institutions and policies is controlled for (Fayissa and El-Kaissy, 1999; Burnside and Dollar, 2000).[8]

The structure of factor endowments matters for the risk of civil conflict and post-conflict growth dynamics. Hausmann, Hwang, and Rodrik (2007), among others, show that countries dependent on natural resource exports experience, on average, slower grow than

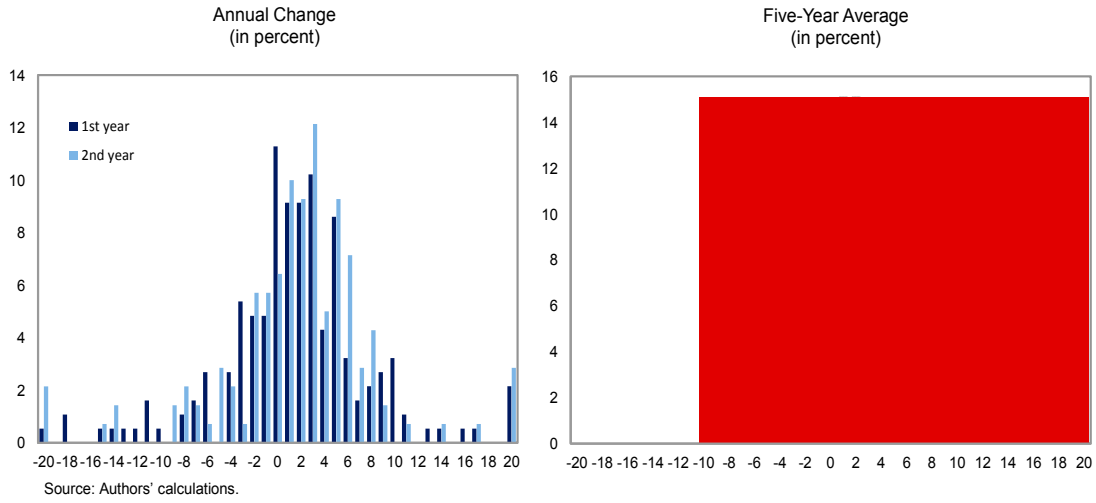
[7] For the analysis presented in this paper, cyclical and structural changes in the global economy over the past half century are expected to be an important factor in differences in post-conflict recovery dynamics.

[8] Easterly, Levine, and Roodman (2004) find contradicting results about the effectiveness of international aid, even in with good policies.

more diversified economies do. This so-called "resource curse" acts through the volatility of commodity prices and the "Dutch disease" that tends to occur when a commodity boom leads to appreciation of the real exchange rate and undermines non-resource sectors (Bruno and Sachs, 1982; Corden and Neary, 1982; Sachs and Warner, 1995). Resource dependence, particularly on hydrocarbons and precious stones, has also been linked to the risk of intra-state conflict through the opportunity cost of rebellion and the value of the state prize (Collier and Hoeffler (2002; 2004)), for example, argue that civil conflict is associated with low opportunity cost of rebellion.[9] The most convincing evidence in favor of the opportunity cost argument comes from the analysis of the interaction between economic shocks and the incidence of civil conflict. Miguel, Satyanath, and Sergenti (2004) show that rainfall variability in sub-Saharan Africa affects income growth and the opportunity cost of conflict, while Sambanis (2005) suggests that high unemployment contributes to the onset and duration of civil conflict by lowering the opportunity cost of rebellion. The state prize theory, on the other hand, predicts that the conflict risk rises with the value of the prize (Besley and Persson, 2011), with the strongest evidence in favor of the "state prize" argument coming from the historical analysis of Africa (Reno, 1998; Bates, 2008) and from studies showing a link between natural resource wealth and civil conflicts (Fearon, 2005; Ross, 2006).[10]

Post-conflict rebound in economic growth shows great variation and is not typically a sustainable phenomenon. According to our dataset of 146 cases of internal armed conflict in 94 countries during the period 1960–2010, real GDP per capita growth accelerates after

Figure 2. Distribution of Post-Conflict Growth Rates, 1960 - 2010



Source: Authors' calculations.

[9] This idea is rooted in the economic theories of crime developed by Becker (1968) and Elrich (1973), and central to the theories of insurrection advanced by Tullock (1971), Grossman (1991). and Lichbach (1995).

[10] It is worth noting that while higher resource revenues raise the value of capturing the state, resource revenues could also create greater fiscal space and thereby strengthen the regime against rebellion.

the end of a conflict, with an average of 1.5 percent a year over the subsequent five years. This is a very weak performance relative to the rest of the world economy and especially considering the low level of initial income and the depth of contraction during the conflict. Furthermore, as illustrated in Figure 2, the distribution of post-conflict growth rates is spread out, ranging from a five-year average of -10 percent per year in Liberia to 20 percent per year in Bosnia and Herzegovina. The empirical regularities of post-conflict economic transitions identified in this paper are broadly consistent with other studies. For example, analyzing growth performance in 62 post-conflict countries from 1974 to 1997, Collier and Hoeffler (2004b) find that the economic recovery tends to be marked by a rebound in growth in the first three years followed by an "above normal" average growth rate over the next four to seven years if peace is maintained and the security situation improved. However, since the initial recovery stage is simply a spurt of growth, with the onset of peace initiating a mean reversion in economic activity supported by foreign aid flows and reconstruction projects, this growth rebound is not typically a sustainable phenomenon. Likewise, studying sub-Saharan African countries, David, Bastos, and Mills (2011) uncover that changes in the terms of trade and the quality of institutions are the most important determinants of post-conflict economic growth, while trade openness and international aid do not have statistically meaningful effects.

III. Data Overview

We assemble a panel dataset of 146 cases of civil conflict in 94 countries spanning the years from 1960 to 2010. To investigate the empirical patterns of post-conflict economic transitions, we gauge the strength of growth by the annual rate of growth in real GDP per capita and use a comprehensive set of conflict data—encompassing 146 cases of civil conflict in 94 countries across Africa, the Americas, Asia, Europe, and the Middle East—extracted from the latest version of the UCDP/PRIO Armed Conflict Dataset (Appendix Table 1).[11] The UCDP/PRIO dataset characterizes four different types of conflicts according to location and participants: (1) extra-systemic armed conflicts, (2) inter-state armed conflicts, (3) intra-state armed conflicts, and (4) internationalized intra-state armed conflicts. In this paper, we concentrate on episodes of internal armed conflict including all three categories based on the level of intensity: *low-intensity* conflict with at least 25 battle-related deaths a year and fewer than 1,000 battle-related deaths during the course of the conflict; *cumulatively high-intensity* conflict with an accumulated total of at least 1,000 battle-related deaths, but fewer than 1,000 in any given year; and *high intensity* conflict with at least 1,000 battle-related deaths a year. Although low-intensity conflicts may not necessarily have a measurable impact on economic activity during and after the conflict, we still include such episodes, excluding terrorist attacks, in the sample to develop a broader understanding.

[11] The UCDP/PRIO dataset is available at http://www.pcr.uu.se/research/ucdp/datasets/; Gleditsch et al. (2002) provide a detailed description of the criteria used in coding civil conflicts.

We use annual observations, instead of five-year averages, to avoid a loss of valuable information. Most of the empirical literature uses five-year averages, with the aim of removing business cycle fluctuations. Although year-to-year variations in data may include cyclical components, averaging does not necessarily eliminate the cyclical effect. Moreover, as argued by Aguiar and Gopinath (2007), cycles tend to be the trend in developing countries. That is, in contrast to business cycles in advanced economies, some shocks tend to have a permanent impact in developing countries and especially in post-conflict episodes during which an economy is subject to various structural breaks. Moreover, uncertainty is better measured over the business cycle and accordingly, using five-year averages could underestimate the importance of volatility, particularly in resource-dependent countries. Additionally, because of the frequent occurrence of conflicts, five-year averages may include developments during the conflict period and may consequently fail to represent the true extent and magnitude of post-conflict performance. In contrast, if averaging only applies to non-conflict periods, then spell durations become endogenous because the post-conflict risk can potentially decrease the non-conflict years. In other words, these averages over different spells are not comparable; and averaging growth rates over time would lead to misleading results or, at least, reduces the dimension of data. Accordingly, we use a set of annual observations that allows for a more complete empirical analysis with more robust results.

In testing our model of economic transitions, we include in the sample only countries with a history of conflict. In the construction of our dataset, we adopt a conservative strategy and limit the sample to conflict episodes, since post-conflict economic dynamics reflect specific factors including an unprecedented destruction of human and physical capital that tends to lead to an unbalanced growth path. Similarly, institutions after a conflict behave differently than they did before the conflict (or in countries with no history of intra-state conflict) with a corresponding effect on growth dynamics. Another important reason to focus on countries with a history of conflict is related to certain variables, such as the duration and intensity of conflict and the extent of destruction, which must be included in the regression as explanatory variables, and which do not exist for a country with no history of an internal conflict. Accordingly, we construct an unbalanced panel over the period 1960–2010, using annual data, in such a way that the cross-sectional dimension is defined by country and that the time dimension is defined by years.[12]

We make use of a host of variables, including the risk of conflict recurrence, to explain the strength of post-conflict economic growth. Economic performance depends on a multitude of interlinked factors ranging from the stocks of human and physical capital, natural resources and geography to institutions, politics, and developmental stage, but we

[12] For every country in the panel of data, we treat all the observations up to and including the conflict incident as missing values. In the case of countries with multiple episodes of civil conflict, we treat the observations corresponding to subsequent conflicts as missing values. We focus on internal civil conflicts and exclude all episodes of interstate aggression during the period 1960–2010.

need to keep the construction of the dataset in accordance with the growth literature as well as our objective of working with a panel data set covering 94 countries over the period 1960–2010. Accordingly, our empirical model considers a broad range of variables: these include the initial level of real GDP per capita at the end of the conflict; duration and intensity of the conflict as defined by the UCDP/PRIO dataset, but scaled to account for the population size; human capital as measured by educational attainments; demographic variables such as population density, the size of the youth bulge, and ethnic fractionalization; geographic variables and climatic conditions; natural resource dependence; terms of trade; global real GDP growth; degree of trade openness; international factors such as foreign aid, IMF-supported economic programs, and UN peacekeeping operations; and institutional variables.[13] In addition, because post-conflict countries have a tendency to relapse into subsequent conflicts, we introduce an estimated measure of the forward-looking risk of conflict recurrence as an explanatory variable in our econometric estimations.

We test the unit root or stationarity properties of our panel dataset and find no evidence of non-stationarity. The majority of the tests for unit root or stationarity in panel data that are widely used in the empirical literature assume a balanced panel dataset (Levin, Lin, and Chu, 2002; and Im, Pesaran, and Shin, 2003). In our study, however, the panel dataset of post-conflict growth episodes is unbalanced because of frequent occurrences of civil conflict, making most of these tests for unit root in panel data inapplicable. One prominent exception is the approach proposed by Choi (2001) that introduce a Fisher-type unit root test for even unbalanced panel datasets. The results, presented in Appendix Table 6, show that there is no evidence for non-stationarity in our panel dataset.

IV. Theoretical Framework and Empirical Methodology

We adopt an augmented version of the neoclassical growth model to capture the impact of human capital, institutions, and the risk of conflict recurrence. As a basis for estimating the determinants of economic growth, this paper follows the theoretical framework extended by Mankiw, Romer, and Weil (1992) to incorporate human capital into the neoclassical growth model:

$$(7)\quad Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta}$$

where an economy's output (Y) is produced by the stock of physical capital (K), the stock of human capital (H), and the stock of labor (L), with labor-augmenting technology (A) growing exogenously at the rate of g, and $\alpha, \beta > 0$ and $\alpha + \beta < 1$. The effect of institutions and other

[13] This list of variables and sources is presented in Appendix Table 2, while Appendix Table 3 provides a summary of descriptive statistics for main variables used in the regressions.

potential factors on economic growth can also be incorporated by expressing the production model as a function of:

$$(8)\ Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta} Z_t$$

where *Z* denotes the influence of a vector of potential determinants such as institutions, geography, and policy variables on the productivity of inputs.

A. Estimating Post-Conflict Economic Performance

The potential endogeneity of the explanatory variables and unobserved country-specific effects plague much of the empirical work. To avoid widespread econometric problems in the literature, Holtz-Eakin, Newey, and Rosen (1988) and Arellano and Bond (1991) developed a GMM estimator for dynamic panel data regressions using the lagged levels of the regressors as instruments for the equation in first differences. However, this approach suffers from small sample bias when the time series is short and exhibit high persistency over time, which makes the lagged levels weak instruments for subsequent first differences. These shortcomings of the first-difference GMM estimator—documented by Arellano and Bover (1995) and Blundell and Bond (1998)—are more pronounced when α approaches one and/or $\sigma_{\eta_i}^2/\sigma_{\varepsilon_{it}}^2$ is high. Although using multiple-year intervals or averages has become a standard procedure in the empirical literature, this reduces the number of observations and does not effectively mitigate persistency in the data. Furthermore, if the variance of country-specific characteristics increases relative to transitory shocks, the standard method produces weak results. Because of the dominant impact of unobserved heterogeneities in growth during and after a conflict, it is likely that $\sigma_{\eta_i}^2$ will be greater than $\sigma_{\varepsilon_{it}}^2$. In addition, post-conflict data are relatively short, partly because of a series of conflict recurrences. As a result, given the above-mentioned drawbacks, the first-difference GMM estimator is not a suitable approach to studying post-conflict economic growth.

