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On Income, Democracy, Political Stability, and Internal Armed Conflicts

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On Income, Democracy, Political Stability, and Internal Armed Conflicts

Abstract

Whether or not a country is likely to encounter an internal armed conflict is considered in the literature to depend, among other things, on its extent of economic and political development. Using a dataset covering 139 countries over the 1961-2011 period, we find that a country's per capita income has an unambiguously negative effect on the probability that it encounters an armed conflict as long as it does not suffer from a severe political instability. In contrast, countries that experience severe political instability are more likely to encounter an armed conflict the higher is their per capita income. The policy implication of our result is clear: safeguarding political stability during hard times is essential – and should take precedence over enhancing democracy and economic growth – for reducing the risk of internal armed conflicts. Our findings do not undermine the importance of protecting democratic institution or accountability, but underscore the importance of collaboration across opposing parties to progress while preserving the political stability.

Introduction

In its global risk assessment reports over the last decade, the World Economic Forum has repeatedly identified violent conflicts amongst the most impactful risks.[1] There is little doubt that armed conflicts are indeed considered as one the most tormenting problems of the era and, in fact, the upward trend in the occurrence of internal armed conflicts that has been observed over the recent years is rather alarming.[2] This article responds to the need for a better understanding of the extent to which promoting democracy or political stability could be effective in reducing the occurrence of internal armed conflicts in a country, as well as examining the way this effectiveness might depend on, and interact with, the level of economic development the country enjoys.

The potential causes of internal armed conflicts are believed to lie in nationalistic tendencies, in grievances provoked by severe heterogeneity in religious beliefs, ethnicity or levels of economic well-being, or simply in looting motivations triggered by factors such as poverty, deprivation, social exclusion.[3] The wide-spread nature of the phenomenon has led to what is termed as the feasibility hypothesis which is based on its self-fulfilling nature and in its more general form maintains that rebellion and violence are likely to occur where there are fertile grounds for them.[4] This was supporting some previous evidence which argued that the existence of fertile grounds, or favorable conditions, in a country enables exploitation of potentials for conflicts via facilitating the formation of and action by insurgent groups with sufficiently strong motivations.[5] Promoting economic development and improving the quality of democratic institutions feature predominantly amongst policy recommendations which are believed to facilitate peaceful resolution of political conflicts. In their empirical studies, many scholars, establish the role of per capita income in initiating armed conflicts.[6] Some other studies, which focused on the role of regime types and democratization, find a peace promoting role for full democracies, but a disrupting role for semi-democracies, regime changes, and movement towards democratization.[7]

Repeated occurrences of conflicts in democratic regimes, for example, India (1961, 1966, 1983, 1989, 1995, 1997, 2005, 2008) and Philippines (1993, 1997, 1999) —and its complete absence in some rich countries with non-democratic regimes—such as Kuwait or Saudi Arabia—are counter examples that experts cannot regard simply as exceptions. Therefore, a limited number of studies tried to explore the interactive

role of regime type and per capita income on initiating conflicts. One notable study finds that although the net effect of extent of democracy is ambiguous, it is systematically related to the effect of income.[8] In particular, the authors state that "as [per capita] income rises, not only might democracies become safer, but the greater weight placed upon the goal of accountability might make autocracies absolutely more prone to violence".[9] Another study finds democracy and economic development to play interdependent roles in affecting the risk of conflicts; the authors conclude: "Increasing the level of economic development reduces the risk of armed conflict only for democratic countries, and increasing the level of democracy only for developed countries."[10] Using evidence from three African case studies, another study also finds that "neither democratization nor economic development, nor a combination of them, as instruments of structural social change, can be applied under all circumstances for conflict resolution".[11] The existing evidence indicates a complex relationship exists between these two factors that requires further investigation. However, scholars have not explored thoroughly the dynamics of political change, rather than regime type, in association with income yet.

Therefore, building on the existing work, this article starts by examining the empirical determination of probability of onset of internal armed conflicts by focusing on the specific role of real per capita income and regime type which are usually considered as proxies respectively for the level of economic development of a country and the extent of democracy afforded by the quality of its political institutions.[12] The empirical analysis of a rich dataset confirms that, ceteris paribus, per capita income plays a decisive role in reducing the probability of occurrence of an armed conflict. However, by extending the analysis on regime type and political change, this study finds that per capita income's effect is contingent on the extent of political stability rather than on the level of democracy. This is the main contribution of this study, as the previous studies have not explored explicitly the contingent role of income per capita with dynamic political changes, rather than static regime type, on conflicts. The results imply that countries which suffer from a high level of political instability are more likely to experience an internal armed conflict if their income level exceeds the low per capita income threshold. The policy implication of the result is clear: Promoting political stability is essential for reducing the risk of internal armed conflicts especially in high and middle-income countries. The rest of the article is organized as follows:

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Empirical Methodology and Data describes the data and methodology employed in the empirical analysis; Evidence presents and discusses the empirical evidence; and Summary and Conclusions concludes the article.

