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Post-conflict Recovery:
Institutions, Aid, or Luck?

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Abstract

This Working Paper should not be reported as representing the views of the IMF.
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This paper identifies the factors linked to cross-country differentials in growth performance in the aftermath of social conflict for 30 sub-Saharan African countries using panel data techniques. Our results show that changes in the terms of trade are the most important correlate of economic performance in post-conflict environments. This variable is typically associated with an increase in the marginal probability of positive economic performance by about 30 percent. Institutional quality emerges as the second most important factor. Foreign aid is shown to have very limited ability to explain differentials in growth performance, and other policy variables such as trade openness are not found to have a statistically significant effect. The results suggest that exogenous factors ("luck") are an important factor in post-conflict recovery. They also highlight the importance in post-conflict settings of policies to mitigate the macroeconomic impact of terms of trade volatility (including countercyclical macroeconomic policies and innovative financing instruments) and of policies to promote export diversification.

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I. INTRODUCTION

Wars have devastating consequences in terms of human costs, destruction of infrastructure and weakening of institutions,[2] as well as erosion of social capital. Domestic social conflict is believed to be a key factor in understanding the instability of economic performance in developing countries. Rodrik (1999), for instance, argues that deep social divisions and weak institutions to manage conflict magnify the economic costs of exogenous shocks and therefore lead to higher growth volatility, mainly because these shocks trigger distributional conflicts. Arbache and Page (2007) present evidence that growth in sub-Saharan Africa has been low and volatile since the 1970s and posit that a higher incidence of conflict events in this continent compared to other regions in the world, might be an important factor explaining this outcome. Conflict is also thought to be a major determinant of polarization in economic performance and the observance of "convergence clubs" when looking at the distribution of growth rates across countries.

Nevertheless, periods following the end of social conflict present a number of economic opportunities, as discussed in detail by Collier (2009). For example, it is likely that in post-conflict periods, one observes high returns to investment in infrastructure following the destruction caused by war and high potential for growth in commodity exports and resource extraction. It is also plausible that the political context can be more favorable to growth-enhancing reforms in post-conflict situations, despite the fact that these economies usually have low capacity to implement these reforms (Collier, 2009.).

Despite conventional wisdom suggesting that reconstruction efforts after social turmoil should lead to faster growth, post-conflict economic performance has presented significant heterogeneity across countries, as documented by Cerra and Saxena (2008). For example, since the end of its civil war in 1992, Mozambique's GDP per capita has grown at an average rate of 5.2 percent a year. In contrast, Guinea-Bissau has experienced negative average per capita growth in the 10 years after the end of its short civil conflict in the late 1990s.

Post-conflict episodes are filled with historical specificities that help to explain the different fortunes of the countries involved. Policymakers of these countries are the ones best placed to take such specificities into account while successfully formulating and implementing policies to support social and economic recovery at home. At the same time, they are eager to draw lessons from other countries in order to shape their own policy responses and avoid unnecessary pitfalls. One approach to dealing with this challenge is to pursue a careful case-study review of international experiences and qualitatively map similar features of the problem to what other countries did and what results were achieved.

This paper follows a different route. It investigates quantitatively the existence of systematic determinants underlying different post-conflict growth performance among 30 sub-Saharan African countries. The adoption of econometric techniques is not meant to disabuse any of the other approaches mentioned above, but rather to complement the toolkit for policymakers in post-conflict countries. While quantitative, our approach is also pragmatic, as shown by the

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[2] At least during war, institutions are weakened. There is some evidence in East Africa and Southeast Asia of stronger states emerging once conflict is resolved (Blattman and Miguel, 2010).

various simplifying assumptions discussed in the text. A key simplification is the decision to consider only those countries that have indeed experienced post-conflict episodes. This spares us from the analytical complexities of modeling the determinants of the conflict itself and its ending. Hence, the scope of our findings is limited to the following specific question: among those sub-Saharan countries that have undergone a period of conflict, what variables are capable of explaining differential growth performance once the conflict ends?

Thus, this paper identifies the factors linked to cross-country differentials in growth performance in the aftermath of social conflict for 30 sub-Saharan African countries using panel data techniques. The paper is divided in five sections. After this introduction, Section II presents stylized facts about economic growth in post-conflict periods, drawing on the existing literature with a special focus on sub-Saharan Africa. Subsequently, Section III discusses the framework used for the empirical analysis, including the rationale for the choice of variables included in the different models. Section IV presents the estimation results for three different measures of post-conflict economic performance and their interpretations. Finally, Section V presents conclusions and policy implications based on the empirical results obtained in previous sections.

II. Stylized Facts about Post-conflict Economic Growth

From the perspective of economic theory, there are strong arguments for a rapid acceleration in economic growth once civil conflict is resolved. Standard neo-classical models of growth predict that after the destruction of the capital stock observed during the war years, catch-up would begin at peace onset when the returns to capital accumulation are high relative to the steady state. This would lead to higher growth until the steady state stock of capital is reached. Furthermore, the end of civil conflict might also spur increases in total factor productivity, because the political and institutional uncertainty[3] linked to war is resolved, providing additional incentives for investment in research and development, thus fostering innovation. This could lead to more sustained increases in growth rates.

Nevertheless, if one considers the persistent impact of conflict on human capital (health, education, nutrition) or the possible destruction of specific non-renewable resources, growth patterns in post-conflict periods could be less clear-cut (Blattman and Miguel, 2010). The relative degree of destruction among different types of capital (human and physical) is also likely to affect the speed of post-conflict recovery (Blattman and Miguel, 2010). In the presence of adjustment costs for human capital investment, post-conflict growth could be faster if more physical capital is destroyed during the war and human capital is relatively less affected, because this would imply an increase in the relative marginal product of physical capital in standard models. Conversely, a higher relative destruction of human capital could lead to slower post-conflict growth. Moreover, civil wars are also likely to have negative spillovers on neighboring countries, for example through a large influx of refugees.

Furthermore, the political and institutional environment after conflict might also be an important factor in recovery (Blattmann, 2010). If a country emerges from conflict more

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[3] Note that such reductions in uncertainty could also have direct positive effects on the returns of capital investment, reinforcing the prediction of increases in capital accumulation previously described.

politically stable than before or better governed, the capital stock in the final steady state (and economic growth in the transition) are likely to surpass pre-conflict levels. Blattmann cites as examples of such situations Uganda after 1986 and Rwanda after 1994. Conversely, it is also possible that institutions emerge weaker after conflict, leading to lower equilibrium capital per worker.

The large negative impact of civil strife on economic performance has been established in an extensive empirical literature (see Blattman and Miguel, 2010 for a survey). For example, Rodrik (1999) compares the growth differential between two periods 1960–1975 and 1975–1989 in cross-country regressions and concludes that countries that experienced sharp drops in output after 1975 were "divided societies" (measured using indicators of inequality, ethnic fragmentation, and others) with weak conflict management institutions. For sub-Saharan Africa, Arbache and Page (2007) present evidence that major conflict countries had significantly lower average growth than the regional average. They also use fixed effect logistical models that indicate that conflicts reduce the odds of growth accelerations and increase the odds of growth decelerations or collapses. In addition to the overall growth effects, evidence shows that several macroeconomic indicators such as fiscal balances, inflation, the current account balance, and external debt tend to deteriorate during conflict episodes (Staines, 2004).

In addition, the literature points to the importance of economic determinants of conflict and generally concludes that low per capita income and slow growth exert a strong influence on the incidence of conflict (Blattman and Miguel, 2010). Collier (2009) argues that post-conflict societies face a high risk of reverting to conflict (estimated to be around 40 percent in the literature) and that this risk is strongly linked to economic performance. In an innovative paper, Miguel, Satyanath, and Sergenti (2004) look at the impact of economic conditions on the likelihood of civil conflict using instrumental variables techniques. They instrument economic growth in African countries by rainfall variation in 1981–99 and find that growth is strongly negatively related to civil conflict and that the impact of growth shocks on conflict is not significantly different in richer, more democratic, or more ethnically diverse countries.

But systematic efforts to assess the determinants of post-conflict economic performance have been sparser. Chen Loayaza, and Reynal-Querol (2008) use an event study methodology to evaluate the aftermath of civil wars in a cross-section of countries during 1960-2003. These authors conclude that the average growth rate of per capita GDP accelerates by about 2.4 percentage points after conflict. This increase in growth is usually supported by an increase in the investment rate. This acceleration in growth in post-conflict periods is confirmed by Elbadawi, Kaltani, and Schmidt-Hebbel (2008) using Generalized Method of Moments (GMM) dynamic panel estimation[4]. Nevertheless, these authors conclude that this catch-up growth is only temporary after controlling for other growth determinants[5].