We use the system-GMM estimator to analyze the determinants of cross-country differences in the strength of post-conflict economic growth. In this paper, we follow the system-GMM approach proposed by Arellano and Bover (1995) and Blundell and Bond (1998), which brings together the equation in differences and the equation in levels in a system of equations and utilizes both lagged levels and differences of the regressors as instruments. Accordingly, the system-GMM estimator performs better with highly persistent data and allows us to obtain more precise estimates with an additional layer of information provided by the over-time variation in dependent variables and underlying determinants. We operationalize the theoretical framework by adopting a modified version of the standard specification of the growth equation in the following form:

$$(3)\ \Delta y_{it} = g_{it} = \alpha g_{it-1} + \beta CR_{it} + \gamma Z_{it} + \eta_i + \varepsilon_{it}$$

where Δy_{it} is the growth rate of real GDP per capita for country *i* and *t* periods after the end of the conflict (i.e. time *t = 0* denotes the end of conflict); $g_{i,t-1}$is the lagged growth rate at the time $t-1$; CR_{it} is the risk of conflict recurrence over the subsequent period after the end of the conflict, which we estimate according the below-outlined approach; Z_{it} represents a vector of variables; η_i are unobserved country-specific effects; and ε_{it} is the error term. The empirical method used in this paper makes following assumptions:

(4) $\mathrm{E}[\eta_i] = 0, \quad \mathrm{E}[\varepsilon_{it}] = 0, \quad \mathrm{E}[\eta_i \varepsilon_{it}] = 0,$

We also assume that transitory shocks are serially uncorrelated (i.e. $\mathrm{E}[\varepsilon_{it}\varepsilon_{i,s}] = 0$ for all $s \neq t$) and initial conditions are predetermined (i.e. $\mathrm{E}[g_{i1}\varepsilon_{it}] = 0$). These assumptions, in turn, provide $L = (T-1)(T-2)/2$ moments conditions to estimate Equation (3):

(5) $\mathrm{E}[g_{i,t-s}\Delta\varepsilon_{it}] = 0$ for $t = 3, \cdots, T$ and $s \geq 2$

The assumption of $E(u_{i3}\Delta g_{i2}) = 0$ improves the performance of the estimator. Using the standard GMM assumption, this condition can be reduced to $\mathrm{E}(\eta_i \Delta g_{i2}) = 0$, which is satisfied for stationary series as long as $\mathrm{E}(g_{i1}|\eta_i) = c_i$. This implies that deviations from the initial conditions are uncorrelated with c_i itself. Although Bond, Hoeffler, and Temple (2001), among others, employ this methodology to estimate the level of GDP, assuming $\mathrm{E}(\eta_i \Delta y_{i2}) = 0$, we believe this condition may be violated in estimating post-conflict growth dynamics, as it implies that the initial rate of post-conflict economic growth (Δy_{i2}) is unrelated to unobserved fixed effects. On the other hand, assuming the change in post-conflict growth is orthogonal to η_i provides a weaker assumption for post-conflict recoveries. We therefore use the above-outlined moment conditions and employ the system-GMM methodology to reduce the potential bias in estimation and generate consistent and efficient parameter estimates.[14]

B. Estimating the Risk of Conflict Recurrence

We estimate the probability of conflict recurrence and use it as an explanatory variable in our growth regressions. The strength of post-conflict recovery depends considerably on economic agents' perception of the stability of peace after the end of violence. Therefore, since the risk of plunging into a new bout of conflict deters investment spending and inhibits overall growth in the economy, it is necessary to include a measure of forward-looking risk assessment as an explanatory variable in estimating the determinants of post-conflict

[14] The consistency of the system-GMM estimator is dependent on the validity of the instruments, which can be tested by the standard Sargan test. The null hypothesis of no misspecification is rejected if the minimized GMM criterion function registers a large value compared with a chi-squared distribution with the degree of freedom equal to the difference between the number of moment conditions and the number of parameters.

macroeconomic performance. However, quantifying the relationship between the probability of conflict recurrence and the strength of income growth remains a challenge. There are different modeling approaches in the early warning/leading indicators literature; these include linear regression and limited dependent variable probit/logit techniques developed to test the statistical significance of various indicators in determining the incidence of an event risk.[15] While these statistical tools have been extensively applied in the empirical literature to estimate the probability of currency/financial crisis, debt/loan default or economic recession, we adopt a similar approach to estimate the risk of conflict recurrence.

The risk of an event at time *t* + 1 can be measured by estimating its distribution given the available information at time *t*. Measuring the risk of conflict recurrence over the subsequent years by using proxy variables would yield biased estimates mainly because there is no good proxy to convey forward-looking risk expectations, especially in many developing and low-income countries that have experienced episodes of civil conflict. Therefore, we model the perceived risk of conflict recurrence with the latest available information in each period by imposing more structure on a general model of conflict and defining risk as the probability of conflict recurrence in the next period. Assuming conflict is a latent variable, the model of hostility in country *i* at time *t* (h_{it}) becomes as a function of:

$$(6)\quad h_{it} = \phi X_{it} + \nu_i + \epsilon_{it}$$

where X_{it} is a set of independent variables contributing to the level of enmity at time *t* in country *i* and ν_i represents fixed effects for country i. Although the level of hostility is unobservable, we can still estimate Equation (7) since conflict incidence is an observable variable, assuming that it happens when the level of hostility passes a certain threshold:[16]

$$(7)\quad cr_{it} = 1 \;\; if\; h_{it} > 0 \text{ and } cr_{it} = 0 \;\; if\; h_{it} < 0$$

If ϵ has a distribution of Δ, a conflict occurs with the probability of $1 - \Delta(\phi X_{it} + \nu_i)$. These binary observations provide enough variation to estimate β in Equation (6)—a well-established exercise in the literature for characterizing the causes of civil conflicts. At the same time, the forward-looking probability of conflict recurrence can be defined as:

$$(8)\quad \mathrm{E}[r_{it}] = \text{probability}(cr_{i,t+1} = 1 | X_{it}; \phi, \nu_i)$$

Based on this framework, the perceived risk of conflict recurrence can be calculated as:

[15] There is a vast and growing literature on early warning indicators and prediction methods, led by, among others, Eichengreen, Rose, and Wyplosz (1995) and Frankel and Rose (1996) on forecasting currency crises and Estrella and Mishkin (1998) on predicting economic recessions.

[16] Without loss of generality, the threshold can be zero.

$$
\begin{aligned}
\mathrm{E}[r_{it}] &= \int \mathrm{P}\left(cr_{i,t+1}=1 \middle| X_{i,t+1}, \epsilon_{i,t+1}; \nu_i\right) P\left(X_{i,t+1} \middle| X_{i,t}\right) \Delta\left(\epsilon_{\mathrm{i},t+1}\right) dX_{i,t+1} d\epsilon_{i,t+1} \\
&= \int 1\left(\phi X_{i,t+1} + \nu_i + \epsilon_{i,t+1} > 0\right) P\left(X_{i,t+1} \middle| X_{it}\right) \Delta(\epsilon_{i,t+1}) dX_{i,t+1} d\epsilon_{i,t+1} \\
&= \overline{\Delta}(X_{it}; \nu_i)
\end{aligned} \tag{9}
$$

Therefore, risk can be measured by the probability of a conflict at the next period given the information set available at time t in country i (X_{it}), and the above equation can be estimated by using the following likelihood estimator:

$$
L_{it} = \left(\overline{\Delta}(\phi X_{it} + \nu_i)\right)^{1(cr_{i,t+1}==0)} \left(1 - \overline{\Delta}(\phi X_{it} + \nu_i)\right)^{1(cr_{i,t+1}==1)} \tag{10}
$$

One major advantage of our method, compared to earlier studies, is that we control for unobserved fixed effects (ν_i) and therefore deal with unobserved variables that may contribute to the incidence of relapsing into subsequent conflicts. Following Wooldridge (2005), assuming that the unobserved fixed effect ν_{i} is distributed by a distribution $\Omega(.;\pi)$, the likelihood estimator becomes a function of:

$$
L = \sum_{i,t}\left[\int_{-\infty}^{\infty} \left(\overline{\Delta}(\phi X_{it} + \nu_i)\right)^{1(cr_{i,t+1}==0)} \left(1 - \overline{\Delta}(\phi X_{it} + \nu_i)\right)^{1(cr_{i,t+1}==1)} d\Omega(\nu_i; \pi)\right] \tag{11}
$$

For this exercise, we assume $\overline{\Delta}$ has the logistic functional form as $\frac{\exp(\phi X_{it}+\nu_i)}{1+\exp(\phi X_{it}+\nu_i)}$ and ν_i is distributed by $N(0, \sigma_\nu^2)$. It is worth mentioning that a significant and economically large σ_ν shows that ignoring these unobserved fixed effects may lead to biased results.

This is the first attempt in the conflict literature to control for unobserved fixed effects in a nonlinear probability model. We measure the risk of conflict recurrence with the logit technique, using the level and growth rate of real GDP per capita and whether the country had a civil conflict before.[17] The estimated baseline coefficients for Equation (12), based on a set of 195 countries, with or without a history of conflict, across the world, are presented in the first column of Table 1. The results show that the variance of unobserved fixed effects (σ_ν) is significant in all cases, illustrating that country-specific fixed effects are crucial in measuring conflict recurrence risk (or the initial occurrence of civil conflict, for that matter). Another important conceptual distinction between this paper and earlier studies is the timing of the model, as we infer the risk of conflict recurrence at time *t + 1* by using the available information set at time *t*, which is an abstraction and not burdened by the problem of endogeneity often present in conflict regressions. Various models of conflict recurrence risk, presented in Table 1, exhibit a high degree of cross-correlation, with an average of 80 percent (Appendix Table 7). Furthermore, to check the robustness of our estimations, we develop an

[17] We explore various specifications of the model, using a broad range of variables, as presented in Table 1, and find that the estimated risk of conflict recurrence remains robust.

Table 1. Determinants of the Risk of Conflict Recurrence: Random-Effect Logistic Panel Model

Variables	Models 1 Baseline	2 Alternative	3	4	5	6	7	8	9
Log (real GDP per capita)$_t$	-0.363***		-0.275**	-0.087	-0.507***	-0.399***	-0.457***	-0.260**	-0.282**
	(-3.114)		(-2.245)	(-0.701)	(-3.204)	(-3.078)	(-3.031)	(-2.025)	(-2.392)
Real GDP per capita growth$_t$	-1.639**		-1.667**	-1.834**	-2.687**	-1.988**	-3.397***	-2.305***	-1.766**
	(-2.223)		(-2.243)	(-2.226)	(-2.565)	(-2.441)	(-3.301)	(-2.869)	(-2.379)
Had conflict$_t$	5.383***	2.619***	5.238***	4.932***	5.627***	5.407***	5.606***	5.292***	5.428***
	(9.567)	(3.494)	(9.346)	(8.572)	(7.698)	(8.495)	(7.536)	(9.296)	(9.562)
Log (global real GDP)$_t$		1.443			1.724				
		(0.873)			(1.053)				
Global real GDP growth$_t$		-4.703			-3.813				
		(-0.903)			(-0.679)				
Duration of conflict$_t$		0.044***							
		(3.327)							
Terms of trade$_t$					-4.630**		-4.890***		
					(-2.546)		(-2.921)		
Natural resource rent$_t$						4.294***	6.847***		
						(2.724)	(3.693)		
Natural resource rent$_t^2$						-3.134	-5.235**		
						(-1.492)	(-1.974)		
Secondary school enrollment rate$_t$								-11.822*	
								(-1.817)	
Secondary school enrollment rate$_t^2$								76.206**	
								(2.257)	
Ethnic fractionalization		0.675	1.677**						
		(0.866)	(2.178)						
Youth bulge$_t$		0.121***							
		(3.930)							
Frequency of cabinet changes$_t$		0.352***		0.190**	0.293***				
		(3.619)		(2.166)	(2.889)				
Type of political regime$_t$				0.013					
				(1.050)					
Type of political regime$_t^2$				-0.016***					
				(-6.631)					
UN peacekeeping operations$_t$									0.931***
									(3.549)
1960s	-0.920***		-0.866***	-0.625***				-0.877***	-0.824***
	(-4.619)		(-4.327)	(-2.834)				(-3.314)	(-4.101)
1970s	-0.196	0.103	-0.159	0.167	0.708	-0.060	0.066	-0.153	-0.103
	(-1.205)	(0.163)	(-0.975)	(0.869)	(1.028)	(-0.346)	(0.345)	(-0.748)	(-0.624)
1980s	0.423***	0.551	0.452***	0.691***	1.215**	0.525***	0.779***	0.521***	0.494***
	(2.835)	(1.242)	(3.008)	(3.938)	(2.553)	(3.371)	(4.520)	(3.154)	(3.263)
1990s	0.531***	0.309	0.515***	0.626***	0.866***	0.621***	0.752***	0.633***	0.558***
	(3.827)	(1.130)	(3.676)	(4.079)	(3.272)	(4.264)	(4.756)	(4.242)	(3.988)
Constant	-4.782***	-21.707	-6.038***	-5.734***	-18.662	-4.996***	-4.559***	-5.190***	-5.473***
	(-4.627)	(-1.531)	(-5.003)	(-5.279)	(-1.331)	(-4.388)	(-3.403)	(-4.848)	(-5.110)
σ_v^2	1.202***	1.086***	1.156***	1.163***	1.443***	1.292***	1.440***	1.182***	1.210***
	(6.790)	(5.250)	(6.450)	(6.404)	(7.255)	(7.007)	(7.447)	(6.577)	(6.846)
Log Likelihood	-1469	-1060	-1449	-1323	-1028	-1254	-1098	-1387	-1463
χ^2	184.9	86.17	179.7	205.5	133.2	134.4	138.1	177.0	197.5
Number of observations	7,087	2,848	6,795	5,409	4,564	5,340	4,646	6,303	7,087
Number of countries	195	105	184	159	165	168	153	184	195

Notes:

The dependent variable is a dummy for the recurrence of a conflict at the next period; the coefficients are estimated with a random-effect logit panel model for the sample period 1960 - 2010.

z-statistics are reported in parenthesis, with ***, **, and * indicating statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Authors' estimations.

alternative measure of conflict recurrence risk, presented in the second column of Table 1 and discussed thoroughly in Section VI, using an array of variables such as a country's history of conflict, the level and growth rate of global real GDP, the frequency of cabinet changes, and the degree of ethnic fractionalization, but without relying on the level and growth of domestic per capita income.