Empirical Methodology and Data

The empirical methodology is based on estimating the parameters of the following regression equation

Equation 1: $$y_{i,t} = x'_{i,t-1}\beta + z'_{i,t-1}\varphi + u_{i,t},\ t \in [1,T],\ \ i \in [1,N],$$

where $y_{i,t} = 1$ if there is an onset of internal armed conflict in country i in year t and $y_{i,t} = 0$ otherwise. The model divides the explanatory variables into two groups: those in vector x capture the effect of income and democracy levels under the focus of this study while vector z includes the other relevant socio-economic characteristics as well as several pertinent dummy variables. The country-time specific disturbance term $u_{i,t}$ reflects all the omissions and the model assumes an independent distribution for the adequately specified relationship.

To populate $y_{i,t} = 1$ in the sample, this study uses the definition provided by the Uppsala Conflict Data Program: "a contested incompatibility that concerns government 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."[13] The focus is on explaining internal armed conflicts, data for which are available in the form of onset and incidence.[14] The latter accounts for the existence of an active ongoing conflict in a country in a specific year while the former records the starting of a new conflict, or when an old and dormant conflict is retriggered after more than one year since it was last active. Since the purpose is to explain the probability of onset of a conflict, the dataset shall use a subset of the incidence dataset. This is because each ongoing conflict should only retain the observation corresponding to the starting year and exclude the rest; otherwise, one cannot distinguish a country-year observation with an ongoing conflict from one with no conflict.[15] Table 1 displays the summary statistics distinguishing between the onset and incidence in the full sample which covers 139 countries over the 1961-2011 period.[16]

Table 1. Summary Statistics for Internal Armed Conflicts

	Sample Size	Percent of occurrence in the Sample
Onset of a Conflict (only newly started; ongoing conflicts excluded)	5515	4.15
Incidence of a Conflict (both newly started and ongoing conflicts)	6224	15.07

For explanatory variables in vector x, this study uses a country's real income-per-head and its political position within a well-established measure of regime authority spectrum. The common practice is to use the real per capita gross domestic product (GDP) in constant United States currency prices and the Polity Score, which respectively denote by GDP^{pc} and RT.[17] The rest of the explanatory variables, which appear in vector z, are selected on the basis of the statistical significance of their explanatory role in the sensitivity analysis carried out in a study, which examined 88 most commonly used variables in the literature.[18] These consists of Peace Duration, Ethnic Heterogeneity, Rough Terrain, Population, and GDP Growth. The model also adds the average annual growth rate of temperature to represent the climatic factor—of which some more recent studies have explained their relevance—as well as a dummy variable for each of the following: Oil exporter countries; countries with a conflict in their neighboring nations; countries located in a specific region of the world; years of political disruptions following the ending of the Cold War; and, the year fixed effect.[19] These variables will always feature as the fixed set of control variables in all regression equations which this study examines in the below. This study uses lagged form for all time-dependent explanatory variables. This is because it is likely to takes time for the change in these variables to trigger a conflict and, more importantly, the existence of reverse causality between the dependent and explanatory variables implies that their current values are jointly determined. Given the purpose, using lags is an adequate method of avoiding the simultaneity bias problem.[20]