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[4] They also find that typically growth increases by 2 percentage points following the two years after the peace onset, but decelerates thereafter.

[5] These authors also analyze the issue of Dutch-Disease (excessive real exchange rate appreciation) in post-conflict economies linked particularly to increased inflows of foreign aid.

This evidence of "peace dividend" or catch-up effects in post-conflict periods may mask significant heterogeneity in economic performance across countries following civil strife. For example, Przeworski and others (2000) find that wars cause more damage under dictatorships than under democracies, but that recoveries are more rapid under dictatorships. Cerra and Saxena (2008) systematically analyze the behavior of output following financial and political crises in a large set of countries using panel methods and also conclude that output partially rebounds following a civil war. Nevertheless, the authors point out that in several cases the standard error bands tend to be large, and the estimates tend not to be statistically significant, reflecting different country experiences in post-conflict situations. Interestingly, when civil wars are combined with fewer controls on the executive (leading to twin political crises in their terminology), the effects on output tend to be quite large and negative. They estimate that output declines by about 16 percent on average (20 percent for low income countries) and that this loss is persistent, with no discernable rebound.

Overall, the empirical literature seems to indicate that conflicts have a large negative effect on output and that a significant temporary catch-up effect takes place in the medium run when civil strife ends, but subsequently growth tends to return to pre-peace levels. Nevertheless, as we previously pointed out, these conclusions conceal a large observed heterogeneity in post-conflict economic performance. Therefore, a closer examination of the factors linked to growth performance in the aftermath of social conflict is warranted, motivating our analysis in the next sections.

In fact, the evidence from the dataset containing civil strife events in sub-Saharan Africa analyzed in this paper confirms that economic performance exhibits significant variation across post-conflict episodes, as suggested by the anecdotal evidence discussed in the introduction. Figure 1 presents histograms depicting the distribution of real GDP per capita growth in different post-conflict years. The first top left panel presents the distribution of growth rates in the first year after conflict, the second panel the distribution in the second year and so on (note that the sixth panel presents the distribution for year six and all subsequent post-conflict years). The definition of the variables (including the construction of post-conflict episodes) and the respective data sources will be discussed in the next section.

It is interesting to note the relatively large dispersion of economic performance across the post-conflict units. This dispersion is also a marked characteristic across time as more years elapse after the end of civil strife, even if the distributions are somewhat "narrower" as years after conflict increase.[6] This evidence suggests that indeed the average results presented in the empirical literature that was previously discussed can be misleading and a deeper analysis of the correlates of post-conflict performance is required.

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[6] We formally tested whether growth prospects were particularly weak in the immediate years after conflict by adding time effects to the regressions presented in Section IV. The results were not statistically significant.

**Figure 1: Cross-Country Distribution of Real GDP Per Capita Growth
during Post-Conflict Years**

Distribution of Growth of GDP Per Capita
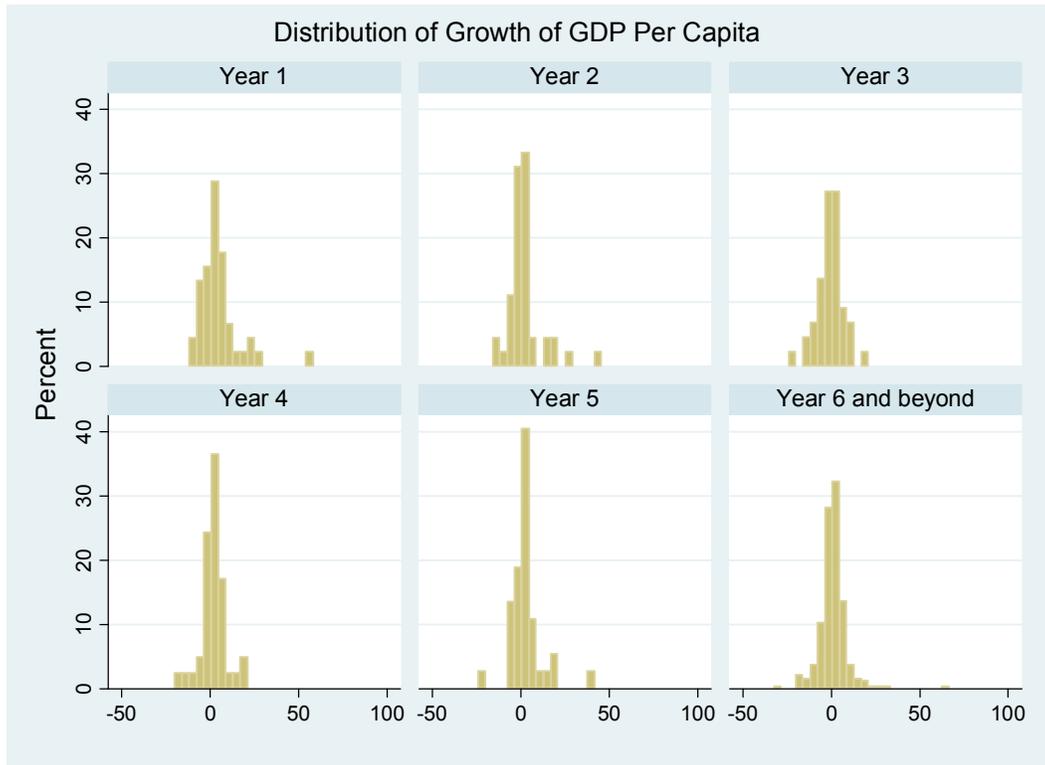
III. A FRAMEWORK FOR THE ANALYSIS OF POST-CONFLICT ECONOMIC PERFORMANCE

This section presents an empirical analysis of post-conflict growth using panel data techniques to determine the factors linked to differences in performance across conflict episodes. The sample will cover annual data for 1950–2007. The definitions and sources for the variables used in the analysis are included in Annex A.

The first empirical problem for our analysis consists of finding an adequate definition for and the appropriate timing of social conflict events. We base our classification on the start and end dates of conflict as identified in the latest version of the UCDP/PRIO Armed Conflict Dataset described by Gleditsch and others (2002).[7] This dataset spans 1946 to 2008 and defines a 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." Furthermore, it distinguishes between two levels of conflict intensity: a) *minor armed conflicts* characterized by between 25 and 999 battle-related deaths in a given year and b) *wars*, which are events where at least 1,000 battle-related deaths occur in a given year. It is interesting to note that this dataset comprises both interstate and intrastate (such as civil wars) conflicts. It is also important to bear in mind that this dataset is somewhat biased against the inclusion of conflicts in the earlier decades and in developing countries because of lack of reliable information for the earlier years.

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[7] The dataset is available at: http://www.prio.no/CSCW/Datasets/Armed-Conflict/

We complement this dataset with information from Sambanis (2004) on civil wars in sub-Saharan African countries and other relevant country-specific knowledge. This means that the exact timing of post-conflict episodes used in the paper differs from the one proposed in the UCDP/PRIO Armed Conflict Dataset. The differences are not major and all departures are documented in the appendix. The following illustrates a few instances in which we applied discretion: (i) a conflict was introduced in Togo in 2005 reflecting post-election violence as confirmed by official UN numbers; (ii) a conflict was introduced in 1998 and 1999 in Liberia as shown in the Sambanis (2004) data; (iii) two conflict episodes in Angola in 2004 and 2007 were disregarded from the original UCDP/PRIO – given the severity of the long-standing conflict that ended in 2002, we decided to classify the years after 2002 as a single post-conflict episode. Annex B provides a list of countries and post-conflict episodes considered in this paper.

The approach for building the panel has also informed our post-conflict timing classification. In particular, the cross-sectional dimension in the panel does not represent countries, but conflict episodes. As a result, one country can provide multiple cross-sectional units to the panel as long as it has lived through more than one post-conflict episode. At the same time, as in the case of Angola mentioned above, we avoided breaking a post-conflict episode that followed a long and severe conflict into distinct short-lived post-conflict episodes. This afforded us more time variation and ability to examine within-event effects. Additionally, the time-dimension of the panel does not correspond to calendar time, but rather years elapsed since the corresponding conflict ended.