The higher the level and growth rate of real GDP per capita, the lower the risk of conflict recurrence over the next period in that country. Regression results, presented in Table 1, show that the impact of the level and growth rate of real GDP per capita on the perceived risk of conflict recurrence over the subsequent period after the end of aggression is negative and highly statistically significant across all specifications of the model. According to our baseline model, the estimated coefficients on real GDP per capita and its annual growth rate are -0.32 and -1.72, respectively, which are equivalent to the marginal effects of -0.02 and -0.11. In other words, a one percent increase in the level of real GDP per capita or in its rate of growth would lower the probability of conflict recurrence in the subsequent period by 2 percent and 11 percent, respectively, in that country.

One of the most important factors in determining the risk of conflict recurrence is whether the country had a conflict before. The coefficient on the "had conflict" variable is statistically significant at the 1 percent level across all specifications. Accordingly, the marginal effect of having a history of civil conflict increases the probability of conflict recurrence in the subsequent period by 35 percent, which alone highlights the importance of efforts to avoid an incidence of conflict in the first place. While the "had conflict" variable may arguably capture country characteristics, there is no test available to address this question directly. It is also worth noting that country fixed effects are modeled separately in our estimation, based on the logit random-effect framework. Furthermore, we include a range of other explanatory variables in the second column and find that the marginal impact of having a conflict before never drops below 25 percent.[18]

The impact of human capital on the risk of conflict recurrence is statistically significant and has a U-shape. The coefficient on human capital, as measured by secondary school enrollment rates, is statistically significant at the 5 percent level, which implies that the risk of conflict recurrence declines with the stock of human capital. However, this relationship is not linear. Including the squared term of secondary school enrollment rate in the regression indicates that the risk of conflict recurrence starts to increase once a country reaches a certain

[18] The coefficient of a past incident of conflict is identified by relative changes in future civil wars between countries that were involved in a conflict for the first time and countries that were not Given that this relative change is evaluated when other variables are kept fixed, country-specific factors play a minor role in producing a significant coefficient for having had a conflict.

threshold in human capital.[19] In other words, raising educational attainments from a low base has a stabilizing effect, as it helps to increase the productivity of labor and lower the opportunity cost of rebellion. But when a country is relatively well endowed with human capital, further gains would add to labor market pressures in a fragile post-conflict economy and consequently increase the risk of conflict recurrence.

The youth bulge is a significant factor in explaining the risk of conflict recurrence, while ethnic fractionalization does not appear to be robust. In order to identify the dynamic interaction between human capital, demographic conditions, and the risk of conflict, we also include a measure of the youth bulge, along with educational attainments, in the regression. Consistent with the findings of Urdal (2004), we find that the size of the youth bulge is also a momentous contributor to the risk of conflict recurrence, with a positive coefficient at the 1 percent level of significance. Furthermore, we also estimate the role of ethnic fractionalization, as measured by the ethnolinguistic fractionalization (ELF) index, which measures the probability that two randomly drawn individuals from a given country do not speak the same language. In contrast to other studies including Esteban, Mayoral, and Ray (2012) that highlight a relationship between ethnic fractionalization and the incidence of civil conflict, our analysis does not yield robust results for the relationship between ethnic heterogeneity and the forward-looking risk of conflict recurrence.[20] Depending on the model specification, the statistical significance of ethnic fractionalization varies, but it always has the same sign—that is, a higher degree of ethnic fragmentation appears to increase the risk of conflict recurrence over the subsequent period.

The magnitude of natural resource rents as a share of GDP has a significant effect on the risk of conflict recurrence. Empirical studies offer mixed results on the link between natural resource wealth and civil conflicts. Collier and Hoeffler (2004a) suggest that the share of primary goods in total exports has a quadratic and statistically significant effect on the incidence of conflict, while Ross (2006) argues along the same lines, but using data on petroleum and diamond production, instead the share of primary exports. Nevertheless, data limitations, especially in countries with a history of conflict, make the identification of the impact of resource dependence empirically challenging. We decided to use natural resource rents as a share of GDP—as a consistent metric for all countries—in the regressions, and find that its coefficient is statistically significant at the 1 percent level in different specifications of the model. In other words, the higher the extent of natural resource rents in a country, the

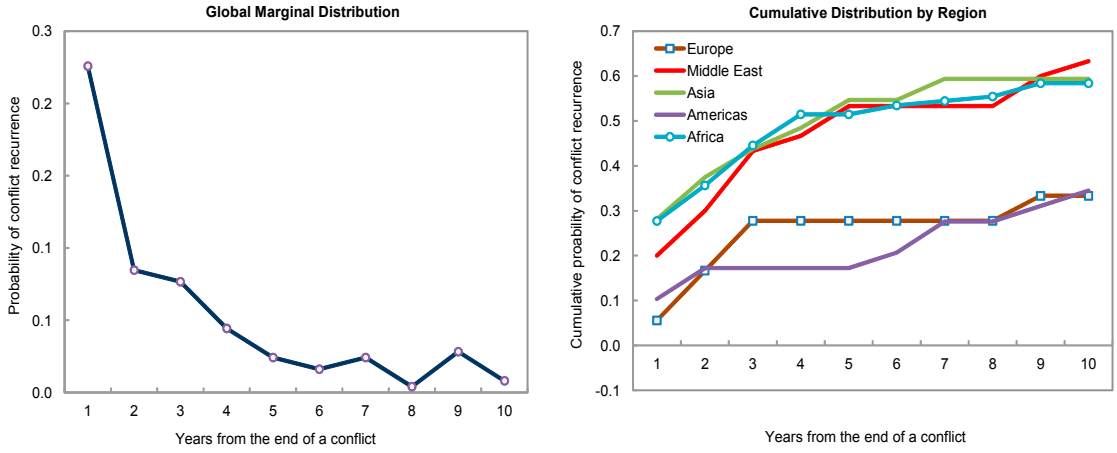
[19] We test other measures of human capital such as primary, university, and total school enrollment rates, which show the same pattern as secondary school enrollment, but are statistically insignificant. In our view, this is because conflict has a greater effect on secondary school enrollment, causing a higher degree of volatility compared to other variables.

[20] The impact of factors such as ethnic fragmentation, natural resource dependence, and potentially omitted country-specific variables is most likely captured by unobserved fixed effects (v_i) in the regression.

higher the risk of conflict recurrence after the cessation of violence.[21] We also include the squared term of natural resource rent, which is weakly significant at the 10 percent level only in one specification but still provides evidence that an increase in natural resource rents reduces the probability of future conflicts in higher-income countries.

Institutional factors have statistically and economically large effects on the probability of conflict recurrence. The literature on the institutions-growth nexus has become more diverse and multilayered, thanks to the development of a wide range of institutional measures. For example, the International Country Risk Guide (ICRG) dataset and the World Bank's Country Policy and Institutional Assessment (CPIA) dataset provide survey-based variables ranging from the rule of law and the risk of expropriation to the quality of governance. The problem is that these series cover a relatively short period—starting from the 1980s in the case of the ICRG and from 1996 in the case of the CPIA dataset. Given that our sample period spans from 1960 to 2010, we need alternative measures to estimate the impact of institutions on the risk of conflict recurrence as well as economic growth. The Polity IV dataset, going back as far as 1800, provides a measure of political regime type; the Cross-Nations Time Series (CNTS) dataset reports the frequency of changes in government.[22] Both measures have been used extensively in the literature and should be a reasonable proxy for the quality of institutional arrangements. Our estimation results show that although the type of political regime has a weakly significant effect that tends to increase the risk of

Figure 3. Probability of Conflict Recurrence, 1960 - 2010



Source: Authors' estimations. .

[21] Additional regressions show that hydrocarbon production is not significant for the occurrence of civil conflict. We also consider two other time dummies for the discovery of hydrocarbon reserves and the start of production, which are insignificant when the "had conflict" variable is included in the regression.

[22] Political regime type is measured by an index ranging from -10 for complete autocracy to 10 for full democracy, while the frequency of changes in government is the number of cabinet changes in a given year.

conflict recurrence in democratic countries, the relationship is not linear. The negative squared term in political regime type indicates that a competitive election process and executive constraints reduce the probability of conflict recurrence in more democratic societies, while a high degree of institutionalized autocracy would also lower the risk of conflict recurrence. In other words, countries in the middle of the political regime spectrum appear to have a higher perceived risk of conflict recurrence. On the other hand, the coefficient on the number of cabinet changes is negative and highly significant at the 1 percent level in various specifications of the model, implying that frequent changes in government contribute to a higher risk of conflict recurrence.

External factors, especially changes in the terms of trade, have a significant influence on the risk of conflict recurrence. Dube and Vargas (2007) study the impact of commodity prices on intra-state armed conflicts in Colombia and find that a sharp fall in the price of coffee lowers wages, decreases the opportunity cost of violence, and, consequently, increases the risk of conflict outbreaks in coffee-intensive areas. However, they also show that the commodity price link to conflict incidence changes in hydrocarbon-rich areas, where an increase in the price of oil leads to an increase in conflict outbreaks. Likewise, using cross-country data, Fearon (2005) and Ross (2006) find that an increase in the price of crude oil adds to the value of rents controlled by the government, leading to a rise in the incidence of conflict. From a methodological point of view, it is not possible to disentangle these two opposing channels because of extensive heterogeneities across countries and export prices. Nonetheless, the significant negative coefficient of the terms of trade indicates that, on average, the first channel of transmission is dominant. In other words, an improvement in export prices raises the opportunity cost of violence through higher wages, and thereby reduces the risk of conflict occurrence over the subsequent years. It is worth noting that a key difference between this paper and other studies is that we estimate a forward-looking measure of conflict recurrence risk, instead of the current incident of conflict.

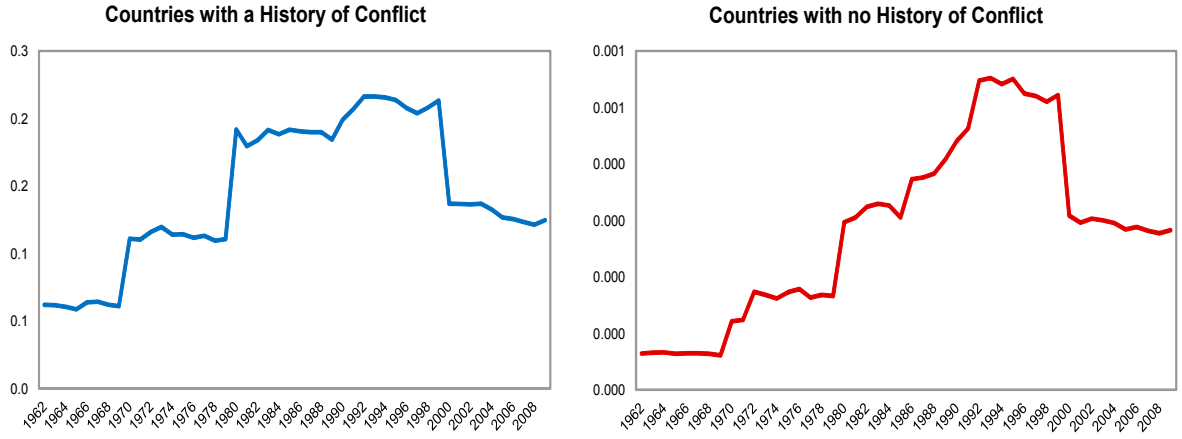
UN peacekeeping operations are positively correlated with the estimated forward-looking risk of conflict recurrence. Using a dummy variable for peacekeeping operations, we identify a positive and statistically significant effect on the perceived risk of conflict recurrence.[23] In other words, the presence of UN peacekeeping forces appears to increase the risk of conflict recurrence. Moreover, this finding remains robust even if alternative measures of UN interventions, such as the number of UN troops in the country, are included instead of a binary dummy variable. This result is counterintuitive; we believe it can be explained by the endogeneity of peacekeeping operations: the UN initiates an operation when risk is apparent in generating a chaos in an attempt to support the development of an environment of economic and political stability and social cohesion, confirming the perceived risk of conflict

[23] The list of UN peacekeeping operations during the period 1948–2010 is available at http://www.un.org/en/peacekeeping/list.shtml.

recurrence.[24] Accordingly, we exclude this variable from the benchmark model, because the aforementioned endogeneity problem can potentially lead to biased estimates for other factors.[25] We also include decade dummies to capture shifting political relationships between countries during and after the Cold War. Following the end of the Cold War and the disintegration of the Soviet Union, there have been significant changes in the global political landscape, with far-reaching economic implications. The results indicate that decade dummies, except for the 1960s, are statistically significant in most specifications of the model, capturing the evolution of conflict recurrence risk over time.