Evidence

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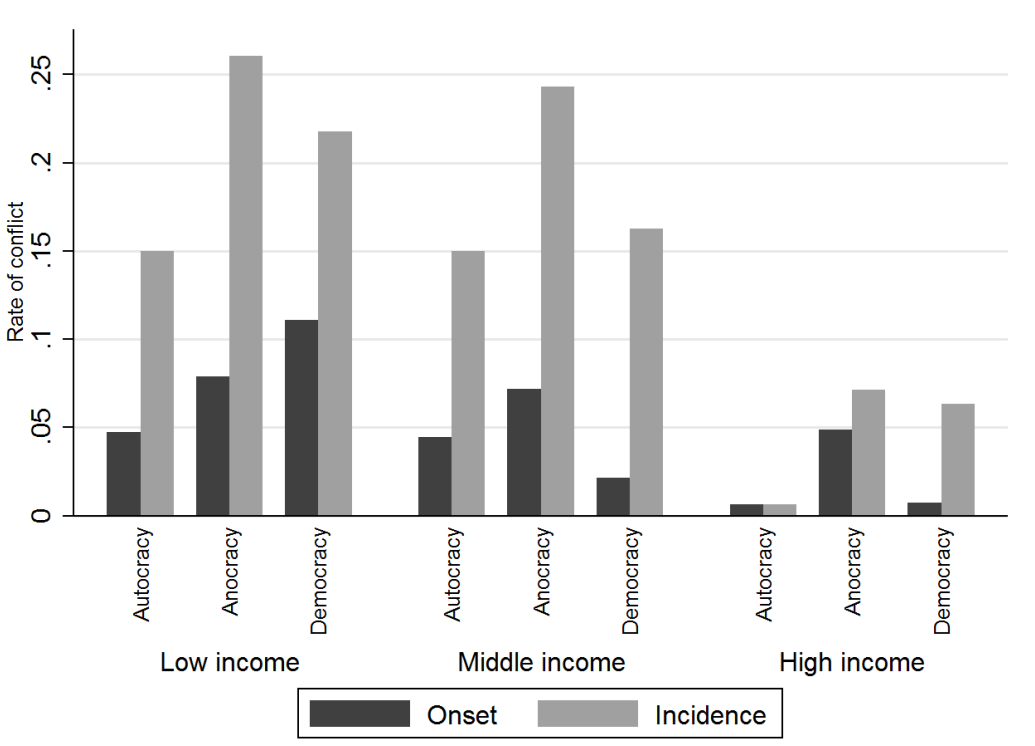
Although the full dataset covers 139 countries over the 1961-2011 period, onset only occurs in 229 observations—see Table 1. It is also worth noting at the outset that, as one would expect, the distribution of onset cases is uneven across countries and vary with countries' extent of economic and political status. As a preliminary indication of this, Figure 1 divides countries into three different income levels and three regime types and find a non-negligible variation in the rate of conflict across these groups. To further highlight the relevance of income and democracy levels, Figures 2 and 3 show how GDP^{pc} and RT, averaged across all the countries within the sample, compare with patterns of onset and incidence of conflicts. Clearly, given the nature of aggregation, these figures are merely illustrative. Nevertheless, they provide some preliminary indication of how GDP^{pc}, RT and conflicts have, on average, evolved over time; even at this level of aggregation the existence of some mild counter cyclical pattern is evident which encourages the use of more detailed regression analysis.

Figure 1. Rate of conflict by regime type and income level



This figure measures rate of conflict as the ratio of number of observations involving a conflict to the total number of observations in the sample. The income thresholds are $875 and $10725, based on the World Bank constant $ in 2005.

Figure 2. Per capita GDP and conflict pattern

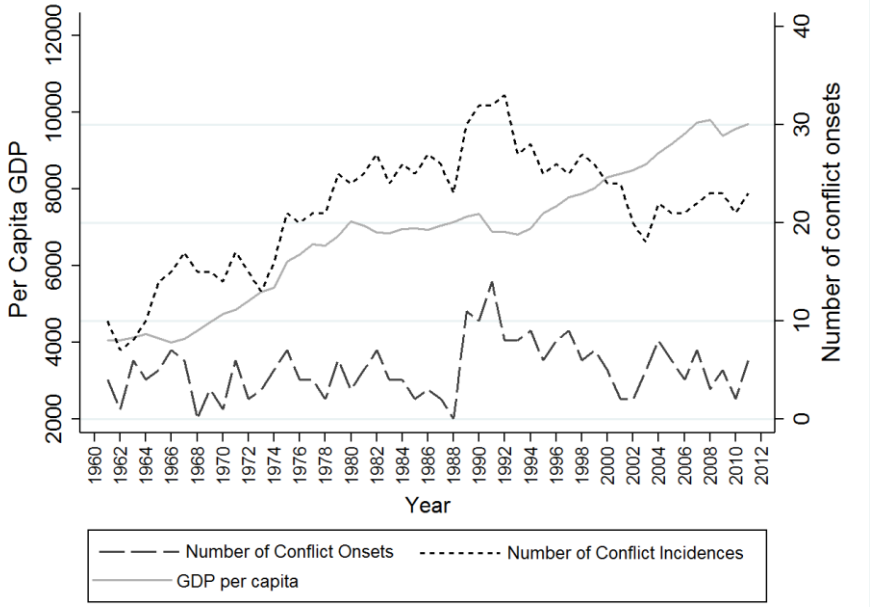
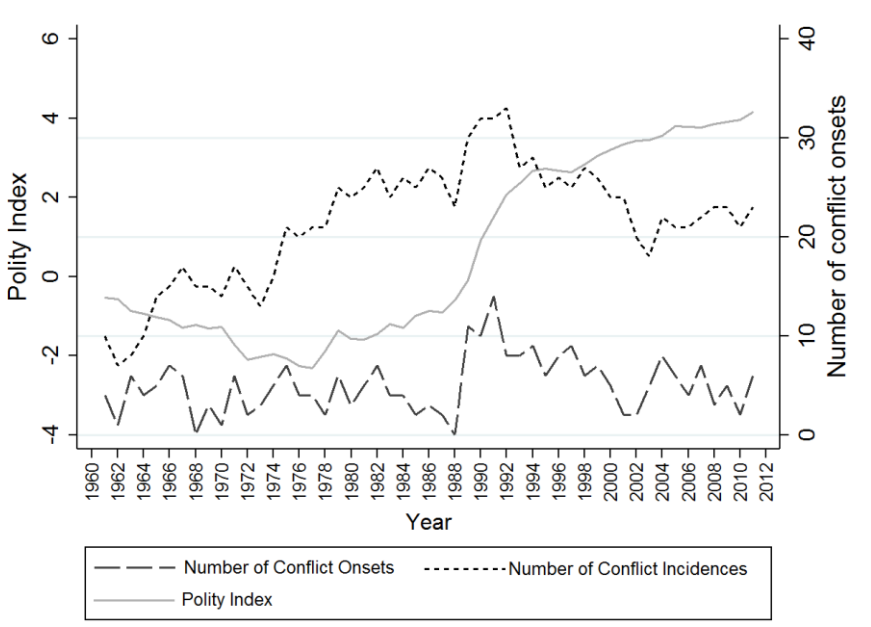