By design, the panel includes only countries that have experienced post-conflict episodes. Hence, the paper will not address directly the determinants of conflict occurrence and/or resolution. Instead, the goal is to look for systematic determinants of post-conflict performance once (or given that) the conflict ended. We accept that "unobserved commonalities" may exist across the group of countries in the analysis and that our findings should not be extrapolated given the lack of treatment for sample selection bias. At the same time, the paper does address an important and concrete policy debate currently unfolding among many sub-Saharan African countries that already find themselves (or aspire to be) in that post-conflict group. Furthermore, we do not explicitly control for the intensity of conflict because this would significantly reduce the number of observations in the sample and a differentiation of the impact of the intensity of conflict episodes on post-conflict growth in addition to what is captured by "conflict" fixed-effects is beyond the scope of this paper.

Hence, the empirical specifications presented in the next section could be formally summarized in equation (1). Where the subscript i refers to the panel unit (post-conflict episode) and t refers to time (measured in years since the conflict ended), y is the indicator of economic performance, x is a vector of determinants of growth, and the last term is the error component.

$$y_{it} = \delta_i + x_{it}\beta + \varepsilon_{it} \tag{1}$$

Economic performance (y) is treated as a binary variable, and three measures are used: (i) whether GDP per capita has shown positive growth (1) or not (0) in each i and t; (ii) whether GDP per capita has grown above the unconditional mean over the longest available sample for the country (1) or not (0) for each i (belonging to a particular country) and t; and (iii) whether

GDP per capita has grown above the unconditional median over the longest available sample for the country (1) or not (0) for each i (belonging to a particular country) and t. Economic performance (y) is calculated using the variable RGDPCH (growth rate of Real GDP Chain per capita) from the World Penn Tables (WPT). Annex C presents descriptive statistics for selected variables. Using a binary classification rather than the underlying continuous variable has smoothed out high-frequency fluctuations and improved the results. The empirical growth literature has often addressed this problem by using five or three year growth averages. This approach would not work in our context given the design of our panel, which is unbalanced and uses events rather than countries as the cross-sectional units.

The vector x contains standard candidates for growth determinants (see, for instance, Mirestean and Tsangarides, 2009) such as foreign direct investment, changes in the terms of trade, real interest rates, openness, foreign aid, population (to capture possible scale effects), and the current gap relative to the US per capita GDP (to capture possible catch up effects and distance to the technological frontier). In addition, we include a measure of institutional quality extracted from the POLITY IV dataset: constraints on the executive. This variable captures the official (de jure) discretionary leeway that the executive branch has in changing and implementing new policies. The rationale for its inclusion is the interaction between formal rules binding the behavior of the post-conflict leadership and the potentially unstable underlying environment in the country.

On the one hand, fewer restrictions on the executive could have a positive role during a post-conflict phase if discretionary power is still needed to ensure political stability and move quickly ahead with reforms to unlock growth. On the other hand, fewer restrictions on the executive may hinder growth if they constitute a source of arbitrary political decisions that may be conducive to the adoption of distortionary economic policies. In fact, in such a situation, official discretionary leeway would not even need to materialize to be harmful. The simple existence would be a sign that the authorities could more easily revert to non-consensual policies, fueling lingering animosity in the country and reigniting conflict. Restrictions on the executive would then work as a commitment device by raising the costs of the post-conflict leadership to quickly and freely act on a non-consensual basis.

In environments with fewer constraints on the use of power, political conflicts tend to be more polarized with agents presenting a "winner takes all" mentality that may lead to higher levels of corruption and rent seeking behavior, thus harming economic development. Besley and Persson (2008), for example, argue that increases in the prices of exports are linked to increased prevalence of civil conflict, because growing government revenue and rents make seizing the state attractive.

Furthermore, constraints on the executive have also been depicted as a mechanism for securing property rights, because they limit arbitrary decisions by the government or political elites (see for example Acemoglu and Johnson, 2005, and Aldashev, 2009, who surveys models where the degree of political accountability affects the degree of investor protection). The consequent decrease in expropriation risk should provide additional incentives for capital (human and physical) accumulation and investment in research and development that foster technological change, therefore engendering faster economic growth.

In addition, it is also possible that more authoritarian regimes, in other words regimes with fewer constraints on the executive, create more barriers to entry to new entrepreneurs and new technology therefore harming growth prospects in the long run. Acemoglu (2008) develops a model where an "oligarchic" society protects property rights of incumbent firms, but also creates barriers to the entry of new entrepreneurs. In "democratic" societies political power is more diffuse and entry barriers tend to be avoided. This model attempts to explain why oligarchic societies may decline over time relative to democracies as the distortions created by barriers to entry tend to increase.

Hence, the literature suggests that through a variety of microeconomic and macroeconomic channels, countries with weak constraints on the power of governments and the political elite are more likely to pursue economic policies that are conducive to lower growth and higher output volatility. In fact, Acemoglu and others (2003) present empirical evidence to that effect and argue that distortionary macroeconomic policies are more likely to be symptoms of institutional problems rather than the main causes of economic backwardness and volatility. Furthermore, the variable constraints on the executive has some advantages over other proxies for the quality of property rights institutions (Acemoglu and Johnson, 2005), in particular, they directly correspond to rules constraining state action, and it is not a clear equilibrium outcome variable determined by actions from political elites and citizens (such as the Heritage Foundation's private property protection index). A potential disadvantage is that this variable ignores constraints on expropriation by non-political elites.

It is also important to bear in mind that institutions tend to respond to economic and policy changes, albeit slowly and are not an immutable constraint on growth. Johnson, Ostry, and Subramanian (2007) present evidence that several episodes of sustained growth in Africa began in periods marked by weak political institutions and over time countries have benefited from a virtuous circle in which economic and political institutions improved. Post-conflict environments might be especially conducive to institutional change as highlighted by Collier (2009). Collier argues that there is strong evidence of rapid improvement in the quality of institutions and economic management in post-conflict periods as shown by changes in the country policy and institutional assessment (CPIA) index.

Nevertheless, the use of political variables as "deep" determinants of economic development has been subject to criticism. Most notably, Glaeser and others (2004) argue that rather than political institutions causing economic growth, causality flows in the reverse direction with growth and human capital accumulation as important drivers of institutional improvement. They claim, for example, that pro-market dictators can decide to secure property rights as a policy choice unrelated to checks on government. These authors also state that measures such as the constraints on the executive variable are actually a measure of outcomes rather than a measure of permanent characteristics of the political environment. In this context, their preferred variables reflecting human capital and legal origins would dominate the typical POLITY IV variables as less volatile measures of "deep" determinants of growth.

Nonetheless, we believe these concerns are not particularly problematic for this paper. First, we do not aim to explain structural relationships between "deep" institutional/political features and growth. Secondly, we are using a panel framework rather than the cross-sectional regressions typically estimated in this literature (including the paper by Glaeser and others, 2004 and references therein). Thus, as long as political institutions are weakly exogenous with respect to

growth, we should still be able to identify the impact of proxies for institutional quality over growth. In other words, we assume that political change in post-conflict episodes does not respond within the same year (the frequency of time in our analysis) to economic developments.[8] In fact, recent empirical evidence indicates that institutions tend to change/improve slowly over time (Prichett and de Weijer, 2010). Third, we found a positive association between the POLITY IV measures and alternative variables capturing institutional quality such as the International Country Risk Group (ICRG) composite index (and its sub-components) for the countries in the sample.[9] Finally, we also control for legal origins in some specifications.

Figure 2 shows a descriptive view of the incidence of GDP per capita growth episodes across different levels of the executive constraint variable. As one moves from a low to a high level of constraints, the proportion of above-average growth episodes increases. In particular, when looking at all episodes in which the institutional environment was characterized by a level lower than three (indicating slight to moderate limitation on executive authority), below-average growth was dominant. Nonetheless, as one adds to the sample those countries with higher levels of executive constraint, the situation flips and above-average growth becomes dominant by a significant margin. It is thus interesting to study how the executive constraint variable performs once it is added to the more standard vector of explanatory variables used to determine growth performance.