The risk of relapsing into conflict declines with a lasting peace, but it remains higher in the subsequent years than to the pre-conflict probability. According to our estimations, in the first year after the end of conflict the probability of recurrence exceeds 20 percent, and in the five-year period following the probability exceeds 40 percent. While the probability of relapsing into conflict declines with a lasting peace, it is remains higher in the subsequent years than to the pre-conflict probability. The analysis presented in this paper highlights the importance of establishing appropriate policies and reforms immediately after the end of a conflict, to address the underlying causes and to accelerate the pace of economic recovery. As shown in the right panel of Figure 3, the cumulative distribution of conflict recurrence by region indicates extensive heterogeneity among countries and highlights the importance of taking into account country-specific effects in the empirical analysis. In addition, there is a

Figure 4. Variation in the Risk of Conflict Recurrence, 1962-2009



Source: Authors' estimations.

[24] Rhoads (2012) provides a recent journalistic account of UN interventions in civil conflicts, with a particular focus on the Democratic Republic of Congo.

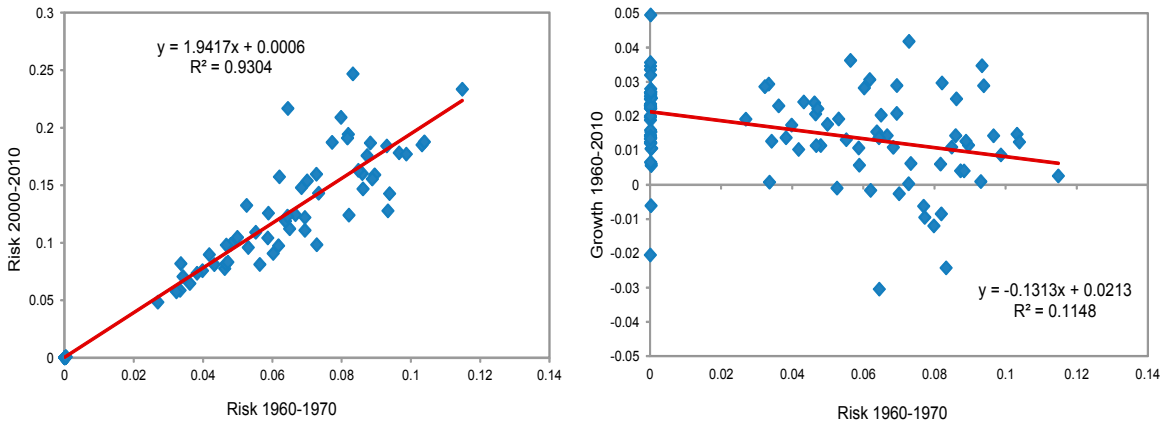
[25] To disentangle the impact of UN intervention on the risk of conflict recurrence, an appropriate IV variable must be employed—an important empirical question left for future studies.

systematically higher risk of conflict recurrence in Africa, Asia, and the Middle East than in the Americas and Europe. In particular, African and Asian countries start peace with a significantly higher risk of relapsing into conflict, although the probability declines over time with a lasting peace. In contrast, however, countries in the Middle East appear to suffer from a high risk of conflict recurrence without much decline over subsequent years.

The risk of civil conflict peaked in the 1990s across the world, but remains high for countries with a history of conflicts. In Figure 4, the average risk of conflict occurrence in countries with at least one conflict (left panel) and no history of civil conflict (right panel) across the world is depicted. The probability of civil conflict peaked for all countries in the1990s, increasing from an average of 4 percent in the 1960s to 10 percent in the 1970s, 15 percent in the 1980s, and 16 percent in the 1990s.[26] However, the risk of civil conflict incidence is more than 100 times greater in countries with at least one past episode of civil conflict: it was 22 percent in the 1990s for countries with a history of civil conflict versus 0.06 percent for countries with no history of civil conflict. Even though the risk of conflict occurrence declined over the past decade for all countries across the world, the probability of relapsing into a new bout of conflict remains elevated for countries with a history of conflict.

The estimated risk of conflict recurrence has a statistically significant and economically large negative effect on post-conflict growth. As illustrated in Figure 5, the average risk of conflict recurrence in the 2000s is highly correlated with that in the 1960s, indicating a

Figure 5. Risk of Conflict Recurrence and Economic Growth, 1960-2010



Source: Authors' estimations.

[26] These simple averages are not weighted by population or GDP, which better highlights the global level of conflict recurrence risk. First, since GDP and population have a direct effect on risk, averaging according to these weights can lead to biased results. Second, the sample of countries is changing over time in both panels. The reason is that if a country experiences a civil conflict for the first time, it will be accounted in the left panel afterwards. Therefore, a weighted average can make the comparison less meaningful.

highly persistent risk of conflict recurrence in countries with a history of civil conflict. While it is not possible to formally test for the direction causality, we reason that persistency reflects a wide range of underlying factors including unresolved grievances and hostilities as well as dysfunctional institutions and economic weaknesses. In addition, the relationship between the average risk of conflict recurrence in the 1960s and average real GDP per capita growth over the entire period 1960–2010 appears to be robust. Again, consistent with the economic theory, a higher initial level of conflict recurrence risk tends to reduce the growth rate of real GDP per capita in the future.

V. EMPIRICAL RESULTS

The empirical results are consistent with the economic theory and provide robust evidence for conditional convergence. The post-conflict data on real GDP per capita show feeble recovery after the end of a civil conflict, with an average growth rate of 1.5 percent per year over the subsequent five years for all countries in our sample. This is a very weak performance relative to the rest of the world economy, especially considering the low level of initial income and the depth of economic contraction during a conflict. Furthermore, the distribution of post-conflict growth rates indicates a diverse pattern, ranging from a five-year average of -10 percent in the case of Liberia to 20 percent in the case of Bosnia and Herzegovina. We present the results of the cross-country panel growth regression in Table 2 for the baseline model and in Table 3 for the model with the alternative definition of conflict recurrence risk, which is discussed in detail in assessing the robustness of the results in Section VI. Our findings show that the extent of autocorrelation is well below 1 and not persistent, implying that growth is less autocorrelated in the aftermath of a civil conflict than in normal times. Nonetheless, the coefficient on the level of per capita income at the end of a conflict is statistically significant and consistent with conditional convergence. The magnitude of the coefficient implies that a country with lower per capita income would converge towards richer countries at a speed of 3 percent following the end of a conflict.

The risk of conflict recurrence has a statistically significant and economically large effect on post-conflict growth. The coefficient on the risk factor is negative, as expected, and statistically robust at the 1 percent level of significance across all baseline specifications of the model, with an economically large negative effect on post-conflict growth dynamics. According to our estimations, a one percent increase in the probability of conflict recurrence in the subsequent period would lower real GDP per capita growth by 10 percent.[27] The magnitude of this effect is substantial, especially considering that a country with a history of

[27] An important feature of this result is that we use an abstract measurement of risk in our calculation (the first column of Table 1). If we include other variables, the impact of the risk of conflict recurrence would be larger.

conflict would be 30 percent riskier than a country with no history of conflict.[28] Similarly, alternative specifications of the risk of conflict recurrence, presented in the second column of Table 1, also have a negative effect of the same magnitude on post-conflict real GDP per capita growth. However, it is worth mention that the coefficient on conflict recurrence risk varies according to its model specification. Intuitively, a limited information set with only low-frequency components would be a weak measurement of conflict recurrence risk and would consequently underestimate the risk factor in the growth regression.

The duration of conflict has a negative and statistically noteworthy impact on the post-conflict growth experience. The coefficient of conflict duration is statistically significant at the 5 percent level across all specifications of our model. There are competing explanations for the interaction between the duration of conflict and the growth rate of real GDP per capita after the end of the conflict. On the one hand, a long conflict tends to destroy the stocks of human and physical capital, the restoration of which would lead to rapid recovery due to higher marginal production of capital. On the other hand, a long-lasting civil conflict can damage the institutional infrastructure and undermine post-conflict recovery prospects for an extended period. The results presented in this paper support the latter hypothesis: that a long-lasting conflict, when controlling for the risk of reoccurrence, undermines post-conflict economic performance.[29] However, we could not identify the impact of conflict intensity on real GDP per capita growth after the end of the conflict. Although we get the expected sign, data limitations prevent reaching definite conclusions.[30] Likewise, the depth of economic contraction during the conflict period has the expected negative sign, but does not appear to be a statistically significant factor. According to Collier and Hoeffler (2004b), the rate of economic growth tends to accelerate after three consecutive years of peace, implying that a variable measuring the duration of peace should show a positive effect on post-conflict growth dynamics. Although we find that the number of years since the end of conflict is positive and statistically significant at the 1 percent level, its economic magnitude is small, especially if we control for lagged growth and the risk of conflict recurrence. Nevertheless, this result indicates that efforts to maintain post-conflict peace would contribute to growth, which in turn reinforces the stability of peace and reduces the risk of conflict recurrence.

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[28] Interestingly, this effect is present in different variants of estimators including the panel time series method (the first column of Table 2) and the dynamic system of equations (the columns 2 to 18 of Table 2). As discussed in the methodology section, since using the panel time series approach may lead to biased estimates, we do not report the simple panel results in this paper.

[29] This conclusion should be treated with caution, because the direction of causality is unclear as weak institutions may also contribute to conflict duration and to slower growth afterwards. In this paper, while we do not explicitly deal with this issue, we reason that the impact of institutional factors beyond what is incorporated in our growth model is captured by fixed effects and therefore should not distort the key empirical findings.

[30] We use alternative variables including the number of battle-related deaths according to Gleditsch (2004), but data limitations prevent a conclusive analysis.

Table 2. Determinants of Post-Conflict Real GDP Per Capita Growth: System-GMM Dynamic Panel