Figure 3. Polity score and conflict pattern



Encouraged by the above preliminary evidence, this study starts the regression analysis of Equation 1 which, given the binary form of the dependent variable, is expressed as

Equation 2: $$Prob\left(y_{i,t} = 1 \middle| \left(x'_{i,t-1}, z'_{i,t-1}\right)\right) = F\left(\alpha + x'_{i,t-1}\beta + z'_{i,t-1}\varphi\right) + u_{i,t},$$

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to reflect the assumption that its right-hand-side determines the conditional probability of an onset—where $F(\cdot)$ is the underlying distribution function which this study assume to determine the probability of occurrence of the event subject to the independently distributed random disturbance term, $u_{i,t}$. The analysis uses the logit approach to estimate different versions of Equation 2. To begin, this study specifies $x'_{i,t-1}\beta$ as

Equation 3: $x'_{i,t-1}\beta = \theta_0 + \theta_1 RT_{i,t-1} + \theta_2 RT^2_{i,t-1} + \left[\gamma_0 + \gamma_1 RT_{i,t-1} + \gamma_2 RT^2_{i,t-1}\right] GDP^{pc}_{i,t-1}$,

which this study postulates based on two main assumptions derived from the discussions in the literature, namely it is:

- Possible that the impact of RT is nonlinear and heightens as RT approaches autocracy or democracy extremes; and
- Likely that the effects of RT and GDP^{pc} are contingent on each other, capturing which requires including their interactions.

Clearly, the sign and statistical significance of the parameter estimates determine if data can support this generalization. In particular:

- If it is true that, regardless of level of income, more democratic regimes are less likely to experience internal armed conflicts, one would expect to find estimates of $\left[\theta_1 RT_{i,t-1} + \theta_2 RT^2_{i,t-1}\right]$ to reduce (or even become negative) as RT increases; and

- If it is believed that there is a smaller chance of occurrence of internal armed conflicts in richer countries regardless of their regime type, one would expect to find estimates of $\left[\gamma_0 + \gamma_1 RT_{i,t-1} + \gamma_2 RT^2_{i,t-1}\right]$ to be negative for all values of RT so that increasing GDP^{pc} lowers the probability of conflict. In addition, $\theta_2 = \gamma_2 = 0$ implies that there is no nonlinearity in the way RT deters conflicts while $\gamma_1 = \gamma_2 = 0$ ensures that the impacts of RT and GDP^{pc} are not contingent on each other.

Table 2 illustrates the estimated values of θ_j and γ_j. As column (I) shows, except the intercept coefficient θ_0, no coefficient estimates are statistically significant when the model specifies $x'_{i,t-1}\beta$ as in Equation

2. The rest of the columns report coefficient estimates corresponding to the restricted versions of Equation 2 and show that on the whole data seem to favor excluding both nonlinearity in the effect of RT and interactions between GDP^{pc} and RT. This is because the specification in column (V) which correspond to imposing restrictions $\gamma_1 = \gamma_2 = \theta_2 = 0$ statistically outperform the rest. However, while the effect of GDP^{pc}, captured by γ_0, has the expected sign indicating that the probability of onset of a conflict falls as per capita income rises, the positive sign of coefficient of RT, θ_1, is counterintuitive since it implies that, ceteris paribus, more democratic regimes are more likely to experience an internal armed conflict.

The data used for GDP^{pc} and RT in the above regression analysis are based on continuous measures of income and regime type. There is, however, a view in the literature that dichotomized measures of these variables could better capture their role in this context. As an alternative for GDP^{pc}, a dummy variable can be constructed to indicate if GDP_{it}^{pc} belongs to the per capita income ranges as advocated by the World Bank, in other words $GDP_{it}^{pc} \leq \$875$, $\$875 < GDP_{it}^{pc} \leq \$10725$, and $GDP_{it}^{pc} > \$10725$ for low, middle and high per capita income levels, respectively.[21] The Polity Score, RT, also can be replaced by a dummy which indicates whether RT_{it} is within a range that the corresponding regime could be considered democratic or non-democratic. It is common to associate democracy with the score range [6, 10] while scores within [-10, 5] and -77 and -88 are considered non-democratic. The findings suggest that using these dichotomized versions of per capita income level and regime type, instead of GDP_{it}^{pc} and RT_{it}, did not improve upon the results reported in Table 2. In addition, changing the regime type classification by using the trio of democracy (>+5 policy score), anocracy (between ±5 inclusive), and autocracy (<−5)—based on the recommendation of Policy score developers—did not alter the results either (therefore do not report the corresponding results).[22]