Figure 2

Growth of GDP per capita (Cumulative Count of Below and Above Average - All Sample)

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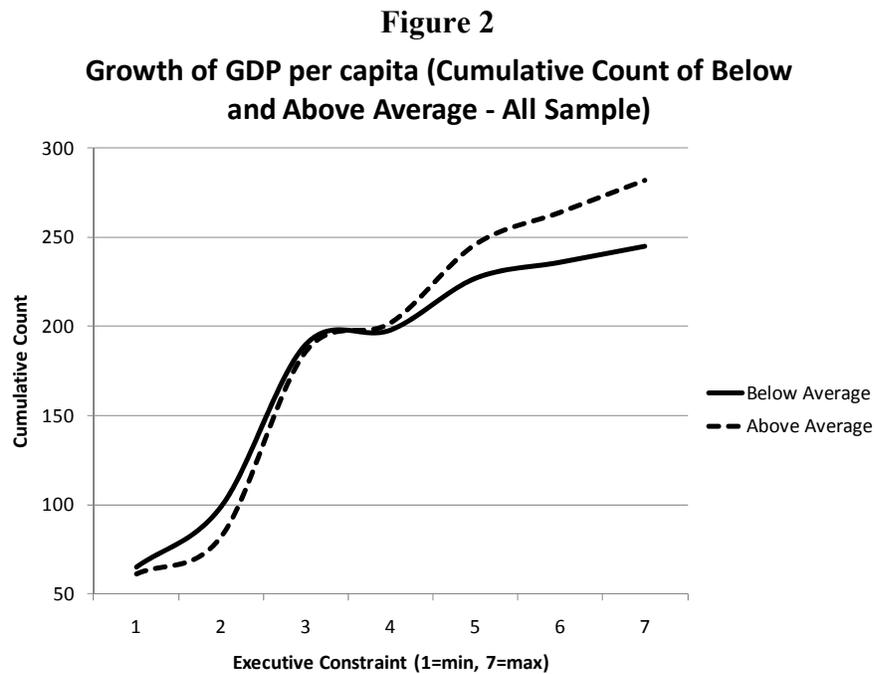
[8] This is consistent with the observed dynamics of the POLITY IV variable before, during and after conflict episodes in our sample. It is also important to mention that weak exogeneity does not preclude political variables from responding to economic ones with a lag of one year or more.

[9] The sample availability of the ICRG index was quite limited, which prevented its use in all econometric specifications.

IV. EMPIRICAL DETERMINANTS OF POST-CONFLICT ECONOMIC PERFORMANCE

We begin our analysis by estimating panel Logit models for three different discrete measures of economic performance in years following a conflict episode, conditioned on a set of explanatory variables that include: our measure of institutional quality (constraints on the executive), a dummy variable capturing British/French legal origin, the income differential with respect to the United States, population, the first difference in the terms of trade, the investment to GDP ratio, the real interest rate, a measure of trade openness, and measures of FDI and foreign aid flows. Annex A provides a detailed description of the construction of the variables included in the models and data sources.

It is important to note that a number of the right-hand-side variables included in the models are potentially endogenous to our economic performance measures, which could lead to biased and inconsistent coefficient estimates. In particular, we believe the terms of trade variable, the investment to GDP ratio, the real interest rate, and the trade openness measure are susceptible to being endogenous. Nevertheless, we assume throughout our specifications that the executive constraints variable, the income differential variable, and the population variable are weakly exogenous. To attenuate the potential endogeneity bias, we consider several specifications in which we include lagged values of the regressors. In addition, we also estimate panel regressions with instrumental variables to assess whether the results obtained with the Logit models are robust (a discussion and presentation of these results follows).

The panel Logit regressions will take the general form outlined in Equation 2 with once again i denoting a post-conflict episode, as we defined it in previous sections, and t denoting time. The dependent variables considered are discrete variables indicating whether economic performance has been favorable (non-negative growth, above-average growth, above-median growth). So the regressions model the probability that the dependent variable equals 1 conditioned on the selected explanatory variables contained in the vector x_{it}, such that:

$$\Pr(y_{it} \neq 0 \mid x_{it}) = \Phi(x_{it}\beta) \qquad \qquad (2)$$

where $\qquad \Phi(x_{it}\beta) = \left\{1 + \exp(-x_{it}\beta)\right\}^{-1}$

The Logit models are estimated by the population-averaged estimator, which specifies only the marginal distribution of the population rather than the full distribution[10]. Intuitively, the population-averaged models will allow us to look at the odds of positive economic performance for the average post-conflict episode conditioned on certain variables. In addition, given the relatively small sample size, we report robust standard errors calculated by bootstrap methods using 500 replications.

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[10] We also estimated Logit models using random effects estimators and obtained similar results to the ones presented in this section. We do not present tables for these regression results to save space.

We first consider panel Logit models that include as the dependent variable an indicator of whether non-negative growth was observed in a post-conflict year, such that $y_{it} = 1$ if the real per capita growth rate is greater or equal to zero in a given year and $y_{it} = 0$ if the real per capita growth rate is negative. The results obtained are presented in Table 1. They suggest that, in most specifications, among our baseline determinants of post-conflict growth, the executive constraints variable and the terms of trade variable are statistically significant at conventional levels. The change in international aid to post-conflict economies is statistically significantly different from zero at the 10 percent level only in the specification where this variable is included contemporaneously in the regression. Furthermore, we also consider specifications that include a dummy variable designating (French) legal origin, but this variable does not present a statistically significant effect.

Using the coefficients presented in the tables it is possible to calculate the marginal effects of these two variables on the probability of observing non-negative growth in a post-conflict year. The results indicate that on average an increase in executive constraints is associated with an increase in the probability of a country experiencing non-negative growth in a given year after conflict of about 4 percent. This result does not change significantly when we consider the models with lagged explanatory variables. The marginal effects are also similar when rather than considering average effects, we consider the effects evaluated at 75th percentile values of some of the covariates, such as the income differential with respect to the United States, or when we consider the effects evaluated at different values of the executive constraints variable.

Regarding changes in the terms of trade, on average an increase in this variable is linked to a 30 percent increase in the probability of experiencing non-negative growth in a post-conflict year. Once again, the coefficient estimates obtained are similar for the models including only contemporaneous variables and the models including lagged variables. Interestingly, the marginal effect of the terms of trade variable seems to decrease when evaluated at higher values of the executive constraints variable. The marginal effects evaluated at a value of the constraints on the executive variable that indicates there is executive parity or subordination suggesting an increase in the probability of non-negative growth between 22 and 25 percent. Nevertheless, the probability of non-negative growth increases to between 33 and 39 percent with an increase in the terms of trade variable when the effects are evaluated at a value of the executive constraints variable that indicates there is unlimited authority of executive power.

The positive relationship between changes in terms of trade and economic growth has been clearly identified in the empirical and theoretical growth literature, see for example Mendoza (1997) and Funke, Granziera, and Imam (2008). In fact, changes in the terms of trade can affect growth through multiple channels. In Mendoza's model, for example, changes in the terms of trade affect the expected real rate of return on savings (in units of the imported good) and hence the savings rate and consequently growth. Other channels through which changes in the terms of trade can affect growth include "spending" and "resource movement" effects (Funke, Granziera, and Imam, 2008). While the former effect posits that movements in wealth caused by changes in the terms of trade (an increase in the terms of trade leading to an increase in wealth) affect the demand for goods, the latter is linked to changes in the marginal product of factors in the export sector caused by changes in the terms of trade, which would in turn affect the allocation of resources between the tradable and non-tradable sectors.

In addition to these standard effects, some specific characteristics of post-conflict environments might amplify the typical impact of changes in the terms of trade on economic growth. For example, the onset of peace is likely to reduce overall uncertainty regarding the economic environment and could affect the elasticity of the economy's savings rate to changes in the return on savings and therefore to changes in the terms of trade[11]. It is also possible that after widespread destruction of human capital and other sources of growth during conflict, natural resources become the primary (perhaps only) source of growth (Blattman, 2010), therefore magnifying the economic impacts of exogenous movements in the terms of trade. However, it is also important to note the results presented by Besley and Persson (2008) that point to a link between export and import prices and an increased incidence of conflict, which would indicate a detrimental effect of movements in these prices on economic growth in post-conflict settings.

The foreign aid variable is statistically significant in the specification where it is included contemporaneously, but not when lagged values are included. Nevertheless, even in the former case, the coefficient estimates suggest small marginal effects in an economic sense and close to zero. This finding could be due to the fact that aid is highly endogenous to economic performance and therefore estimates would not be reliable, but it is also consistent with a large recent literature that finds no robust econometric evidence of the effectiveness of international aid in promoting growth (see Easterly, 2009, for a survey; and Rajan and Subramanian,[12] 2005). Furthermore, in general terms, foreign aid tends to be more volatile in post-conflict settings (World Bank, 2011). In any case, policy implications should be drawn with caution as we discuss in Section V and, additionally, one should note that aid is importnat for humanitarian reasons, which are likely to be especially pressing in post-conflict situations.

It is also important to bear in mind the critique by Clemens, Radelet, and Bhavnani (2004) who argue against using aggregate measures of foreign aid when looking at the impact of aid on growth. When considering specific aid flows that are likely to stimulate growth in shorter time frames,[13] they find a robust, positive, and large causal relationship between aid and economic growth. They also report evidence that the impact of aid on growth is larger in countries with stronger institutions. We attempted to interact aid with the constraints on the executive variable to examine whether the impact of aid depends on institutional quality, but our results for post-conflict settings did not support the conclusions of Clemens, Radelet and Bhavnani (as discussed below).

