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RESOURCE RENTS, INSTITUTIONS AND VIOLENT CIVIL CONFLICTS

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Abstract

Natural resources have been blamed for inducing slow growth and sparking civil conflicts and violence. This paper first develops a model to account for the hazard of armed civil conflicts as a manifestation of the natural resource curse which is mediated by the quality of both economic and political institutions. We then use recently published data on institutional quality and natural resource rents to measure the potential impact of the resource curse on violent civil conflicts using a panel of data for over 100 countries in the period 1970-2010. Our model explicitly accounts for the role of good economic and political institutions in deterring the recourse to violence as well as the extent to which they might weaken the resource rents effect.

JEL Classification: Q34, Q38, E02.

Keywords: Oil and natural resource curse, armed civil conflict, economic growth, democracy, political checks and balances

ملخص

ألقي باللوم على الموارد الطبيعية لإحداث نمو بطيء واثارة الصراعات الأهلية والعنف. هذه الورقة تطور أول نموذج لحساب الخطر من النزاعات الأهلية المسلحة بوصفها مظهرا من مظاهر لعنة الموارد الطبيعية التي تتم بوساطة نوعية من المؤسسات الاقتصادية والسياسية. ثم نستخدم البيانات المنشورة مؤخرا عن الجودة المؤسسية وإيجارات الموارد الطبيعية لقياس الأثر المحتمل للعنة الموارد على الصراعات الأهلية العنيفة باستخدام مسح بيانات لأكثر من 100 بلدا في الفترة 1970-2010. يوضح نموذجنا دور المؤسسات الاقتصادية والسياسية الجيدة في ردع اللجوء إلى العنف، فضلا عن المدى الذي قد يضعف تأثير ايجار الموارد.

1. Introduction

Despite its potential for generating substantial financial wealth, oil and other point-source rents have long been associated with an economic development 'curse'. The literature has identified multiple manifestations of this curse, including proneness of resource-dependent societies to conflicts and political instability. In a widely cited paper Ross (2004) reviews 14 cross-national econometric and several qualitative studies that cast light on the relationship between natural resources and civil war. It suggests the existence of four underlying regularities: first, oil increases the likelihood of conflict, particularly separatist conflict; second, there is no apparent link between legal agricultural commodities and civil war; third, the association between primary commodities –a broad category that includes both oil and agricultural goods– and the occurrence of civil war is not robust and, finally, 'lootable' commodities like gemstones and drugs do not make conflict more likely to begin, but they tend to lengthen existing conflicts. We focus on the first three regularities.

This paper makes three main contributions to the literature on resource curse and violent civil conflicts. First, we build upon Bodea and Elbadawi (2007) and model the hazard of armed civil conflict as a manifestation of the natural resource curse, along with other standard correlates analyzed in the literature. Second, unlike most models of armed civil conflict occurrence, ours explicitly accounts for the role of good economic and political institutions in deterring the recourse to violence as well as the extent to which they might weaken the resource rents effect. Third, we use recent World Bank data on natural resource rents to measure the potential impact of the resource curse on armed civil conflicts. Save for a few exceptions[1], the empirical resource curse literature has, by and large, relied on qualitative indicators of natural resource dependency, which do not convey as much information as our quantitative resource rents measure.

Our empirical results corroborate the predictions of the theoretical model. First, we find a robust and positive association between resource rents per capita and the occurrence of armed civil conflict. Second, good economic and political institutions do reduce the hazard of conflict. Third, strong political institutions for checks and balances appear to weaken the impact of resource rents on conflicts.

Our emphasis on institutions bodes well with the emerging consensus in the empirical growth literature which suggests that while the resource curse does exist, it is not destiny but the result of bad economic and political governance (e.g. Collier and Goderis, 2009; Elbadawi and Soto, 2012). The high premium placed on the role of institutions in resource-dependent societies is premised on the fact that making resource rents work for development is particularly arduous due to: first, the nature of these rents and, second, the need for strong economic and political institutions for their successful management. Resource rents are intrinsically temporary when they are derived from non-renewable, depletable stocks (e.g., oil, gas and minerals). Their returns are also unreliable because prices of oil and other minerals are highly volatile and adequate risk coverage is not always available. Moreover, unless such institutions are already in place, their development is likely to be impaired by the corrosive effects of natural resource-dependency.[2]

[1] For example, Ulfelder and Lustik (2005) and Ross (2009) tested the impact of resource rents on democratic transitions. However, they used gross natural resource income, which tends to overstate the extent of the resource rents because it does not account for production costs.