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Real GDP per capita $_{t-1}$	0.289***	0.291***	0.241***	0.168***	0.286***	0.150***	0.296***	0.256***	0.289***	0.206***	0.226***	0.277***	0.225***	0.289***	0.240***	0.230***	0.289***	0.208***
	(14.438)	(14.572)	(11.263)	(7.821)	(13.506)	(6.266)	(14.654)	(12.312)	(14.435)	(8.470)	(8.506)	(14.020)	(11.158)	(14.403)	(11.465)	(10.935)	(14.427)	(6.472)
Log real GDP per capita $_{t}$	-0.030***	-0.033***	-0.028***	-0.021***	-0.022***	-0.025***	-0.037***	-0.035***	-0.030***	-0.058***	-0.071***	-0.031***	-0.036***	-0.032***	-0.033***	-0.038***	-0.029***	-0.088***
	(-6.824)	(-7.136)	(-5.874)	(-5.381)	(-5.685)	(-5.894)	(-7.665)	(-7.119)	(-6.741)	(-8.313)	(-8.640)	(-7.146)	(-7.882)	(-6.874)	(-7.144)	(-8.050)	(-6.607)	(-8.202)
Risk of conflict recurrence $_{t}$	-0.089**	-0.087**	-0.093**	-0.121***	-0.103***	-0.079**	-0.083**	-0.112***	-0.096**	-0.115**	-0.103*	-0.098***	-0.146***	-0.091**	-0.134***	-0.168***	-0.087**	-0.241***
	(-2.327)	(-2.272)	(-2.465)	(-3.186)	(-2.592)	(-1.974)	(-2.140)	(-2.733)	(-2.481)	(-2.294)	(-1.699)	(-2.590)	(-3.890)	(-2.379)	(-3.432)	(-4.238)	(-2.259)	(-3.244)
Duration of conflict $_{t}$	-0.001		-0.001**	-0.000	0.001	0.000	-0.000	-0.000	-0.001	-0.002***	-0.002***	-0.001	-0.001**	-0.001	-0.001**	-0.000		0.001
	(-1.416)		(-1.995)	(-0.108)	(1.248)	(0.017)	(-0.909)	(-0.714)	(-1.444)	(-3.253)	(-2.993)	(-1.438)	(-1.966)	(-1.072)	(-2.107)	(-0.617)		(0.617)
Time since the end of conflict $_{t}$		0.004***																0.013***
		(3.016)																(2.616)
Depth of contraction during conflict $_{t}$			-0.056															-0.495***
			(-1.034)															(-3.639)
Terms of trade $_{t}$				0.043														
				(0.920)														
Temperature variability $_{t}$					0.001													-0.002
					(0.848)													(-0.641)
FDI $_{t}$						0.007***												
						(5.305)												
Landlocked							-0.093***											-0.059
							(-4.172)											(-1.597)
Global real GDP growth $_{t}$								0.481***										0.014
								(5.826)										(0.044)
UN peacekeeping operations $_{t}$									0.014									0.063*
									(1.043)									(1.757)
Trade openness $_{t}$										-0.120*	-0.119*							-0.028
										(-1.743)	(-1.655)							(-0.374)
Trade Openness*GDP $_{t}$										0.020**	0.018*							0.008
										(2.098)	(1.891)							(0.763)
Trade Openness *Global growth $_{t}$											0.622**							0.011
											(2.274)							(0.017)
Foreign aid per capita $_{t}$												-0.001						-0.013***
												(-0.391)						(-3.284)
Secondary school enrollment rate $_{t}$													0.239***					
													(2.900)					
Ethnic fractionalization $_{t}$														-0.036				-0.098**
														(-1.330)				(-2.285)
Cabinet Changes $_{t}$															-0.009***			-0.012***
															(-3.989)			(-3.708)
Natural resource rent $_{t}$																-0.048**		0.010
																(-2.404)		(0.338)
IMF Program $_{t}$																	-0.005	-0.006
																	(-1.269)	(-1.206)
Constant	0.253***	0.253***	0.239***	0.182***	0.178***	0.216***	0.311***	0.276***	0.252***	0.470***	0.562***	0.262***	0.293***	0.278***	0.290***	0.317***	0.231***	0.701***
	(6.914)	(7.299)	(6.112)	(5.395)	(5.335)	(6.249)	(7.790)	(6.878)	(6.867)	(8.266)	(8.317)	(7.281)	(7.911)	(6.669)	(7.558)	(8.233)	(6.851)	(7.691)
Number of observations	1,916	1,916	1,563	1,618	1,617	1,166	1,856	1,748	1,916	1,261	1,103	1,908	1,761	1,908	1,691	1,767	1,916	773
Number of countries	89	89	83	83	78	81	84	89	89	73	73	89	89	88	89	89	89	57
Sargan Test	1943	1943	1605	1696	1667	1247	1865	1744	1942	1279	1125	1930	1738	1940	1669	1757	1942	797.8
χ2	333.0	343.3	206.5	119.9	272.7	108.3	370.4	331.6	334.2	205.1	234.6	328.3	265.9	334.2	274.2	300.0	332.4	215.0

Notes:
The dependent variable is the growth rate of real GDP per capita at time t, starting with the end of conflict.
The model is estimated with the system-GMM dynamic panel approach for the sample period 1960-2010.
The sample includes only post-conflict observations.
z-statistics are reported in parenthesis, with ***, **, and * indicating statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.
Source: Authors' estimations.

Table 3. Determinants of Post-Conflict Real GDP Per Capita Growth (with the Alternative Measure of Conflict Risk): System-GMM Dynamic Panel

Variables	Models 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Real GDP per capita growth$_{t-1}$	0.272***	0.285***	0.151***	0.257***	0.138***	0.278***	0.273***	0.270***	0.258***	0.258***	0.266***	0.271***	0.272***	0.269***	0.270***	0.259***
	(12.129)	(11.513)	(5.928)	(10.719)	(4.830)	(12.312)	(12.204)	(11.830)	(11.303)	(11.384)	(11.806)	(12.095)	(12.133)	(12.077)	(11.608)	(8.943)
Log (real GDP per capita$_t$)	-0.059***	-0.052***	-0.036***	-0.043***	-0.026***	-0.060***	-0.058***	-0.059***	-0.072***	-0.071***	-0.060***	-0.059***	-0.060***	-0.060***	-0.053***	-0.078***
	(-9.161)	(-7.352)	(-6.434)	(-7.939)	(-4.881)	(-9.070)	(-9.006)	(-8.939)	(-9.439)	(-9.366)	(-9.338)	(-9.170)	(-8.839)	(-9.402)	(-8.323)	(-7.911)
Risk of conflict recurrence$_t$	-0.092***	-0.074**	-0.132***	-0.123***	-0.106***	-0.084**	-0.078**	-0.092***	-0.090**	-0.077**	-0.093***	-0.096***	-0.092***	-0.100***	-0.088***	-0.100**
	(-2.672)	(-2.125)	(-4.029)	(-3.533)	(-2.789)	(-2.405)	(-2.262)	(-2.687)	(-2.528)	(-2.142)	(-2.712)	(-2.779)	(-2.693)	(-2.934)	(-2.589)	(-2.541)
Duration of conflict$_t$	-0.002***	-0.003***	-0.000	0.001	0.001	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002**	0.000
	(-2.926)	(-2.988)	(-0.534)	(1.450)	(1.430)	(-2.735)	(-2.951)	(-2.938)	(-2.681)	(-2.752)	(-3.119)	(-2.851)	(-2.871)	(-3.022)	(-2.351)	(0.368)
Depth of contraction during conflict$_t$		-0.167**														-0.586***
		(-2.549)														(-4.243)
Terms of trade$_t$			0.015													
			(0.246)													
Temperature variability$_t$				0.000												-0.002
				(0.076)												(-0.906)
FDI$_t$					0.006***											
					(2.936)											
Landlocked						-0.069**										-0.029
						(-1.995)										(-0.732)
Global real GDP growth$_t$							0.400***									0.147
							(3.017)									(0.450)
UN peacekeeping operations$_t$								-0.007								0.058
								(-0.346)								(1.597)
Trade openness$_t$									-0.164**	-0.167**						-0.017
									(-2.302)	(-2.359)						(-0.220)
Trade openness*GDP$_t$									0.026***	0.025***						0.006
									(2.685)	(2.576)						(0.575)
Trade openness*global growth$_t$										0.763***						0.096
										(2.868)						(0.147)
Foreign aid per capita$_t$											-0.005**					-0.012***
											(-2.117)					(-3.023)
Secondary school enrollment rate$_t$												0.101				
												(0.765)				
Ethnic fractionalization													-0.015			-0.058
													(-0.408)			(-1.397)
Number of cabinet changes$_t$														-0.013***		-0.012***
														(-4.508)		(-3.711)
Natural resource rent$_t$															-0.062**	0.036
															(-2.323)	(1.224)
Constant	0.486***	0.432***	0.303***	0.329***	0.217***	0.503***	0.470***	0.491***	0.570***	0.562***	0.500***	0.485***	0.498***	0.504***	0.442***	0.593***
	(9.220)	(7.393)	(6.265)	(7.178)	(4.937)	(9.222)	(8.895)	(9.003)	(9.345)	(9.246)	(9.419)	(9.190)	(8.274)	(9.585)	(8.482)	(7.406)
Number of observations	1,176	976	1,004	1,056	730	1,150	1,176	1,176	1,096	1,096	1,176	1,175	1,176	1,176	1,172	757
Number of countries	79	72	72	70	68	76	79	79	73	73	79	79	79	79	79	57
Sargan Test	1119	963.0	1006	1009	766.5	1085	1118	1119	1078	1080	1117	1118	1117	1112	1098	785.0
χ2	242.0	182.1	81.15	205.9	55.74	264.0	251.0	242.2	233.6	242.1	246.1	241.1	241.8	262.7	254.5	209.5

Notes:
The dependent variable is the growth rate of real GDP per capita at time t, starting with the end of conflict.
The model is estimated with the system-GMM dynamic panel approach for the sample period 1960-2010.
The sample includes only post-conflict observations.
z-statistics are reported in parenthesis, with ***, **, and * indicating statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.
Source: Authors' estimations.

Human capital, as measured by educational attainments, tends to have a positive and statistically significant effect on the pace of post-conflict growth. The coefficient of secondary school enrollment rates is statistically significant at the 1 percent level and the expected positive sign with an economically large effect on post-conflict real GDP per capita growth. This is consistent with the findings of a plethora of studies, including Lucas (1993), showing the accumulation of human capital as one of the main engines of growth. However, secondary school enrollment is not significant in all specifications. For example, with the alternative definition of conflict recurrence risk as presented in the second column of Table 1, the impact of secondary school enrollment rates becomes statistically insignificant. Nonetheless, the results suggest that high levels of human capital can endogenously foster post-conflict economic growth. Another factor at play is the asymmetric destruction of different types of capital during a conflict. If the conflict destroys the stocks of human capital more than physical capital, then human capital becomes scarce compared to other factors of production in the aftermath of the conflict. The lower the ratio of human to physical capital, the higher the marginal production of investing in human capital, and consequently the higher the growth. At the same time, such an asymmetric destruction of human and physical capital may lead to changes in the economy's production possibility frontier. As a result, this relationship may then depict a negative correlation between educational attainments and economic growth.

Institutional variables have the expected signs, but do not appear to be statistically significant when the risk factor is included in the regression. The empirical results show that institutional measures, such as the type of political regime and the number of cabinet changes in a given year, have the expected signs, but do not appear to be robustly significant, when the risk of conflict recurrence is included in the model. However, we are reluctant to draw definite conclusions on the relationship between institutional variables and economic growth. First, the analysis covers post-conflict recovery periods, which may be too short for institutional change to have a meaningful impact on growth dynamics. Second, depending on the definition of conflict recurrence risk or other factors included as explanatory variables, the significance of institution variables varies across model specifications. When the growth estimation is conducted using a broader set of observations that includes non-conflict countries, institutional factors indeed become statistically and economically highly significant with the expected signs. In our opinion, reflects numerous institutional similarities among conflict-prone countries; therefore, excluding observations from non-conflict countries makes the empirical identification of the impact of institutional variables on post-conflict growth weaker.

Resource-dependent countries suffer from a double curse of higher risk of conflict recurrence and lower post-conflict growth. The empirical literature finds mixed results whether natural resource rents are a blessing or curse for an economy with or without a history of civil conflict. Sachs and Warner (1997), among others, document that resource dependence tends to slow growth, supporting the view that the natural resource is probably a

curse. They, and many others, measure the extent of natural resource dependence with the ratio of natural resource exports to GDP. In contrast, we prefer to use natural resource rents scaled by GDP as a measure of resource dependence—as well as resource wealth that could be perceived as a "state prize" subject to aggression—in the growth regression. The results show that the coefficient on natural resource rents is statistically significant at the 5 percent level and has a negative sign, with an economically large effect on post-conflict real GDP per capita growth. In other words, post-conflict countries with a high degree of dependence on natural resources suffer from a double curse of higher risk of conflict and lower growth, compared to other post-conflict countries with a more diversified economic structure.

Landlocked status is a significant factor, but other geographical variables such as climatic variability do not appear to be important. The results show that the landlocked status of a country has a negative and statistically significant effect at the 1 percent level on the growth rate of real GDP per capita after the end of a conflict, indicating that landlocked countries tend to grow, on average, at a considerably lower rate.[31] Though represented with a dummy variable in the regression, a country's landlocked status captures the impact of complex interactions between geographic and economic factors on income growth through various channels including transaction costs, international trade, foreign investment, and the extent of technology diffusion. Another geographic factor included in the empirical analysis is the variability in climatic conditions measured by the standard deviation of temperature, which helps eliminate possible scale effects. We find that the coefficient on temperature variability is not a statistically significant factor in the post-conflict growth regression.

Ethnic fractionalization has a statistically significant negative effect on the pace of economic growth in the aftermath of a civil conflict. We find that the coefficient on ethnic fractionalization, as measured by the ELF index, is negative and statistically significant, albeit at the 10 percent level. This implies that ethnic fragmentation tends to lessen the strength of post-conflict real GDP per capita growth. This result is broadly consistent with earlier studies including Easterly and Levine (1997) that identify ethnic heterogeneity as an important factor in determining cross-country differences in economic growth in the case of sub-Saharan Africa. Interestingly, the impact of ethnic fractionalization on the growth rate of real GDP per capita after the end of conflict remains statistically significant and economically meaningful, even when we control for the risk of conflict recurrence.