Table 2 presents results for models including an alternative indicator of performance that attempts to account for the determinants of above-average growth during a post-conflict episode, where the average growth rate is calculated over the entire sample period for a given country. Therefore, in this case, the panel Logit models include as the dependent variable an

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[11] As noted in previous paragraphs, in certain modeling environments, changes in the terms of trade affect the returns on savings and thus the savings rate (Mendoza, 1997).

[12] Rajan and Subramanian argue that the possible beneficial effects of aid on long-term growth in poor countries are offset by a systematic adverse effect of aid inflows on the receiving country's competitiveness owing to the real exchange rate overvaluation caused by these inflows.

[13] This includes budget and balance of payments support, investments in infrastructure, and aid for productive sectors such as agriculture and industry.

indicator of whether the real per capita GDP growth rate in year t exceeded the mean GDP per capita growth rate over the period 1950 to 2007 for a country, such that $y_{it} = 1$ if $g_{it} > \overline{g_i}$ and $y_{it} = 0$ if $g_{it} \leq \overline{g_i}$. This indicator is arguably more suitable for capturing the growth catch-up or "peace dividend" that has been identified in parts of the literature as characteristic of post-conflict periods.

Table 1. Panel Logit Regressions for Non-Negative Growth in Post-Conflict Periods

	1	2	3	4	5	6	7	8	9	10	11	12	13
Executive Constraints	0.195**	0.193**	0.188*	0.178 [a]	0.178*	0.186**	0.171*	0.191*	0.191*	0.193*	0.201*	0.209*	0.215*
	[0.086]	[0.091]	[0.102]	[0.112]	[0.107]	[0.090]	[0.097]	[0.104]	[0.111]	[0.108]	[0.107]	[0.118]	[0.129]
Income Differential	0.286	0.337	0.366	0.395	0.395	0.410	0.411	0.417	0.416	0.427	0.401	0.533*	0.608*
	[0.248]	[0.230]	[0.258]	[0.264]	[0.276]	[0.294]	[0.289]	[0.299]	[0.300]	[0.316]	[0.255]	[0.321]	[0.355]
Population		0.178*	0.095	0.100	0.099	0.143	0.154	0.139	0.139	0.144	0.220*	0.236	0.305
		[0.097]	[0.133]	[0.159]	[0.170]	[0.138]	[0.154]	[0.135]	[0.139]	[0.137]	[0.126]	[0.215]	[0.194]
Terms of Trade			1.468**	1.430*	1.430*								
			[0.724]	[0.746]	[0.782]								
Real Interest Rate			0.009	0.009	0.009								
			[0.019]	[0.018]	[0.019]								
(Investment/GDP)			0.327	0.294	0.295								
			[0.345]	[0.376]	[0.361]								
Openness			-0.346	-0.268	-0.270								
			[0.425]	[0.481]	[0.440]								
Growth Rate of AID per capita				0.014*	0.014								
				[0.008]	[0.009]								
Growth Rate of FDI					0.035								
					[1.122]								
(Terms of Trade)$_{t-1}$						1.580**	1.589**	1.658**	1.659**	1.659**		1.552**	1.620**
						[0.747]	[0.711]	[0.812]	[0.779]	[0.701]		[0.703]	[0.705]
(Real Interest Rate)$_{t-1}$						-0.006	-0.005	-0.003	-0.003	-0.003		-0.008	-0.006
						[0.020]	[0.021]	[0.019]	[0.019]	[0.021]		[0.019]	[0.019]
(Investment/GDP)$_{t-1}$							0.248	0.300	0.301	0.294			0.476
							[0.291]	[0.302]	[0.289]	[0.300]			[0.324]
(Openness)$_{t-1}$								-0.190	-0.193	-0.182			-0.188
								[0.390]	[0.385]	[0.394]			[0.373]
(Growth of Aid)$_{t-1}$									0.001	0.001			0.001
									[0.005]	[0.005]			[0.005]
(Growth of FDI)$_{t-1}$										-0.123			-0.145
										[0.554]			[0.653]
Legal Origin											0.218	0.409	0.633
											[0.332]	[0.553]	[0.580]
Constant	-0.470	-2.134**	-0.572	-0.871	-0.861	-1.780	-2.337	-1.635	-1.629	-1.719	-2.748*	-3.114	-4.229
	[0.363]	[0.992]	[1.819]	[2.231]	[2.245]	[1.246]	[1.566]	[1.980]	[1.951]	[2.086]	[1.470]	[2.452]	[2.739]
Observations	527	527	349	349	349	343	341	341	341	341	527	343	341
Number of Post-Conflict Events	49	49	34	34	34	34	34	34	34	34	49	34	34

Dependent variable is an indicator of whether the coutry experienced non-negative growth rates in real per capita GDP in the post-conflict period. Standard errors in brackets. Standard errors calculated using bootstrap simulations (500 replications). (***) indicates statistical significance at the 1 percent level, (**) indicates statistical significance at the 5 percent level, (*) indicates statistical significance at the 10 percent level.

[a] Statistically significant at the 11 percent level.

Table 2. Panel Logit Regressions for Above-Average Growth in Post-Conflict Periods

	14	15	16	17	18	19	20	21	22	23	24	25	26
Executive Constraints	0.150**	0.146**	0.206**	0.204**	0.204*	0.150*	0.154*	0.187*	0.186*	0.186*	0.164*	0.206**	0.245**
	[0.076]	[0.072]	[0.097]	[0.100]	[0.104]	[0.083]	[0.089]	[0.105]	[0.107]	[0.107]	[0.085]	[0.104]	[0.117]
Income Differential	0.200	0.233	0.148	0.161	0.161	0.169	0.170	0.179	0.179	0.182	0.329	0.417	0.476
	[0.233]	[0.216]	[0.274]	[0.284]	[0.279]	[0.313]	[0.342]	[0.328]	[0.298]	[0.328]	[0.238]	[0.351]	[0.336]
Population		0.166	0.124	0.141	0.140	0.202	0.195	0.171	0.171	0.174	0.235*	0.354**	0.364*
		[0.102]	[0.166]	[0.159]	[0.199]	[0.163]	[0.173]	[0.186]	[0.192]	[0.185]	[0.124]	[0.180]	[0.204]
Terms of Trade			1.198	1.154	1.156								
			[0.770]	[0.720]	[0.745]								
Real Interest Rate			0.018	0.019	0.019								
			[0.017]	[0.017]	[0.018]								
(Investment/GDP)			0.098	0.083	0.084								
			[0.331]	[0.369]	[0.352]								
Openness			-0.583	-0.571	-0.571								
			[0.509]	[0.524]	[0.532]								
Growth Rate of AID per capita				0.019**	0.019**								
				[0.008]	[0.009]								
Growth Rate of FDI					0.046								
					[0.646]								
(Terms of Trade)$_{t-1}$						1.000*	0.999*	1.075*	1.075*	1.075*		0.986	1.105
						[0.602]	[0.591]	[0.631]	[0.636]	[0.628]		[0.672]	[0.674]
(Real Interest Rate)$_{t-1}$						-0.002	-0.001	0.000	0.000	0.000		-0.005	-0.003
						[0.017]	[0.019]	[0.019]	[0.019]	[0.020]		[0.017]	[0.019]
(Investment/GDP)$_{t-1}$						-0.046	0.019	0.018	0.014				0.275
						[0.327]	[0.322]	[0.336]	[0.344]				[0.358]
(Openness)$_{t-1}$								-0.287	-0.286	-0.281			-0.389
								[0.438]	[0.482]	[0.508]			[0.459]
(Growth of Aid)$_{t-1}$									-0.000	-0.000			-0.000
									[0.005]	[0.005]			[0.005]
(Growth of FDI)$_{t-1}$										-0.079			-0.090
										[0.742]			[0.856]
Legal Origin											0.393	0.883*	1.002*
											[0.327]	[0.516]	[0.557]
Constant	-0.544	-2.081**	0.368	0.165	0.174	-2.268	-2.118	-1.029	-1.032	-1.063	-3.119**	-4.745**	-4.176
	[0.403]	[1.024]	[2.348]	[2.185]	[2.652]	[1.441]	[1.711]	[2.478]	[2.638]	[2.722]	[1.500]	[2.113]	[3.251]
Observations	527	527	349	349	349	343	341	341	341	341	527	343	341
Number of Post-Conflict Events	49	49	34	34	34	34	34	34	34	34	49	34	34

Dependent variable is an indicator of whether the coutry experienced above average growth rates in real per capita GDP in the post-conflict period. Standard errors in brackets. Standard errors calculated using bootstrap simulations (500 replications). (***) indicates statistical significance at the 1 percent level, (**) indicates statistical significance at the 5 percent level, (*) indicates statistical significance at the 10 percent level.