[2] The political economy literature predicts that, when government accountability is lacking, resource booms allow politicians to expand public sector employment or to directly boost private consumption to enhance their popularity (e.g. Robinson and Torvik, 2005; Robinson et al, 2006). In addition to these distributional aspects, another strand of the literature suggests that bad governance also discourages savings and promotes excessive spending, which is reflected in appreciated real exchange rates (e.g. Matsen and Torvik, 2005).

Section 2 presents the theoretical model, while section 3 discusses data issues and the econometric strategy for estimating the model and argues for the desirability of using the random probit model for the estimation of the hazard function in the context of qualitative panel data. Section 4 discusses the results. Section 5 concludes.

2. Theory

Our theoretical model describes the interplay between institutions (both political and economic) and natural resource rents. We extend the political economy model of civil violence in Bodea and Elbadawi (2007) to account for the role of natural resources and explicitly acknowledge the role of institutional factors in deterring or fostering the recourse to violence. In turn, their model builds on Rodrik (1999) and Caselli and Coleman (2013) and highlights the role of political institutions and "latent" social conflict in explaining why socially heterogeneous societies that lack functioning democratic institutions are likely to be exposed to violent conflict. Caselli and Coleman focus on the decision of the dominant ethnic group to exploit or not the other groups in terms of the proceeds from extraction of natural resources, but do not take into account how institutions affect the risk of ethnic conflicts. Reuveny and Maxwell (2001) build a dynamic version of a Hirshleifer-style model of conflict over a single contested renewable resource. Also Grossman and Mendoza (2003) use a dynamic framework to predict that present resource scarcity and future resource abundance cause appropriative competition. Hodler (2006) finds that natural resources lead to lower growth in fractionalized countries through the channel of more fighting. Fearon (2005) argues that natural resources can foster conflict by weakening state capacity.

Our model is also closer to that of Besley and Persson (2009) where weak institutions, low income and large natural resources lead to a greater risk of armed civil conflict. Their model, however, has the reverse timing: in our model the group in power mounts an opportunistic grab of the share of the natural resource accrued to the minority population thus potentially leading to a conflict (if the minority chooses to fight) while in their model the minority mounts an insurgency by using its army to seize power. Then, the government decides whether to use its army, which it can do whether or not there is an insurgency. These choices and the insurrection technology probabilistically determine who is in power. Finally, the winner determines the allocation of the natural resource.

2.1 The model

We assume the existence of two socially distinct coalitions: A and B, with A being the larger and also the stronger group. Group sizes are N_A and N_B, respectively, so that the total population is $N= N_A + N_B$. Members in a given group are assumed to be identical. Each individual has an initial exogenous income stream from assets that cannot be expropriated (e.g., arising from human capital). Society members from both groups have equal shares from the aggregate common wealth (Z) arising from natural resources so that each individual is entitled to $z = {}^{Z}/_{N}$.

We use a follow-leader game, where Group A makes the first move on whether or not to mount an opportunistic grab on the common resource Z and internalize the benefits to its members only. Group B might accept passively the expropriation or choose to fight, which will result in conflict.

The 2-stage game tree is presented in Figure 1. The payoffs are as follows:

- If Group A decides to play by the rules and, hence, does not mount an opportunistic grab on the natural resource peace prevails, because Group B will not choose to fight in this case: the (Peace, Peace or P, P) scenario in Figure 1. Under this (no-exploitation) equilibrium each member in society receives $y_i + z$, where y_i is their inalienable endowment and, as before, z is the per-capita share in the country's natural resource base.