Table 2. Logit Estimates of Coefficients of Equation 3

Coefficients	**(I)**	**(II)**	**(III)**	**(IV)**	**(V)**
θ_0	-12.05***	-11.59***	-11.60***	-11.70***	-11.69***
γ_0	-0.0661	-0.159	-0.158	-0.175*	-0.175*
θ_1	0.0223	0.0250	0.0294*	0.0510	0.0278*
θ_2	0.0080	-	-	0	0

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	6	0.00745**	0.00742**		
γ_1	0.00136	0.00064	0	-0.00333	0
γ_2	-0.00213	0	0	0	0
R^2	0.2761	0.2756	0.2756	0.2726	0.2725
Log-L	-602.08	-602.494	-602.49	-605.03	-605.08
AIC	1336	1335	1333	1338	1336
BIC	1759	1751	1743	1748	1739

The sample size in all regressions is 4463, consisting of an unbalanced combination of annual observations on 139 countries over the period 1961-2011. All regressions include the same control variables as explained above. The coefficient estimates report log-odds. ***,' **and *denote significance at 1 percent, 5 percent and 10 percent respectively, based on t-ratios using standard errors clustered at the country level to reduce the bias in standard errors.[23] R^2 and *Log-L* are the pseudo goodness of fit and log-likelihood values, respectively. AIC and BIC are Akaike and Schwarz information criteria (based on the log-likelihood), respectively.

The counter intuitive result regarding the effect of regime type is rather alarming and the fact that the model also fails to find any link between its role and that of per capita income is somewhat unsatisfactory. The political environment of a country is bound to play a decisive role in determining the risk of onset of an internal armed conflict, be it directly or via influencing the impact of other variables, in particular per capita income. As the above estimates show the Polity score is clearly not capturing this. One possibility is that it is the extent of political stability, rather than level of democracy, that constitutes the appropriate explanatory variable in this context. As an earlier study argues,[24] more democratic regimes are not necessarily more efficient in maintaining peace; this is to some extent evident in Figure 1. Also, the breakdown of an unstable political regime is accompanied often by violence and conflict. It is therefore important to distinguish between the relevance of political regime type and political regime stability in the context of what determines the onset of an internal armed conflict. As observed by Collier and Rohner "both Stalin and Saddam Hussein were able to maintain peace through intense repression despite

manifest reasons for popular grievance. In both societies, more democratic successor governments have faced more violence because accountability to the law has limited what security services have the permission to do." [25] Therefore, building on the existing work—now examine the role of political instability which quantify using the extent of change in a country's Polity score.[26] More specifically, distinguish between major and minor instability cases which define as follows:

Major Political Instability: A dummy variable, denoted by $PI_{i,t}^{Maj}$, which is set to unity if country i has experienced a three units or larger change in its Polity score in at least one of the last three years, $t-1$, $t-2$ or $t-3$. Otherwise, $PI_{i,t}^{Maj} = 0$.

Minor Political Instability: A dummy variable, denoted by $PI_{i,t}^{Min}$, which is set to unity if country i has experienced a less than 3 unit change in its Polity Score in at least one of the last three years $t-1$, $t-2$ or $t-3$. Otherwise, $PI_{i,t}^{Min} = 0$.

Table 3 provides a comparison between occurrences of major and minor instability in the sample and shows that, while they are observed in all regime types, major instability is relatively more prevalent in general, and much more frequent in anocracies which experience the highest instability amongst the three established regime types—although, as expected, interregnum and transition regimes show the highest rate of major instability.

Table 3. Instability in different regime types

	Major Instability			**Minor Instability**		
	Stable $PI_{i,t}^{Maj} = 0$	Unstable $PI_{i,t}^{Maj} = 1$	Instability Rate	Stable $PI_{i,t}^{Min} = 0$	Unstable $PI_{i,t}^{Min} = 0$	Instability Rate
Autocracy	2057	209	9.22	2087	179	7.89
Anocracy	989	302	23.39	1174	117	9.06
Democracy	2345	212	8.29	2368	189	7.39
Interregnum & Transition	60	122	67.03	176	6	3.29

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Total	5,451	845	5805	491

The Instability Rate is defined as the ratio of number of Stable observations to Stable and Unstable observations (multiplied by 100).