Global growth and FDI flows are significant factors contributing to post-conflict economic performance across all countries in the sample. We find that global real GDP growth has a statistically significant coefficient at the 1 percent level, with an economically large impact on the post-conflict growth process. This relationship works through at least two channels of transmission. First, an increase in global growth boosts overall demand in the

[31] This is a well-documented empirical regularity, regardless of an incidence of conflict, in the literature.

world economy, pushing export growth to a higher plateau for all countries, including those with a history of conflict. Second, with an expanding global economy, post-conflict countries benefit—directly and indirectly—from the geographical expansion of various technological transfers.[32] Indeed, the empirical results also identify net FDI per capita as a statistically significant factor in the growth model. On the other hand, we find a negative coefficient for the degree of trade openness, as measured the share of exports and imports in GDP. However, interaction terms relating trade openness to the size of the domestic economy and global real GDP growth are highly statistically significant with economically large effects on the post-conflict growth rate of real GDP per capita. In other words, while low-income countries with a history of civil conflict may not be able to compete effectively in the international markets, global factors are still highly effective in facilitating economic recovery in post-conflict countries.

UN peacekeeping operations, foreign aid and IMF-supported economic programs do not appear to influence post-conflict growth. We find that the coefficient on foreign aid is not statistically significant, in line with the findings of Rajan and Subramanian (2008). This may reflect the pattern experienced in many post-conflict countries: foreign aid surges immediately after the cessation of hostilities, but abates thereafter. Moreover, as Collier and Hoeffler (2002) argue, post-conflict countries tend to have low capacity to absorb foreign aid due to political and administrative constraints, although Suhrke, Villanger, and Woodward (2005) challenge these findings.[33] Contrary to popular expectations, UN peacekeeping operations do not appear to be a significant factor in determining the strength of post-conflict economic growth. This, we believe, is related to the relationship between the risk of conflict recurrence and international peacekeeping operations, which may signal a greater level of risk that in turn depresses economic activity. As a result, the coefficient of UN peacekeeping operations becomes sensitive to the definition of the perceived risk of conflict recurrence and makes it difficult to disentangle these linkages and their impact on growth dynamics. We also test the impact of IMF-supported economic programs on post-conflict growth dynamics. Although the empirical evidence does not support a positive relationship between IMF engagement and real GDP per capita growth after the cessation of violence, such lending arrangements do not necessarily deal with the underlying fragilities that remain a drag on post-conflict growth.[34]

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[32] Another possible channel through which global growth may indirectly influence the pace of post-conflict growth is changes in foreign aid due to the state of the world economy. However, as we find that foreign aid plays a minor role in post-conflict growth dynamics, we expect the interaction between global growth and foreign aid flows to have no first-order effect.

[33] An important problem with the analysis of aid effectiveness is identification when all types of aid are bundled together. For example, humanitarian or military aid should not be expected to have the same effect on economic growth as aid adding to a country's productive capacity. Lacking disaggregated data on foreign aid, this study, too, relies on total foreign aid as measured by the OECD Development Assistance Committee.

[34] A recent study by the IMF (2012), covering 75 low-income countries eligible to receive concessional IMF resources during the period 1986-2010, presents evidence that IMF support had played a positive role over the longer term in raising growth, reducing poverty, and strengthening poorer countries' resilience to shocks.

VI. Robustness of the Results

We conduct several robustness tests in order to check the validity of empirical findings presented in this paper. From an econometric methodology point of view, the system-GMM approach is the best available technique for dynamic models of panel data; it corrects for potential biases associated with the joint endogeneity of the explanatory variables and the problems induced by unobserved country-specific effects that may influence both dependent variables and their underlying determinants. Nevertheless, one important concern about the empirical findings presented in this paper is related to the definition of conflict recurrence risk, which is used as an explanatory variable in the growth regression. The baseline definition of conflict recurrence risk is estimated with a set of variables including the level and growth rate of real GDP per capita, which are also included in analyzing post-conflict growth dynamics. Consequently, there may be a potential problem of endogeneity. One possible way to deal with this econometric predicament is to implement an instrumental variable approach for a linear probability model, similar to the methodology outlined by Miguel, Satyanath, and Sergenti (2004). However, a shortcoming of this methodology is that the linear prediction for the probability of an event risk produces many negative risk observations in the growth regression and may result in biased estimates. Furthermore, while Miguel, Satyanath, and Sergenti (2004) use rainfall as an instrumental variable in a limited geographic scope of African countries, our sample includes a broader set of countries across the world, making instrumental variables such as rainfall a weak option for the analysis—or for the robustness check.

An alternative specification of conflict recurrence risk yields similar results, confirming the robustness of our findings. We estimate alternative measures of conflict recurrence risk using a variety of variables such as a country's history of civil conflicts, the level and growth rate of global real GDP, the frequency of cabinet changes, and the degree of ethnic fractionalization, without including the level and growth of domestic per capita income in the model. The results, presented in the second column of Table 1, indicate that having a history of conflict is a robust factor in explaining the recurrence of intra-state wars. Furthermore, other variables such as the youth bulge, the duration of the last conflict, and the frequency of cabinet changes contribute significantly to measuring the time-varying risk of conflict recurrence. The growth regression based on this alternative specification of conflict recurrence risk, presented in Table 3, yields similar results coinciding with the benchmark model, except for foreign aid, which appears to reduce post-conflict growth.[35] Furthermore, though slightly weaker because of the loss of valuable information related to the post-conflict behavior of real GDP per capita, these results, based on the alternative specification of conflict recurrence risk, have no potential problem of endogeneity or reverse causality, as the level and growth rate of per capita income are excluded in the estimation.

[35] This is actually consistent with the findings of Rajan and Subramanian (2008).

We also test whether there are different time regimes, and for a range of geographic sample specifications. To check the robustness of our empirical findings based on the sample covering the entire period 1960–2010, we estimate the post-conflict growth model for different time regimes (1970–89 and 1990–2010). Like the results we derive from benchmark model, the risk of conflict recurrence remains a statistically important factor with a negative coefficient across different time specifications, as shown in Appendix Table 4, although data limitations appear to reduce the level of significance. We also test whether the statistical significance of our results is independent of geographical factors by running regressions that exclude one region at a time. For example, the first column of Appendix Table 5 shows the results when European countries are excluded from the growth regression: both the benchmark and alternative definitions of conflict recurrence risk have a statistically significant and economically large negative effect on post-conflict real GDP per capita growth. Other geographic specifications yield similar results, supporting the validity of the findings based on our benchmark model.

VII. CONCLUSION

This paper provides a broad empirical analysis of the determinants of post-conflict economic transitions. Intra-state conflicts have become the most common type of aggression over the past half century, with devastating economic and social consequences. Although the number of civil conflicts decline over the past decade, countries emerging from a conflict still struggle to break the curse of Sisyphus; 20 percent relapse into a new bout of conflict in the first year and 40 percent within five years after the end of conflict. Hence, understanding the causes and consequences of civil conflicts remains an important objective in the quest to achieve sustainable sociopolitical reconciliation and economic development. To investigate the empirical patterns of post-conflict economic transitions, we use a comprehensive set of conflict data encompassing 146 cases of civil conflict in 94 countries across Africa, the Americas, Asia, Europe, and the Middle East and apply the system-GMM estimation technique developed for dynamic panel models. Based on annual data, instead of five-year averages commonly used in the literature, our empirical model fully exploits the time-series dimension of the data and captures the dynamics of post-conflict economic transitions through a core set of explanatory variables including an estimated measure of conflict recurrence risk.

One important contribution of this paper is the estimation of the risk of conflict recurrence in the future. The strength and sustainability of post-conflict recovery depends considerably on the stability of peace, given that post-conflict countries have a tendency to relapse into subsequent conflicts even years after the cessation of violence. It is therefore necessary to estimate a forward-looking measure of conflict recurrence risk and include it as an explanatory variable in the growth regressions. Using a logistic approach, we model the probability of civil conflict recurrence with the available information in each period. First, we find that there is a high degree of persistence in the risk of conflict recurrence in countries

with a history of civil conflict. For example, the average risk of conflict recurrence in the 2000s is highly correlated with that in the 1960s, which might be reflecting a range of factors including unresolved grievances and hostilities as well as dysfunctional institutions and economic weaknesses. Second, we identify that the estimated risk of conflict recurrence has a statistically significant and economically large negative effect on the post-conflict growth experience across all specifications of our model. With a robust relationship between the average risk of conflict recurrence in the 1960s and average real GDP per capita growth over the entire period 1960–2010, a higher initial level of conflict recurrence risk reduces the growth rate of real GDP per capita in the future. According to our estimations, a one percent increase in the probability of conflict recurrence in the subsequent period would lower real GDP per capita growth by about 10 percent.

Domestic factors are the key to strong, sustainable economic performance after the end of an intra-state conflict. We find a statistically significant negative coefficient on the initial level of real GDP per capita at the end of a conflict, consistent with the neoclassical hypothesis of conditional convergence. Even though the duration of civil conflict is a statistically significant factor with a negative effect on the post-conflict growth rate of real GDP per capita, we could not identify the impact of conflict intensity, as measured by the number of battle-related deaths, or depth of economic contraction during the conflict. Though not across all specifications, human capital, as measured by educational attainments, appears to have a positive and statistically significant effect on the strength of post-conflict economic growth. Likewise, the empirical results show that institutional factors tend to have a positive influence on growth dynamics, although variables used in this paper, such as the type of political regime and the number of cabinet changes in a given year, are not robustly significant when the risk factor is included in the model. We also find that resource-dependent countries suffer from a double curse of higher risk of civil conflict recurrence and lower growth, compared to other countries with a more diversified economic structure. While landlocked status is a statistically significant factor, other geographical variables such as the variability in climatic conditions do not appear to be important in post-conflict growth dynamics. On the other hand, we find that ethnic fractionalization has a statistically significant negative effect on the strength of post-conflict economic growth, even when we control for the risk of conflict recurrence.

International factors make a significant contribution to post-conflict growth across all countries in the sample. We find that global real GDP growth is a statistically significant factor, with an economically large impact on the post-conflict growth process. An increase in global growth raises overall demand in the world economy, pushing export growth to a higher plateau for all countries including those with a history of conflict, and boosts technological transfers, foreign aid and capital flows to post-conflict economies. Although we find a negative coefficient for the degree of trade openness, there is nonlinearity, with interaction terms relating openness to the size of the domestic economy and global real GDP growth having statistically and economically significant effects on post-conflict growth.

Contrary to popular expectations, we do not find foreign aid and IMF-supported economic programs to have significant influence on post-conflict economic growth. However, this may well be a reflection of the pattern experienced in many post-conflict countries that international aid surges immediately after the cessation of violent conflict, but abates afterward. Likewise, UN peacekeeping operations do not appear to be a significant factor in determining the strength of post-conflict economic growth, which could be sensitive to the definition of the perceived risk of conflict recurrence in this paper and thereby makes it difficult to disentangle these linkages and their impact on growth dynamics.

Growth-enhancing policies and institutional reforms are necessary to improve economic growth prospects after the end of a conflict. The empirical findings presented in this paper suggest a framework centered on three main pillars—implementing growth-enhancing policies, reforming dysfunctional institutions, and addressing urgent needs—to reduce the risk of conflict recurrence and pave the way to a broad-based, sustainable growth in real GDP per capita after the end of a conflict. While sound macroeconomic management is important for success, helping to sustain the pace of recovery and avoid a relapse into conflict, strengthening institutions is de rigueur for addressing longstanding grievances and raising the economy's growth potential. Moreover, the challenge facing post-conflict countries is not just to make economic growth stronger, but also more inclusive to ensure that the benefits of increase prosperity are shared more evenly across society, especially considering the possibility that pre-conflict policies and institutional arrangements may have contributed to the outbreak of civil conflict by discriminating against particular ethnic, religious or social segments. Last but not the least, in the particular case of natural resource-dependent countries, the need for economic diversification is not just a long-term development objective, but an urgent undertaking in order to break the double curse of higher conflict recurrence risk and lower post-conflict growth.

A worthwhile extension of our analysis would investigate the process of how conflict risk evolves over time. One of the main contributions of the analysis presented in this paper is to take a first pass at quantifying the impact of the perceived risk of conflict recurrence on post-conflict economic transitions. Accordingly, a valuable extension would be an investigation of the dynamic process of how economic agents assess the risk of conflict recurrence and its evolution over time using a Bayesian methodology. Similarly, the geographic diffusion of conflict risk within and between countries is an interesting empirical question, especially in view of the spread of the "Arab Spring" across the Middle East and North Africa. Last but not least, the empirical results point to an asymmetric destruction of different types of capital during a civil conflict that could lead to changes in the economy's production possibility frontier. Accordingly, an analysis using micro-level data on the stocks of physical and human capital would help in better understanding the dynamics of economic growth after the end of conflict.