As was the case in the models already presented, in most specifications only the executive constraints variable and the terms of trade variable have a statistically significant impact on above-average post-conflict growth. This holds for models including contemporaneous and lagged variables. In two specifications, international aid has a statistically significant effect at the five percent level. In addition, the legal origins dummy also presents a statistically significant effect at the 10 percent level in two specifications, indicating that the impact of legal origins on post-conflict performance is not robust (see also discussions elsewhere in this section as evidence of the non-robust impact of legal origins when alternative measures of economic performance are used).

The average marginal effects suggest that an increase in executive constraints increases the probability of above-average growth in a post-conflict year by about five percent. The average marginal effects for changes in international aid are not economically large implying a less than one percent increase in the probability of above-average growth. Furthermore, the marginal effects for the terms of trade variable indicate that on average, an increase in the terms of trade variable increases the probability of observing above average growth in a post conflict year by 26 percent. Once again, the results change when the marginal effects are estimated at different values of the executive constraints variable. The marginal effects evaluated at a value that indicates there is executive parity or subordination suggest an increase in the probability of above-average growth of 21 percent. Nevertheless, the probability of above-average growth increases to 27 percent with an increase in the terms of trade variable when evaluated at a value of the executive constraints variable that indicates there is unlimited authority of executive power.

Moreover, we also consider models including an indicator of economic performance that accounts for the determinants of above-median growth during a post-conflict episode. Hence, the panel logit models include as the dependent variable an indicator of whether the real per capita GDP growth rate in year t exceeded the median GDP per capita growth rate over the period 1950 to 2007 for a country, such that $y_{it} = 1$ if $g_{it} > g_i^{med}$ and $y_{it} = 0$ if $g_{it} \leq g_i^{med}$. The estimation results for these models are presented in Table 3.

In most specifications the executive constraints variable and the terms of trade variable are associated with above-median growth in a statistically significant way. The marginal effects are of similar magnitude to the ones previously reported, with the executive constraints variable increasing the average probability of above-median growth by 4 percent and the terms of trade variable increasing the probability of above-median growth by 28 percent on average for models including lagged variables and by 34 percent for models including contemporaneous variables. The marginal effects do not change substantially when calculated at different values of the covariates such as the income differential variable evaluated at the 75th percentile, but the marginal effects for the terms of trade variable increase when evaluated at lower values of the executive constraints variable, which is consistent with the results obtained previously.

As in the previous specifications, international aid presents statistically significant results at the five percent level for models including aid contemporaneously, whereas FDI flows do not

present statistically significant coefficients and the legal origins variable presents statistically significant results at the 10 percent level in only one specification. But the estimated effects of aid continue to be economically very small, implying a less than one percent increase in the probability of above median growth.

We have also experimented with specifications for the three performance measures considered that included interaction effects between the different explanatory variables. In particular, we considered interaction effects between policy variables (openness, interest rates, and foreign aid) and institutions and interactions between policy variables and the distance to frontier variable. Aghion and others (2008), for example, find that such interaction terms could point to statistically and economically significant effects on growth even when the "direct" separate effects estimated are small or not statistically different from zero. Nevertheless, in our case, the results remained the same, and we chose not to report these regressions to save space. Furthermore, we also considered specifications where variables capturing human capital (such as secondary school enrollment) were included, but the proxies for human capital were not statistically significant. In addition, their inclusion resulted in the large reduction in the number of available observations.

In order to assess the robustness of the results obtained in the three previous groups of models to alternative estimation methods, we also estimated panel instrumental variable regressions for the three discrete dependent variables. While these regressions allow us to tackle possible endogeneity bias by instrumenting some of the endogenous explanatory variables, it is important to bear in mind that they are linear probability models (given that our dependent variables are binary) and therefore suffer from the usual shortcomings that characterize these models, in particular, the predicted probabilities will drop below 0 and rise above 1 for certain values of the explanatory variables. In light of the difficulty in finding appropriate "external instruments" available for the countries and time periods included in the sample, we decided to use lagged values of the terms of trade, of the real interest rate, of the investment to GDP ratio, and of the openness indicator as instruments for these potentially endogenous variables.

The results from the estimation of the panel instrumental variables regressions are presented in Table 4. The coefficient estimates confirm the results derived from the panel Logit regressions. An increase in the executive constraints variable increases the probability of observing non-negative growth by about four percent, and this holds when above-average and above-median growth are included as dependent variables. The terms of trade variable is statistically significant in most specifications and presents coefficients of similar magnitudes to the ones estimated in the Logit regressions. An increase in the terms of trade variable is linked to an increase in the probability of between 24 and 29 percent.

Table 3. Panel Logit Regressions for Above-Median Growth in Post-Conflict Periods

	27	28	29	30	31	32	33	34	35	36	37	38	39
Executive Constraints	0.154**	0.150**	0.163**	0.154*	0.155*	0.145*	0.148*	0.155	0.156*	0.158*	0.165**	0.181*	0.179*
	[0.064]	[0.070]	[0.080]	[0.085]	[0.093]	[0.075]	[0.083]	[0.098]	[0.094]	[0.093]	[0.080]	[0.093]	[0.105]
Income Differential	0.109	0.135	0.058	0.076	0.079	0.102	0.100	0.103	0.102	0.110	0.222	0.271	0.324
	[0.185]	[0.181]	[0.189]	[0.197]	[0.208]	[0.230]	[0.272]	[0.233]	[0.232]	[0.241]	[0.202]	[0.231]	[0.286]
Population		0.083	0.064	0.075	0.073	0.140	0.138	0.132	0.131	0.132	0.146	0.270*	0.308*
		[0.084]	[0.126]	[0.141]	[0.150]	[0.129]	[0.123]	[0.131]	[0.158]	[0.166]	[0.108]	[0.161]	[0.172]
Terms of Trade			1.547**	1.497*	1.498**								
			[0.751]	[0.779]	[0.708]								
Real Interest Rate			0.013	0.014	0.014								
			[0.018]	[0.018]	[0.020]								
(Investment/GDP)			0.148	0.123	0.127								
			[0.266]	[0.268]	[0.296]								
Openness			-0.348	-0.290	-0.295								
			[0.340]	[0.371]	[0.373]								
Growth Rate of Aid per capita				0.019**	0.019**								
				[0.009]	[0.009]								
Growth Rate of FDI					0.059								
					[1.001]								
$(Terms\ of\ Trade)_{t-1}$						1.186**	1.180**	1.207**	1.207**	1.207*		1.156**	1.168*
						[0.586]	[0.586]	[0.565]	[0.598]	[0.627]		[0.589]	[0.619]
$(Real\ Interest\ Rate)_{t-1}$						-0.004	-0.004	-0.003	-0.003	-0.003		-0.008	-0.007
						[0.020]	[0.020]	[0.017]	[0.019]	[0.019]		[0.018]	[0.019]
$(Investment/GDP)_{t-1}$						-0.015	0.003	0.004	0.009				0.227
						[0.278]	[0.284]	[0.288]	[0.293]				[0.316]
$(Openness)_{t-1}$							-0.073	-0.074	-0.081				-0.073
							[0.384]	[0.395]	[0.370]				[0.364]
$(Growth\ of\ Aid)_{t-1}$								0.000	0.000				0.000
								[0.005]	[0.004]				[0.005]
$(Growth\ of\ FDI)_{t-1}$									0.064				0.086
									[0.621]				[0.828]
Legal Origin											0.321	0.633	0.757*
											[0.286]	[0.404]	[0.447]
Constant	-0.400	-1.169	0.212	-0.070	-0.052	-1.561	-1.513	-1.234	-1.229	-1.231	-2.089	-3.466*	-4.147
	[0.277]	[0.896]	[1.634]	[1.848]	[1.886]	[1.246]	[1.299]	[2.050]	[2.267]	[2.392]	[1.327]	[1.963]	[2.807]
Observations	527	527	349	349	349	343	341	341	341	341	527	343	341
Number of Post-Conflict Events	49	49	34	34	34	34	34	34	34	34	49	34	34

Dependent variable is an indicator of whether the coutry experienced above median growth rates in real per capita GDP in the post-conflict period. Standard errors in brackets. Standard errors calculated using bootstrap simulations (500 replications). (***) indicates statistical significance at the 1 percent level, (**) indicates statistical significance at the 5 percent level, (*) indicates statistical significance at the 10 percent level.