This study examines the explanatory role of political instability by estimating two versions of Equation 2 where the next step is now to replace $x'_{i,t-1}\beta$ with the following

Equation 4: $$x'_{i,t-1}\beta = \delta_k + \lambda_k PI^k_{i,t} + \eta_k PI^k_{i,t} GDP^{pc}_{i,t-1} + \gamma_k GDP^{pc}_{i,t-1},$$

for $k = Min$ and $k = Maj$. Table 4 illustrates the estimated values of parameters of Equation 4 for both cases, confirming that the direct effect of GDP^{pc}, captured by γ_k, is negative and statistically significant at 5 percent critical value, regardless of the nature of political stability. However, while $\lambda_{Min} = \eta_{Min} = 0$ cannot be rejected and therefore find no support for any significant role when considering minor political instability, major political instability does play an effective role: The estimate of η_{Maj} is positive and statistically significant at 5 percent critical value. In addition, its estimated value is sufficiently large to make $(\gamma_{Maj} + \eta_{Maj})$—which captures the the total effect of GDP^{pc}—positive, hence implying that richer countries which experience major instability, for which $PI^{Maj}_{i,t} = 1$, are more likely to encounter an internal conflict. Finally, the average marginal effect of major instability based on estimates of coefficient of $PI^{Maj}_{i,t}$, $(\lambda_{Maj} + \eta_{Maj} GDP^{pc}_{i,t-1})$, evaluated at different levels of $GDP^{pc}_{i,t-1}$, is plotted in Figure 4 which shows that the effect of political instability is statistically insignificant in low income countries—presumably because they cannot afford an uprising by starting an armed conflict—but starts to become significant once a country's per capita income exceeds the low-income threshold.

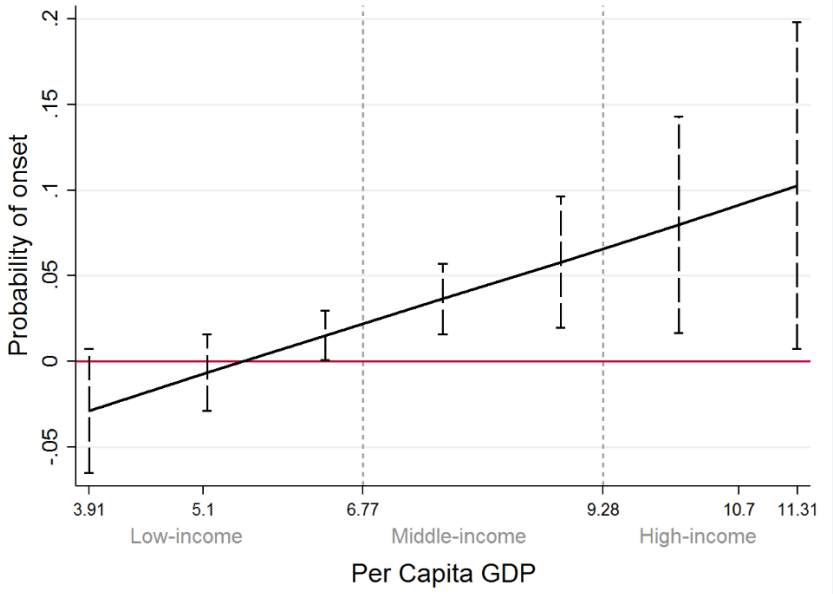
Table 4. Logit Estimates of Coefficients of Equation 4

Regressors	$k = Min$	$k = Maj$
δ_k	-9.961***	-9.259***
λ_k	1.504	-1.894*
η_k	-0.222	0.349**
γ_k	-0.196**	-0.274**
R^2	0.2584	0.2632
L	-616.78	-612.81

AIC	1361	1353
BIC	1771	1763

The sample size in both regressions is 4463. See notes to Table 2.

Figure 4. AMEs of PI^{Maj} with 90 Percent Confidence Intervals



The evidence, based on using major stability, agrees with the implications of the literature on the role of economic and political development in determining the probability of an internal armed conflict. Its usefulness lies in narrowing down the issue for policy considerations as it stresses prioritizing political stability ahead of enhancing democracy and economic growth.

Given policy the relevance of the results reported for $k = Maj$ in Table 4, the analyses carried out the following to ensure their robustness:

- Using the incident sample instead of the onset sample, replacing logit with the probit estimation method, using the approach recommended by Pregibon to eliminate observations with high leverage from the sample, or applying the method advocated by Hosmer and colleagues to omit observations with large residuals (based on Pearson and Deviance Residuals), did not lead to any significant changes in the results.[27]
- Re-estimated the equation after replacing the $PI_{i,t}^{Maj}$ dummy described above with a continuous measure which

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constructed using a decay function of the number of years since the last indication of major regime instability. The estimated values of the parameters were $\lambda_{Maj} = -2.384$, $\eta_{Maj} = 0.530$ and $\gamma_{Maj} = -0.296$ which were statistically significant at 5 percent to 10 percent range, lending further support to the results reported in Table 4.

- Finally, replacing per capita GDP with Night Time Lights data, on the grounds that the latter provide an objective proxy for economic activity and overcome the poor quality of GDP data for some of the regions, did not lead to any encouraging results.[28] However, the Night Time Lights data are only available from 1993 and the shortening of the sample is a crucial factor since the period only covers the post-Cold War era.