Appendix Table 1. List of Countries with Conflict Episodes, 1960-2010

Africa	Americas	Asia	Europe	Middle East
Algeria	Argentina	Afghanistan	Azerbaijan	Egypt
Angola	Bolivia	Bangladesh	Bosnia and Herzegovina	Iran
Burkina Faso	Chile	Cambodia	Croatia	Iraq
Burundi	Colombia	India	Georgia	Lebanon
Cameroon	Cuba	Indonesia	Macedonia, FYR	Oman
Central African Rep.	Dominican Rep.	Lao People's Dem.Rep	Moldova	Syria
Chad	El Salvador	Malaysia	Romania	Yemen
Comoros	Guatemala	Myanmar	Russia	
Congo, Dem. Rep. of	Haiti	Nepal	Serbia	
Congo, Rep. of	Mexico	Pakistan	Spain	
Côte d'Ivoire	Nicaragua	Papua New Guinea	United Kingdom	
Djibouti	Panama	Philippines		
Eritrea	Paraguay	Sri Lanka		
Ethiopia	Peru	Tajikistan		
Gabon	Suriname	Thailand		
Gambia, The	Trinidad and Tobago	Uzbekistan		
Ghana	Uruguay			
Guinea	Venezuela			
Guinea-Bissau				
Kenya				
Lesotho				
Liberia				
Madagascar				
Mali				
Mauritania				
Morocco				
Mozambique				
Niger				
Nigeria				
Rwanda				
Senegal				
Sierra Leone				
Somalia				
South Africa				
Sudan				
Togo				
Tunisia				
Uganda				
Zimbabwe				

Source: UCDP/PRIO.

Appendix Table 2. List of Variables

Variable	Description	Source
Civil conflicts		UCDP/PRIO
Real GDP per capita		World Bank, World Development Indicators
Real GDP per capita growth	Annual change in percent	World Bank, World Development Indicators
Inflation	Annual average in percent	World Bank, World Development Indicators
Terms of trade	Index	IMF, World Economic Outlook
Natural resource rent	Percent of GDP	World Bank, World Development Indicators
FDI	Percent of GDP	World Bank, World Development Indicators
Foreign aid per capita	in real terms	World Bank, World Development Indicators
Trade openness	Export plus import as a share of GDP	CNTS
Global real GDP		World Bank, World Development Indicators
Global real GDP growth	Annual change in percent	World Bank, World Development Indicators
Youth bulge	Youth age 15-24 over all adults over age 15	Urdal (2004)
Secondary school enrollment rate	Percent of population	CNTS
Landlocked	Dummy	Treisman (2007)
Ethnic fractionalization	Ethno-linguistic fractionalization index	Collier, Hoeffler, and Rohner (2009)
UN peacekeeping operations	Dummy	United Nations
Political regime type	Index ranging from autocracy to democracy	Polity IV
Executive Constraint	Index ranging from ineffective to effective	Polity IV
Frequency of changes in government	Annual number of cabinet changes	CNTS

Appendix Table 3. Summary of Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Log (real GDP per capita)	7464	7.61	1.61	4.13	11.67
Real GDP per capita growth	7267	0.02	0.06	-0.69	0.64
Log (global real GDP)	8440	8.41	0.17	8.10	8.71
Global real GDP growth	8229	0.01	0.01	-0.03	0.04
Had conflict	10550	0.10	0.30	0.00	1.00
Duration of conflict	5350	15.74	15.55	0.00	55.94
Landlocked	8050	0.22	0.41	0.00	1.00
Ethnic fractionalization	9550	0.41	0.23	0.00	0.90
Youth bulge	6499	29.91	6.56	9.60	45.00
Frequency of cabinet changes	7353	0.43	0.59	0.00	5.00
Type of political regime	7303	0.30	7.44	-10.00	10.00
Natural resource rent	5764	0.10	0.17	0.00	2.14
Secondary school enrollment rate	7524	0.05	0.04	0.00	0.29
UN peacekeeping operations	10550	0.02	0.15	0.00	1.00
Log (FDI as a share of GDP)	3581	-1.35	2.13	-11.94	5.20
Log (foreign aid per capita)	277	2.35	1.56	-2.19	7.44
Terms of trade	6356	0.12	0.09	0.00	2.92
Trade openness	5971	0.58	0.67	0.01	29.26
Trade openness*GDP	5034	4.30	4.96	0.13	201.60
Trade openness*global growth	4722	0.01	0.01	-0.39	0.29
Risk of conflict recurrence					
Specification 1	7087	0.08	0.09	0.00	0.58
Specification 2	2848	0.20	0.18	0.00	0.89
Specification 3	6795	0.09	0.11	0.00	0.70
Specification 4	5409	0.09	0.10	0.00	0.64
Specification 5	4564	0.09	0.11	0.00	0.81
Specification 6	5340	0.09	0.11	0.00	0.81
Specification 7	4646	0.10	0.12	0.00	0.84
Specification 8	6303	0.08	0.09	0.00	0.77
Specification 9	7087	0.08	0.09	0.00	0.76

Source: Authors' calculations.

Appendix Table 4. Estimation of Different Time Regimes: System-GMM Dynamic Panel

Variables	1960-1989		1990-2010	
	Baseline	Alternative	Baseline	Alternative
Real GDP per capita growth$_{t-1}$	0.021	0.041	0.303***	0.337***
	(0.581)	(1.164)	(6.757)	(10.998)
Log real GDP per capita$_t$	-0.065***	-0.085***	-0.028***	-0.053***
	(-8.450)	(-10.196)	(-3.047)	(-5.150)
Risk of conflict recurrence$_t$	-0.247**	-0.315***	-0.003	-0.197**
	(-2.317)	(-6.504)	(-0.020)	(-2.157)
Constant	0.503***	0.679***	0.210***	0.409***
	(9.130)	(10.723)	(2.705)	(5.154)
Number of observations	570	544	1,172	597
Number of countries	49	49	86	75

Notes:
The dependent variable is the growth rate of real GDP per capita at time t, starting with the end of conflict.
The model is estimated with the system-GMM dynamic panel approach for the sample period 1960-2010.
z-statistics are reported in parenthesis, with ***, **, and * indicating statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.
The sample includes only post-conflict data.

Source: Authors' estimations.

Appendix Table 5. Estimation of Different Geographic Specifications: System-GMM Dynamic Panel

	Benchmark Model excluding					Alternative Model excluding				
Variables	Europe	Middle East	Asia	Africa	Americas	Europe	Middle East	Asia	Africa	Americas
Real GDP per capita growth$_{t-1}$	0.197***	0.235***	0.238***	0.258***	0.224***	0.224***	0.291***	0.270***	0.269***	0.252***
	(8.214)	(10.170)	(10.270)	(9.407)	(8.891)	(9.135)	(12.392)	(11.225)	(10.290)	(9.571)
Log real GDP per capita$_t$	-0.039***	-0.037***	-0.041***	-0.025***	-0.045***	-0.056***	-0.043***	-0.054***	-0.028***	-0.068***
	(-7.388)	(-7.408)	(-7.749)	(-5.790)	(-7.729)	(-8.430)	(-7.015)	(-8.491)	(-4.996)	(-9.038)
Risk of conflict recurrence$_t$	-0.126***	-0.178***	-0.200***	-0.144***	-0.119**	-0.157***	-0.064*	-0.205***	-0.090***	-0.140***
	(-2.718)	(-3.793)	(-3.847)	(-4.269)	(-2.279)	(-4.477)	(-1.939)	(-4.752)	(-3.070)	(-3.827)
Constant	0.306***	0.298***	0.335***	0.222***	0.341***	0.433***	0.324***	0.437***	0.246***	0.513***
	(7.350)	(7.548)	(7.797)	(6.464)	(7.473)	(8.627)	(7.065)	(8.761)	(5.458)	(9.080)
Number of observations	1,582	1,620	1,539	1,141	1,291	1,065	1,071	1,013	768	834
Number of countries	78	82	76	54	72	69	71	66	51	61

Notes:
The dependent variable is the growth rate of real GDP per capita at time t, starting with the end of conflict.
The model is estimated with the system-GMM dynamic panel approach for the sample period 1960-2010.
z-statistics are reported in parenthesis, with ***, **, and * indicating statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.
The sample includes only post-conflict data.

Source: Authors' estimations.

Appendix Table 6. Fisher-Type Unit Root Test Based on the Augmented Dickey-Fuller Test

```
Ho: All panels contain unit roots           Number of panels       =     90
Ha: At least one panel is stationary        Avg. number of periods =  23.57

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 3 lags
```

		Statistic	p-value
Inverse chi-squared(164)	P	232.9740	0.0003
Inverse normal	Z	-4.1678	0.0000
Inverse logit t(344)	L*	-4.4913	0.0000
Modified inv. chi-squared	Pm	3.8085	0.0001

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Source: Authors' calculations.

Appendix Table 7. Correlation of Conflict Risk Measured by Models Presented in Table 1

	Models								
	1	2	3	4	5	6	7	8	9
Risk Model 1	1.00								
Risk Model 2	0.59	1.00							
Risk Model 3	0.88	0.67	1.00						
Risk Model 4	0.78	0.56	0.69	1.00					
Risk Model 5	0.93	0.60	0.82	0.78	1.00				
Risk Model 6	0.91	0.60	0.83	0.73	0.87	1.00			
Risk Model 7	0.77	0.54	0.71	0.65	0.81	0.94	1.00		
Risk Model 8	0.99	0.56	0.86	0.78	0.92	0.91	0.78	1.00	
Risk Model 9	0.94	0.54	0.80	0.78	0.87	0.86	0.75	0.93	1.00

Source: Authors' estimations.

REFERENCES

Acemoglu, D., S. Johnson, and J. Robinson, 2001, "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, Vol. 91, pp. 1369–1401.

Acemoglu, D., S. Johnson, J. Robinson, 2004, "Institutions as the Fundamental Cause of Long-Run Growth," NBER Working Paper, No. 10481 (Cambridge, MA: National Bureau for Economic Research).

Acemoglu, D., and S. Johnson, 2005, "Unbundling Institutions," *Journal of Political Economy*, Vol. 113, pp. 949–995.

Addison, T., A. Chowdhury, and S. Murshed, 2002, "By How Much Does Conflict Reduce Financial Development?" WIDER Discussion Paper, No. 2002/48 (Helsinki: United Nations University World Institute for Development Economics Research).

Alesina, A., S. Ozler, N. Roubini, and P. Swagel, 1996, "Political Instability and Economic Growth," *Journal of Economic Growth*, Vol. 1, pp. 189–211.

Aguiar, M., and G. Gopinath, 2007, "Emerging Market Business Cycles: The Cycle Is the Trend," *Journal of Political Economy*, Vol. 115, pp. 69–102.

Arellano, M., and S. Bond, 1991, "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, Vol. 58, pp. 277–297.

Arellano, M., and O. Bover, 1995, "Another Look at the Instrumental Variables Estimation of Error Components Models," *Journal of Econometrics*, Vol. 68, pp. 29–51.

Barro, R., 1989, "A Cross-Country Study of Growth, Saving, and Government," NBER Working Paper, No. 2855 (Cambridge, MA: National Bureau for Economic Research).

Barro, R., 1991, "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics*, Vol. 106, pp. 407–433.

Barro, R., 1996, "Determinants of Economic Growth: A Cross-Country Empirical Study," NBER Working Paper, No. 5698 (Cambridge, MA: National Bureau for Economic Research).

Barro, R., and X. Sala-i-Martin, 1992, "Convergence," *Journal of Political Economy*, Vol. 100, pp. 223–251.

Bates, R., 2008, *When Things Fell Apart: State Failure in Late-Century Africa* (Cambridge: Cambridge University Press).

Becker, G., 1968, "Crime and Punishment: An Economic Approach," *Journal of Political Economy*, Vol. 76, pp. 169–217.

Becker, G., K. Murphy, and R. Tamura, 1990, "Human Capital Fertility and Economic Growth," *Journal of Political Economy*, Vol. 18, pp. 12–37.

Besley, T., and T. Persson, 2011, "State Capacity, Conflict and Development," *Econometrica*, Vol. 78, pp. 1–34.

Blattman, C., and E. Miguel, 2010, "Civil War," *Journal of Economic Literature*, Vol. 48, pp. 3–57.

Blundell, R. and S. Bond, 1998, "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models," *Journal of Econometrics*, Vol. 87, pp. 115–143.

Bond, S., A. Hoeffler, and J. Temple, 2001, "GMM Estimation of Empirical Growth Models," CEPR Discussion Paper, No. 3048 (London: Center for Economic Policy Research).

Burnside, C., and D. Dollar, 2000, "Aid, Policies, and Growth," *American Economic Review*, Vol. 90, pp. 847–868.

Bruno, M., and J. Sachs, 1982, "Energy and Resource Allocation: A Dynamic Model of the "Dutch Disease," *Review of Economic Studies*, Vol. XLIX, pp. 845–859.

Cass, D., 1965, "Optimum Growth in an Aggregative Model of Capital Accumulation," *Review of Economic Studies*, Vol. 32, pp. 233–240.

Coase, R., 1937, "The Nature of the Firm," *Economica*, Vol. 4, pp. 346–405.

Choi, I., 2001, "Unit Root Tests for Panel Data," *Journal of International Money and Finance*, Vol. 20, pp. 249–272.

Collier, P., 1999, "On the Economic Consequences of Civil War," *Oxford Economic Papers*, Vol. 51, pp. 168–183.

Collier, P., and A. Hoeffler, 2002, "On the Incidence of Civil War in Africa," *Journal of Conflict Resolution*, Vol. 46, pp. 13–28.

Collier, P., and A. Hoeffler, 2004a, "Greed and Grievance in Civil War," *Oxford Economic Papers*, Vol. 56, pp. 563–595.