Table 4
Panel Instrumental Variables Regressions

VARIABLES	Non-Negative Growth			Above Average Growth			Above Median Growth		
	40	41	42	43	44	45	46	47	48
(Investment/GDP)	0.027			-0.004			-0.019		
	[0.074]			[0.100]			[0.078]		
Real Interest Rate	-0.001	-0.002	-0.002	-0.000	-0.000	-0.000	-0.002	-0.001	-0.002
	[0.008]	[0.007]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Openness	-0.002	0.010	0.009	-0.041	-0.064	-0.053	0.028	-0.001	0.010
	[0.102]	[0.086]	[0.089]	[0.134]	[0.119]	[0.118]	[0.103]	[0.088]	[0.098]
Executive Constraints	0.039*	0.040*	0.040**	0.043*	0.045**	0.044*	0.037	0.038*	0.038*
	[0.021]	[0.020]	[0.020]	[0.023]	[0.022]	[0.024]	[0.023]	[0.021]	[0.022]
Income Differential	0.057	0.058	0.058	0.015	0.015	0.015	0.000	0.002	0.001
	[0.055]	[0.055]	[0.052]	[0.068]	[0.068]	[0.064]	[0.053]	[0.050]	[0.055]
Population	0.031	0.032	0.031	0.050	0.047	0.048	0.043	0.040	0.041
	[0.036]	[0.030]	[0.032]	[0.043]	[0.043]	[0.040]	[0.034]	[0.032]	[0.037]
Terms of Trade	0.253*	0.252*	0.253*	0.232	0.236	0.235*	0.285**	0.294**	0.292**
	[0.141]	[0.130]	[0.139]	[0.145]	[0.146]	[0.142]	[0.130]	[0.136]	[0.132]
Constant	0.125	0.131	0.137	0.139	0.230	0.184	0.012	0.098	0.050
	[0.552]	[0.478]	[0.488]	[0.705]	[0.636]	[0.622]	[0.564]	[0.484]	[0.575]
Observations	330	331	332	330	331	332	330	331	332
Number of Post-Conflict Events	34	34	34	34	34	34	34	34	34

Dependent variables are indicators of economic performance after a conflict event, lagged values of potentially endogenous right hand side variables were used as instruments in the regression. Standard errors in brackets. Standard errors calculated using bootstrap simulations (500 replications). (***) indicates statistical significance at the 1 percent level, (**) indicates statistical significance at the 5 percent level, (*) indicates statistical significance at the 10 percent level.

Overall, we can conclude that our measure of institutional quality (constraints on the executive) and the change in the terms of trade have a statistically and economically significant association with the different discrete measures of economic performance considered. This link is robust to alternative estimation methods. The importance of institutional variables for post-conflict growth was discussed in detail in Section III. In particular, constraints on the executive constitute a mechanism for securing property rights by limiting arbitrary decisions by the government or political elites, thus providing additional incentives for capital accumulation and investment in research and development. In general, regimes with weaker constraints on the power of governments and the political elite are more likely to pursue economic policies conducive to lower growth, for example by creating or maintaining barriers to entry that protect incumbents against new entrepreneurs.

The empirical and theoretical growth literature has established that changes in the terms of trade affect growth through multiple channels, including the returns on savings or incentives to shift the sectoral allocation of resources. The strong role of terms of trade for post-conflict performance suggests that some of these channels are likely to be amplified in post-conflict environments. The importance of changes in the terms of trade for post-conflict growth also corroborates the story outlined by Collier (2009), who argues that, under favorable circumstances, the end of conflict episodes could be followed by commodity booms. According to Collier, these expansions could be linked to stronger terms of trade, because governments might have more bargaining power over the terms of extraction of natural resources once conflict is resolved. Furthermore, commodity exports would also be stimulated by the more evident "direct" effect of increased production and investment owing to the peace onset. Our results on terms of trade are not driven by resource-rich countries. In fact, less than a quarter of the countries included in the regressions are resource-rich according to Arbache and Page's (2007) classification.

Our results are at odds with some of the conclusions previously obtained in the literature. While Przeworski and others (2000) argue that post-conflict recoveries tend to be more rapid under dictatorships than under democracies, we find that less authoritarian regimes (regimes with more "checks and balances" on executive power) are associated with increases in the probability of positive economic performance. Furthermore, we find that international aid has a non-robust, statistically significant, but not economically large, impact on performance and that policy variables such as trade openness do not affect the probabilities of positive economic performance. This contrasts somewhat with the results obtained by Collier and Hoeffler (2004) who find that growth is more sensitive to policy in post-conflict societies. In addition, we do not find evidence that the investment rate increases the probability of positive economic performance in post-conflict periods, as suggested by Chen , Loayaza, and Reynal-Querol (2008) using cross-sectional methods for a more diverse group of countries.

V. CONCLUSIONS AND POLICY IMPLICATIONS

In our analysis of post-conflict economic performance for a large number of sub-Saharan African countries, changes in the terms of trade have emerged as the most influential determinant of favorable economic growth in the aftermath of civil wars. This variable is typically associated with an increase in the marginal probability of positive economic performance by about 30 percent. Because short-term movements in the terms of trade could be dominated by exogenous factors, it is possible to say that there is an important element of "luck" in post-conflict recoveries. As mentioned in Section IV, it is also important to note that this result is not driven by a predominance of oil and mineral exporting countries in the sample.

Changes in the terms of trade can affect economic growth through several channels, such as the return on savings or incentives to shift the sectoral allocation of resources, which are likely to be amplified in post-conflict environments. It is also important to bear in mind that post-conflict situations tend to be linked to commodity export booms (Collier, 2009). These expansions are driven by both quantity effects, as production increases due to the resumption of normal operations and increases in investment, and positive price effects. According to Collier, the latter are frequently linked to the typical post-conflict situation where governments are in a better position to renegotiate the terms of extraction; perhaps because more firms are willing to bargain for extraction rights as political uncertainty is resolved, leading to increased competition for such rights. Hence, it is likely that positive movements in the terms of trade that might reflect "global trends" are magnified in post-conflict environments.

At the same time, this result illustrates the relevance of pursuing policies that promote export diversification and leverage international markets over the longer term. Indeed, the terms of trade of an economy partly reflect its productive structure and ability to move resources domestically toward production of goods and services facing favorable international conditions. Hence, our finding supports the case for structural reforms designed to make an economy more diversified and competitive in ways that could mitigate falls in the terms of trade and increase the country's capacity to seize the opportunities provided by favorable movements in the terms of trade. In fact, our results indicate that the impact of terms of trade movements on economic performance tend to vary with the degree of constraints on the executive, such that its marginal effect decreases when evaluated at higher values of the executive constraints variable. This suggests that countries with better institutional quality are less affected by terms of trade movements.

Furthermore, policy instruments to mitigate the macroeconomic impact of volatility in the terms of trade can also play a crucial role in this context, given the well-known stylized fact that terms of trade shocks are larger and more frequent in developing countries than advanced economies. The pursuit of countercyclical fiscal and monetary policies would be the "first line of defense" to attenuate terms of trade volatility. Nevertheless, it is important to bear in mind that in post-conflict settings, capacity and political economy considerations can be binding constraints on the effective implementation of such policies. As a complement, policy makers could foster the use of debt instruments indexed to variations in commodity

prices, the terms of trade, or GDP itself, such that interest and/or amortization payments vary according to movements in these variables, increasing in favorable contexts and decreasing when the country is hit by adverse shocks. In general, the promotion of overall financial development would also contribute to create instruments to hedge against terms of trade volatility.

Our results also show that institutional quality was another variable displaying explanatory power for understanding differences in growth performance across post-conflict episodes. In particular, countries in which the executive branch has limited discretionary power were shown to have a higher likelihood of experiencing positive growth dynamics during post-conflict. There is an extensive literature linking political and institutional variables such as constraints on executive power to economic growth. The literature generally asserts that differences in economic development are caused by differences in institutions that might or might not create the right incentives for economic growth (see, for example, Acemoglu and Johnson, 2005; La Porta, Lopez-de-Silanes and Shleifer, 2008; Acemoglu, 2008).

But there is disagreement about which specific institutions (such as property rights, legal institutions, transaction costs, barriers to entry, among others) are important for growth. Our evidence validates the view that constraints on executive power can act as a mechanism to secure property rights, reduce barriers to entry, and limit arbitrary political decisions that lead to distortionary economic policies. Thus, such institutions provide additional incentives for capital accumulation and investment in research and development that foster technological change and growth. In particular, the limitation of "winner takes all" outcomes may lessen the perceived likelihood of avoiding renewed conflict, thereby boosting confidence.