Summary and Conclusions

The literature considers the extent of economic and political development, among other things, as one of the key predictors of onset of internal armed conflicts. Several studies have examined empirically this causal relationship using the real per capita income and an index of level of democracy as proxies for the extent of economic and political development. Their results, however, do not lead to an unambiguous conclusion on the way these factors might influence the occurrence of internal armed conflicts in a country. The need for further scrutinizing the underlying empirical relationship has motivated this article.

Using a cross-section time-series dataset that covers 139 countries, spans from 1961 through 2011, and controls for other influential socio-economic, geographic and climate factors which other studies have identified as relevant, this article has used appropriate regression analysis to examine the combined impacts of level of democracy and economic development on the probability of onset of armed conflicts. Following common practice, this study approximated the using countries' Polity score and real per capita GDP, and obtained the corresponding data on the onset of conflict from the Uppsala Conflict Data Program. The empirical investigation, based on estimating several differently specified regression equations which are formulated based on predictions found in the existing literature, does not reveal a clear explanatory role for a country's level of democracy but suggests that per capita income has an unambiguously negative effect on the probability that it encounters an armed conflict if the country does not suffer from

a severe political instability. In contrast, countries that experience severe political instability are more likely to encounter an armed conflict the higher is their per capita income. This result is statistically robust, to the extent that it survives when subjected to various econometric checks, and constitutes a new contribution to the literature as it complements the existing results by placing a stronger emphasis on the role of promoting political stability, rather than merely sponsoring democracy, as means of maintaining peace.

The United States government and its allies have long been involved in operations to help fragile states with a view to prevent conflict and promote stability. Bensahel et al. identify several major shortcomings in preparation and execution of United States-led multinational stabilizing interventions which are bound to undermine their effectiveness, and go on to recommend ways of improving United States capacity for stabilization and reconstruction operations.[29] Along the same lines, the first recommendation of *Africa Report 9* states that "Policy makers need to invest more to identify entry points for mitigating political instability and capitalize on opportunities for stability, development and peace."[30] The results provide timely evidence that could complement these recommendations, which should be considered in revising strategies to prevent conflict and promote stability, and in prioritizing conflict-prevention/mitigation interventions, when tackling the identified conflicts in "areas of geographic focus."[31]

Endnotes

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[9] Collier and Rohner, "Democracy, Development, and Conflict.", 532.

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[15] This distinction is advocated in some studies, such as the notable article by Collier and Hoeffler, "Greed and Grievance in Civil War".

[16] The choice of sample was restricted by data availability as well as our desire to have results which could be compared to those reported in the studies. However, the dimension of the dataset use is substantially large—covering 139 (N) countries over 50 years (T)—to ensure sufficient robustness to small variations in either N or T.

[17] Polity IV is the latest available version of the score and captures the regime authority spectrum using a weighted average score on a 21-point scale that assigns the extreme scores of -10 and +10 to hereditary monarchy and consolidated democracy, respectively. Marshall, Monty G., Ted Robert Gurr, and Keith Jaggers, "Polity IV project: Political regime characteristics and transitions, 1800-2012." Center for Systemic Peace (2013). https://www.systemicpeace.org/polity/polity4.htm. The authors extend the index to include three special cases of interregnum regimes, regimes in transition and those having a foreign interruption which are respectively assigned the score -77, -88 and -66. shall use this index as our measure of level of democracy (or regime type). Therefore, to avoid any ambiguity, shall exclude the foreign interruption cases from the sample.

[18] Hegre, Håvard and Nicholas Sambanis, "Sensitivity Analysis of Empirical Results on Civil War Onset". *Journal of Conflict Resolution* 50 no. 4 (2006): 508–535. https://doi.org/10.1177/0022002706289303.

[19] Burke, Marshall B., Edward Miguel, Shanker Satyanath, John A. Dykema, and David B. Lobell, "Warming increases the risk of civil war in Africa." Proceedings of the national Academy of sciences 106.49 (2009): 20670-20674, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2781059/; Hsiang, Solomon M., Marshall Burke, and Edward Miguel, "Quantifying the Influence of Climate on Human Conflict." *Science* 341, no. 6151 (2013): 1235367. https://doi.org/doi:10.1126/science.1235367. https://www.science.org/doi/abs/10.1126/science.1235367; Shiva, Mehdi, Hassan Molana, and Andrzej Kwiatkowski, "Climatic Conditions and Internal Armed Conflicts: An Empirical Study," in *Research in Social Movements, Conflicts and Change* 46 (2022, Chapter 6), https://books.emeraldinsight.com/page/detail/race-and-space/?k=9781801177252; Shiva, Mehdi, "Socio-economic consequences of climate change." Doctoral dissertation, University of Dundee (2018), https://discovery.dundee.ac.uk/en/studentTheses/socio-economic-consequences-of-climate-change; the regions are: Western Europe and the United States, Eastern Europe and Central Asia, South and East Asia and Oceania, Central and South America, Sub-Saharan Africa and Middle East and North Africa.