Collier, P., and A. Hoeffler, 2004b, "Aid, Policy and Growth in Post-Conflict Societies," *European Economic Review*, Vol. 48, pp. 1125–1145.

Collier, P., and A. Hoeffler, 2007, "Civil War," in *Handbook of Defense Economics*, edited by K. Hartley and T. Sandler (Amsterdam: Elsevier North Holland).

Collier, P., A. Hoeffler, and D. Rohner, 2009, "Beyond Greed and Grievance: Feasibility and Civil War," *Oxford Economic Papers*, Vol. 61, pp 1–27.

Corden, W., and J. Neary, 1982, "Booming Sector and De-Industrialization in a Small Open Economy," *Economic Journal*, Vol. 92, pp. 825–848.

Dalgaard, C-J., H. Hansen, and F. Tarp, 2004, "On the Empirics of Foreign Aid and Growth," *Economic Journal*, Vol. 114, pp. 191–216.

David, A., F. Bastos, and M. Mills, 2011, "Post-conflict Recovery: Institutions, Aid, or Luck?" IMF Working Paper, No. 11/149 (Washington: International Monetary Fund).

Diamond, J., 1997, *Guns, Germs and Steel: The Fate of Human Societies* (New York: Norton & Co).

Dube, O., and F. Varagas, 2007, "Commodity Price Shocks and Civil Conflict: Evidence from Colombia," Unpublished manuscript (New York: New York University).

Easterly, W., 2001, "Can Institutions Resolve Ethnic Conflict?" *Economic Development and Cultural Change*, Vol. 49, pp. 687–706.

Easterly, W., and R. Levine, 1997, "Africa's Growth Tragedy: Policies and Ethnic Divisions," *Quarterly Journal of Economics*, Vol. 112, pp. 203–250.

Easterly, W., and R. Levine, 2003, "Tropics, Germs and Crops: How Endowments Influence Economic Development," *Journal of Monetary Economics*, Vol. 50, pp. 3–39.

Easterly, W., R. Levine, and D. Roodman, 2004, "Aid, Policies, and Growth: Comment," *American Economic Review*, Vol. 94, pp. 774–780.

Elbadawi, I., H. Hegre, and G. Milante, 2008, "The Aftermath of Civil War," *Journal of Peace Research*, Vol. 45, pp. 451–459.

Elrich, I., 1973, "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation," *Journal of Political Economy*, Vol. 81, pp. 521–565.

Eichengreen, B., A. Rose, and C. Wyplosz, 1995, "Exchange Rate Mayhem: The Antecedents and Aftermath of Speculative Attacks," *Economic Policy*, Vol. 21, pp. 249–312.

Engerman, S., and K. Sokoloff, 1997, "Factor Endowments, Institutions, and Differential Growth Path among New World Economies," *Economia*, Vol. 3, pp. 30–53.

Engerman, S., and K. Sokoloff, 2002, "Factor Endowments, Inequality, and Paths of Development among New World Economies," in *How Latin America Fell Behind*, edited by S. Haber (Palo Alto, CA: Stanford University Press).

Esteban, J., and D. Ray, 2008, "On the Salience of Ethnic Conflict," *American Economic Review*, Vol. 98, pp. 2185–2202.

Esteban, J., L. Mayoral, and D. Ray, 2012, "Ethnicity and Conflict: An Empirical Study," *American Economic Review*, Vol. 102, pp. 1310–1342.

Estrella, A., and F. Mishkin, 1998, "Predicting U.S. Recessions: Financial Variables as Leading Indicators," *Review of Economics and Statistics*, Vol. 85, pp. 629–644.

Fayissa, B., and M. El- Kaissy, 1999, "Foreign Aid and the Economic Growth of Developing Countries (LDCs): Further Evidence," *Studies in Comparative International Development*, Vol. 37, pp. 37–50.

Fearon, J., 2005, "Primary Commodity Exports and Civil War," *Journal of Conflict Resolution*, Vol. 49, pp. 483–507.

Fearon, J., and D. Laitin, 2003, "Ethnicity, Insurgency, and Civil War," *American Political Science Review*, Vol. 97, pp. 75–90.

Frankel, J., and A. Rose, 1996, "Currency Crashes in Emerging Markets: An Empirical Treatment," *Journal of International Economics*, Vol. 41, pp. 351–366.

Gallup, J., J. Sachs, and A. Mellinger, 1998, "Geography and Economic Development," *International Regional Science Review*, Vol. 22, pp. 179–232.

Giuliano, P., P. Mishra, and A. Spilimbergo, 2012, "Democracy and Reforms: Evidence from a New Dataset," NBER Working Paper, No. 18117 (Cambridge, MA: National Bureau for Economic Research).

Gleditsch, N., P. Wallensteen, M. Eriksson, M. Sollenberg, and H. Strand, 2002, "Armed Conflict 1946–2001: A New Dataset," *Journal of Peace Resolution*, Vol. 39, pp. 615–637.

Gleditsch, K., 2004, "A Revised List of Wars Between and Within Independent States, 1816-2002," *International Interactions* Vol. 30, pp. 231–262.

Grossman, H., 1991, "A General Equilibrium Model of Insurrections," *American Economic Review*, Vol. 81, pp. 912–921.

Grossman, G., 1995, "Insurrections," in *Handbook of Defense Economics*, edited by K. Hartley and T. Sandler (Amsterdam: Elsevier Science).

Grossman, G., and E. Helpman, 1989, "Comparative Advantage and Long-Run Growth," NBER Working Paper, No. 2809.

Hall, R., and C. Jones, 1999, "Why Do Some Countries Produce So Much More Output per Worker than Others?" *Quarterly Journal of Economics*, Vol. 114, pp. 83–116.

Hansen, H., and F. Tarp, 2000, "Aid Effectiveness Disputed," *Journal of International Development*, Vol. 12, pp. 375–398.

Hausmann, R., J. Hwang, and D. Rodrik, 2007, "What You Export Matters," *Journal of Economic Growth*, Vol. 12, pp. 1–15.

Hegre, H., T. Ellingsen, S. Gates, and N. Gledish, 2001, "Towards a Democratic Civil Peace? Democracy, Political Change, and Civil War, 1816–1992," *American Political Science Review*, Vol. 95, pp. 22–45.

Hendrix, C., and S. Glaser, 2007, "Trends and Triggers: Climate, Climate Change and Civil Conflict in Sub-Saharan Africa," *Political Geography*, Vol. 26, pp. 695–715.

Hirshleifer, J., 1995, "Theorizing about Conflict," in *Handbook of Defense Economics*, edited by K. Hartley and T. Sandler (Amsterdam: Elsevier Science).

Holz-Eakin, D., W. Newey, and H. Rosen, 1988, "Estimating Vector Autoregressions with Panel Data," *Econometrica*, Vol. 56, pp. 1371–1395.

Im, K., M. Pesaran, and Y. Shin, 2003, "Testing for Unit Roots in Heterogeneous Panels," *Journal of Econometrics*, Vol. 115, pp. 53–74.

International Monetary Fund, 2012, "Review of Facilities for Low-Income Countries," (Washington, DC: International Monetary Fund).

Knack, S., and P. Keefer, 1995, "Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures," *Economics and Politics*, Vol. 7, pp. 207–227.

Koopmans, T., 1965, "On the Concept of Optimal Economic Growth," in *The Econometric Approach to Development Planning* (Amsterdam: North Holland).

Levin, A., C-F. Lin, and C-S. Chu, 2002, "Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties," *Journal of Econometrics*, Vol. 108, pp. 1–24.

Levine, R., and D. Renelt, 1992, "A Sensitivity Analysis of Cross-Country Growth regressions," *American Economic Review*, Vol. 82, pp. 942–996.

Levine, R., and S. Zervos, 1993, "Looking at Facts: What We Know About Policy and Growth from Cross-Country Analysis," World Bank Policy Research Papers, No. 1115 (Washington: World Bank).

Lucas, R., 1988, "On the Mechanics of Economic Development," *Journal of Monetary Economics*, Vol. 22, pp. 3–42.

Lucas, R., 1993, "Making a Miracle," *Econometrica*, Vol. 61, pp. 251–271.

Mankiw, G., D. Romer, and D. Weil, 1992, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics*, Vol. 107, pp. 407–437.

Mendoza, E., 1995, "The Terms of Trade, the Real Exchange Rate and Economic Fluctuations," *International Economic Review*, Vol. 36, pp. 101–137.

Miguel, E., S. Satyanath, and E. Sergenti, 2004, "Economic Shocks and Civil Conflict: An Instrumental Variables Approach," *Journal of Political Economy*, Vol. 112, pp. 725–753.

Murtin, F., and R. Wacziarg, 2011, "The Democratic Transition," NBER Working Paper, No. 17432 (Cambridge, MA: National Bureau for Economic Research).

Nafzinger, E., F. Stewart, and R. Vayrynen, 2000, *War, Hunger, and Displacement: The Origin of Humanitarian Emergencies* (New York: Oxford University Press).

North, D., 1990, *Institutions, Institutional Change and Economic Performance* (Cambridge: Cambridge University Press).

North, D., 1991, "Institutions," *Journal of Economic Perspectives*, Vol. 5, pp. 97–112.

Olson, M., 1993, "Dictatorship, Democracy, and Development," *American Political Science Review*, Vol. 87, pp.567–576.

Olsson, O., and D. Hibbs, 2005, "Biogeography and Long-Run Economic Development," *European Economic Review*, Vol. 49, pp. 909–938.

Rajan, R., and A. Subramanian, 2008, "Aid and Growth: What Does the Cross-Country Evidence Really Show?" *Review of Economic and Statistics*, Vol. 90, pp. 643–665.

Ramsey, F., 1928, "A Mathematical Theory of Saving," *Economic Journal*, Vol. 38, pp. 543–559.

Rebelo, S., 1991, "Long-Run Policy Analysis and Long-Run Growth," *Journal of Political Economy*, Vol. 99, pp. 500–512.

Reno, W., 1998, *Warlord Politics and African States* (Boulder: Lynne Rienner Publishers).

Reynal-Querol, M., 2002, "Political Systems, Stability and Civil Wars," *Defense and Peace Economics*, Vol. 13, pp. 465–483.

Reynal-Querol, M., 2005, "Does Democracy Preempt Civil Wars?" *European Journal of Political Economy*, Vol. 21, pp. 445–465.

Rhoads, C., 2012, "Peacekeepers at War," *Wall Street Journal*, June 23, 2012, pp. C1-C2.

Robinson, J., 2001, "Social Identity, Inequality and Conflict," *Economics of Governance*, Vol. 2, pp. 85–99.

Rodrik, D., and R. Wacziarg, 2005, "Do Democratic Transitions Produce Bad Economic Outcomes?" *American Economic Review*, Vol. 95, pp. 50–55.

Romer, P., 1990, "Endogenous Technological Change," *Journal of Political Economy*, Vol. 98, pp. S71–S102.

Ross, M., 2006, "A Closer Look at Oil, Diamonds and Civil War," *Annual Review of Political Science*, Vol. 9, pp. 265–300.

Sachs, J., and A. Warner, 1995, "Natural Resource Abundance and Economic Growth," NBER Working Paper, No. 5398 (Cambridge, MA: National Bureau for Economic Research).

Sachs, J., and A. Warner, 1997, "Sources of Slow Growth in African Economies," *Journal of African Economies*, Vol. 6, pp. 335–376.

Sambanis, N., 2001, "Do Ethnic and Non-ethnic Civil Wars Have the Same Causes? A Theoretical and Empirical Enquiry," *Journal of Conflict Resolution*, Vol. 45, pp. 259–282.

Sandler, T., 2000, "Economic Analysis of Conflict," *Journal of Conflict Resolution*, Vol. 44, pp. 723–729.

Skaperdas, S., 1992, "Cooperation, Conflict, and Power in the Absence of Property Rights," *American Economic Review*, Vol. 82, pp. 720–739.

Solow, R., 1956, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, Vol. 70, pp. 65–94.

Suhrke, A., E. Villanger, and S. Woodward, 2005, "Economic Aid to Post-Conflict Countries: A Methodological Critique of Collier and Hoeffler," CMI Working Papers, No. 2005:4 (Bergen, Norway: Chr. Michelsen Institute).

Swan, T., 1956, "Economic Growth and Capital Accumulation," *Economic Record*, Vol. 32, pp. 334–361.

Tavares, J., and R. Wacziarg, 2001, "How Democracy Affects Growth" *European Economic Review*, Vol. 45, pp. 135–158.

Treisman, D., 2007, "What Have We Learned About the Causes of Corruption from Ten Years of Cross-National Empirical Research?" *Annual Review of Political Science*. Vol. 10, pp. 211–244.

Tullock, G., 1971, "The Paradox of Revolution," *Public Choice*, Vol. 11, pp. 89–99.

Urdal, H., 2004, "The Devil in the Demographics: The Effect of Youth Bulges on Domestic Armed Conflict, 1950–2000," Social Development Papers, No. 14 (Washington: World Bank).