In more general contexts, these institutional features tend to be slow-moving characteristics of a country, offering little scope for policymakers searching for immediate levers to prop up growth. Nevertheless, post-conflict environments tend to be more conducive to rapid institutional change, as argued by Collier (2009) among others, partly because conflict is likely to have weakened vested interests and increased political appetite for reform, even if capacity constraints to implement such reforms can be more binding after civil strife. But, systematic empirical evidence on the evolution of institutions in post-conflict environments is scarce. Therefore, it is possible that a post-conflict environment provides an opportunity to be seized by policy makers in terms of fostering improvements in institutional quality more rapidly than the norm.

Additionally, an extensive list of other co-variates included in the regressions does not point to statistically significant effects on differential growth performance. For example, foreign aid was found to be statistically linked to little (or even no) economically meaningful difference in growth performance amongst post-conflict countries, perhaps because of volatility of aid, which is well documented in post-conflict environments (see World Bank, 2011). Nevertheless, it is important to be careful when interpreting this result, in particular because our analysis is not meant to answer how important foreign aid in preventing a return to conflict.

The analysis presented in this paper suggests a number of avenues for further research. In particular, it would be valuable to address the role of human capital (encompassing education and health) in post-conflict recovery. We chose not to directly include such variables in our analysis because of data limitations and the fact that these series are likely to exhibit very high persistence. Therefore their inclusion in the models might not be appropriate in the context of the econometric approach followed here. It would also be interesting to quantitatively assess the impact of civil conflict on institutions and attempt to model the determinants of institutional outcomes (in terms of constraints on the executive, for instance) after conflict events. This line of research could provide further evidence that post-conflict environments are more conducive to institutional change, as previously suggested.

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Annex A. Variables Definitions and Sources

Variable	Description/Notes	Source
Growth Rate	Real GDP per capita growth rate expressed in PPP terms.	Penn World Tables.
Investment in Physical Capital	Gross fixed capital formation as a percentage of GDP	Penn World Tables.
Foreign Aid	Growth rate of official development aid expressed in current US$ per capita (compared to previous year).	World Bank/WDI
Real Interest Rate	Ex-post real interest rate defined as nominal interest rate minus the observed inflation rate for a given year.	Author's calculations based on IMF EDSS database.
Foreign Direct Investment	Change in FDI as a percentage of GDP.	World Bank/GDF
Trade Openness	Log of [(Exports + Imports)/GDP].	Penn World Tables.
Terms of Trade	Terms of trade index for goods and services (2000=100).	IMF WEO database.
Population		Penn World Tables.
Conflict Periods	See description in main text.	UCDP/PRIO Armed Conflict Dataset; Sambanis (2004) and author's calculations
Income difference with respect to the U.S.	Real GDP per Capita Relative to the United States (G-K method).	Penn World Tables.
Human Capital	Several measures used: Gross Secondary School Enrollment, expected years of schooling, and primary completion rate	Word Bank – World Development Indicators
Legal Origin	Dummy variable taking the value of 1 if country has a legal system of French origin and zero otherwise. Given the country composition of our sample, the omitted category is British legal origin.	La Porta, Lopez-de-Silanes and Shleifer, (2008)
Constraints on the Executive	The extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. Values are expressed in a 7 category scale, ranging from unlimited authority to executive parity or subordination.	Polity IV dataset.

Annex B. List of Countries and Post-Conflict Episodes

(Numbers denote the year after a conflict has ended)

Country	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Angola																	
Burkina Faso																	
Burundi														1	2	3	4
Central African Republic																	
Chad																	
Congo, Dem. Rep.												1	2	3	4	5	6
Congo, Republic of																	
Djibouti																	
Ghana																	
Guinea-Bissau																	
Kenya	1	2	3	4	5	6						1	2	3	4	5	6
Lesotho																	
Liberia																	
Madagascar																1	2
Mali																	
Mauritania			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mozambique																	
Namibia																	
Niger																	
Nigeria															1	2	3
Rwanda									1	2	3	4		5	6	7	8
Senegal																	
Sierra Leone																	
Somalia																	
South Africa																	
Sudan																	1
Tanzania																	
Togo																	
Uganda											1	2	3	4			
Zimbabwe													1	2	3		

Country	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Angola																	
Burkina Faso															1	2	3
Burundi	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Central African Republic																	
Chad																	
Congo, Dem. Rep.	7	8	9			1	2	3	4	5	6	7	8	9	10	11	12
Congo, Republic of																	
Djibouti																	
Ghana											1	2	3	4	5	6	7
Guinea-Bissau	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Kenya	7	8	9	10	11	12	13	14		1	2	3	4	5	6	7	8
Lesotho																	
Liberia								1	2	3	4	5	6	7	8		
Madagascar	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Mali													1	2	3	4	
Mauritania	16					1	2	3	4	5	6	7	8	9	10	11	12
Mozambique																	
Namibia																1	2
Niger																	
Nigeria	4	5	6	7		9						1	2	3	4	5	6
Rwanda	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Senegal																	
Sierra Leone																	
Somalia	1	2	3	4	5	6	7	8									
South Africa																	
Sudan	2	3	4	5	6	7	8	9	10								
Tanzania							1	2	3	4	5	6	7	8	9	10	12
Togo														1	2	3	4
Uganda		1	2	3													
Zimbabwe								1	2	3					1	2	3

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Angola													1	2	3	4	5
Burkina Faso	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Burundi																	1
Central African Republic								1	2	3			1	2	3	4	5
Chad													1	2			
Congo, Dem. Rep.	13																
Congo, Republic of										1	2	3	4	5	6	7	8
Djibouti					1	2	3	4	5	6	7	8	9	10	11	12	13
Ghana		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Guinea-Bissau	18	19	20	21	22	23	24			1	2	3	4	5	6	7	8
Kenya				1	2	3	4	5	6	7	8	9	10	11	12	13	14
Lesotho												4	5	6	7	8	9
Liberia																3	4
Madagascar		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Mali						1	2	3	4	5	6	7	8	9	10	11	
Mauritania	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Mozambique			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Namibia	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Niger								1	2	3	4	5	6	7	8	9	
Nigeria	7	8	9	10	11		1		3	4	5	6	7	8	9	10	11
Rwanda					1	2							1	2	3	4	5
Senegal												1	2	3	4	5	6
Sierra Leone												2	3	4	5	6	7
Somalia																	
South Africa					1	2	3	4	5	6	7	8	9	10	11	12	13
Sudan																	
Tanzania	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Togo			2	3	4	5	6	7	8	9	10	11	12	13		1	2
Uganda			1	2													
Zimbabwe	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Annex C. Descriptive Statistics for Selected Variables

Variable		Mean	Std. Dev.	Min	Max	Observations
Income differential	overall	1.560	0.600	-0.144	3.211	N = 535
	between		0.648	-0.127	3.114	n = 50
	within		0.155	1.041	2.251	T-bar = 10.7
Change in terms of trade	overall	-0.003	0.232	-1.356	2.338	N = 451
	between		0.090	-0.153	0.282	n = 41
	within		0.224	-1.407	2.287	T-bar = 11
Population	overall	8.971	1.264	6.015	11.873	N = 536
	between		1.153	6.097	11.774	n = 50
	within		0.152	8.483	9.494	T-bar = 10.72
Growth in foreign aid	overall	1.343	27.505	-348.496	388.256	N = 530
	between		9.601	-23.049	61.088	n = 50
	within		27.101	-345.671	391.081	T-bar = 10.6
Investment share of GDP	overall	2.128	0.660	-0.201	3.927	N = 532
	between		0.620	0.254	3.136	n = 50
	within		0.334	0.255	3.287	T-bar = 10.64
Real interest rate	overall	-1.229	11.954	-70.939	24.323	N = 355
	between		7.135	-26.397	11.248	n = 35
	within		9.007	-45.771	32.307	T-bar = 10.14
Growth in FDI	overall	0.025	0.962	-12.300	9.350	N = 520
	between		0.138	-0.690	0.485	n = 48
	within		0.956	-12.551	9.099	T-bar = 10.83
Constraints on the executive	overall	3.099	1.714	1.000	7.000	N = 527
	between		1.785	1.000	7.000	n = 49
	within		0.781	-0.501	8.349	T-bar = 10.7551
Openness	overall	3.954	0.507	1.575	5.165	N = 535
	between		0.454	2.915	5.059	n = 50
	within		0.261	1.505	4.934	T-bar = 10.7

Note: Panel id is post-conflict episode