[20] Bellemare, Marc F., Takaaki Masaki, and Thomas B. Pepinsky, "Lagged Explanatory Variables and the Estimation of Causal Effect." *The Journal of Politics* 79, no. 3 (2017): 949-63. https://doi.org/10.1086/690946. https://www.journals.uchicago.edu/doi/abs/10.1086/690946. The latter use a specific example to show that the asymptotic bias in the least squares estimator of the coefficient of lagged explanatory variable in question persists. However, the point these studies raise do not apply if the regression equation could be shown to correspond to the reduced form of a recursive structural vector autoregressive system of equations (SVAR), which applies to Equation 1 above. It is now well-established that the reduced form equations of a SVAR model can be consistently estimated by least squares.

[21] World Bank. World Development Indicators 2013. Washington, DC: World Bank Publications, 2013.

[22] Marshall, Monty G., Keith Jaggers, and Ted Robert Gurr, "Polity IV project: Political regime characteristics and transitions, 1800-2002." University of Maryland (2002).

[23] Nichols, Austin, and Mark Schaffer, "Clustered errors in Stata." United Kingdom Stata Users' Group Meeting. 2007. London, UK; Wooldridge, Jeffrey M.,"Cluster-sample methods in applied econometrics." *American Economic Review* 93.2 (2003): 133-138.

[24] Hegre and Nome, "Democracy, Development, and Armed Conflict".

[25] Collier and Rohner, "Democracy, Development, and Conflict", 213.

[26] As Julia Bello-Schünemann and Jonathan Moyer point out—in Institute for Security Studies' Africa Report 9 (September 2018), https://media.africaportal.org/documents/Structural_ pressures.pdf—"Using five different models shows that states are vulnerable for a variety of reasons and that there is no unified set of drivers of political instability. Instead, there are multiple paths to instability." In fact, one of the anonymous reviewers has also pointed out that the definition of political instability have used in our analysis could be seen as somewhat simplistic and/or arbitrary. There are alternative measures that provide possibly better proxies for political instability. The Political Risk Services publishes reports on political, financial and macroeconomic trends in its International Country Risk Guide and time series data (in both annual and monthly frequencies) are available via the European University Institute. Unfortunately, data are recorded from 1984 onwards which would significantly reduce the degree of freedom of our statistical analysis hence severely undermining the robustness of the results. An alternative measure could be constructed using the Worldwide Governance Indicators, as in Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi, "The Worldwide Governance Indicators: A Summary of Methodology, Data and Analytical Issues." *World Bank Policy Research Working Paper* No. 5430, who provide a measure of "perceptions of the likelihood of political instability

https://digitalcommons.usf.edu/jss/vol15/iss2/4
DOI: https://doi.org/10.5038/1944-0472.15.2.1982

and/or politically motivated violence, including terrorism". However, the ingredients of this proxy are survey-based (which restricts its coverage) and involve both conflict and unrest which make it unsuitable as an explanatory variable used for explaining armed conflicts.

[27] Pregibon, Daryl, "Logistic Regression Diagnostics." *The Annals of Statistics* 9, no. 4 (1981): 705-24, 20. https://doi.org/10.1214/aos/1176345513; Hosmer, David W., Stanley Lemeshow, and Rodney X. Sturdivant, *Applied logistic regression,* New York, NY: John Wiley & Sons, 2013. DOI: 10.1002/9781118548387.

[28] NOAA. Version 4 DMSP-OLS Nighttime Lights Time Series. Boulder, CO: National Geophysical Data Center, 2014. https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html.

[29] Bensahel, Nora, Olga Oliker, and Heather Peterson, "Improving capacity for stabilization and reconstruction operations." Vol. 852 (2009). *The RAND*, https://www.rand.org/content/dam/rand/pubs/monographs/2009/RAND_MG852.pdf.

[30] Bello-Schünemann and Moyer, Institute for Security Studies' Africa Report 9.

[31] Bensahel, Oliker, and Peterson, "Improving capacity for stabilization and reconstruction operations". The current United States strategies are documented in "United States Strategy to Prevent Conflict and Promote Stability 2020" available at https://www.state.gov/wp-content/uploads/2021/01/2020-US-Strategy-to-Prevent-Conflict-and-Promote-Stabilit-508c-508.pdf. The document "2022 Prologue to the United States Strategy to Prevent Conflict and Promote Stability", available at https://www.state.gov/2022-prologue-to-the-united-states-strategy-to-prevent-conflict-and-promote-stability/ identifies Haiti, Libya, Mozambique, Papua New Guinea, and Coastal West Africa (Benin, Côte d'Ivoire, Ghana, Guinea, and Togo) as "areas of geographic focus".