- If Group A has decided to mount an opportunistic grab on the resource base (has played Conflict) the response of Group B would be either to capitulate (i.e. to play Peace) or to fight (i.e. to play Conflict). If it chooses to capitulate, we have an 'exploitation' scenario akin to that of Caselli and Coleman (2013). Under this (Conflict, Peace or C, P) scenario the payoff for a typical member of Group A is given by $(1-\delta)\left[y_A + \frac{zN}{N_A}\right]$, where δ is the cost of conflict $(0 < \delta < 1)$ which. On the other hand, a member of Group B only receives her inalienable income, discounted by the cost of conflict $(1-\delta)y_B$. We assume the cost of conflict to be symmetrical for both groups for simplicity.
- If Group B decides to fight in response to Group A's opportunistic grab we have the conflict scenario (Conflict, Conflict or C, C). Under this scenario each member of Group A and B receives $(1-\Delta)\left[y_A - \alpha\frac{zN}{N_A}\right]$ and $(1-\Delta)\left[y_B - (1-\alpha)\frac{zN}{N_B}\right]$ respectively, where Δ is the cost of conflict. Since Group B has decided to fight in response to Group A's conflictive strategy, the cost to the economy will be higher, hence $\Delta > \delta$. We now assume that in this case the stronger Group A receives a fraction α (α>0.5) of the natural resource, while the weaker Group B receives the remaining fraction $1-\alpha$. Therefore, unlike the 'exploitation' scenario, by its decision to fight back, Group B can retain a share of the resource base, albeit smaller than its fair share. However, the overall economic cost associated with the (C, C) scenario is higher than that of the (C, P) scenario.

Moreover, we assume that the decision by Group B on whether to fight or to capitulate depends on its prior about the probability that Group A wins the conflict (π), which is equivalent to Group B's perception that Group A would mount an opportunistic grab on the natural resource.

Under well-established institutions, groups will eventually be forced to play by the rules and the rents from the common resource (net of the cost of conflict) will be equally distributed among all members of the society. The probability of success of the opportunistic move by Group A will therefore be small. However, when institutions are weak, all of the resource rents (net of the cost of conflicts) will be expropriated by Group A, should Group B decide to capitulate. Moreover, the strength of conflict management institutions tends to moderate the potential inequities arising from the asymmetric claims. This feature of the model borrows from Rodrik (1999), who develops a model of social conflicts arising from coordination failure, with two social groups acting independently and facing a shrinking pie as a result of an external shock. In Rodrik's model, depending on a prior opinion about whether the rival group is likely to be "cooperative", each group will attach a high probability to an opportunistic grab of resources by its rival. Therefore, ceteris paribus, the game results in higher claims than available resources, leading to distributional conflicts and strong conflict management institutions moderate the conflict arising from the asymmetric claims by credible rules that govern the ex post distribution of resources.

Using Figure 1, we specify the per capita pay-offs for the representative individual in each group under the three possible scenarios (a) *sustained peace* (P, P), i.e., when Group A does not make the opportunistic move, (b) the case when Group A makes the opportunistic grab and Group B decides to capitulate: the *exploitation scenario* (C, P), and (c) the case when Group B decides to fight in response to an attempted opportunistic grab by Group A: *the continued conflict scenario* (C, C). Figure 2 indicates the pay-offs for each group in the three scenarios. We do not consider risk aversion.

2.2 Group A strategy

The expected value of continued peace for this group happens with probability 1 because Group B (the weaker group) is assumed to prefer peace, conditional on Group A's decision to

avoid wrestling control of the common resource. Therefore, the expected value of peace for Group A ($EV(P)_A$) is simply given by:

$$EV(P)_A = y_A + z \quad (1)$$

On the other hand, the expected value of conflict for Group A would depend on the outcome of such conflict, itself the result of the decision of Group B's to retaliate or capitulate as well as the probability of success due to the strength of the prevailing institutions:

$$EV(C)_A = \pi(.)(1-\delta)\left[y_A + \frac{zN}{N_A}\right] + (1-\pi(.))(1-\Delta)\left[y_A + \alpha\frac{zN}{N_A}\right] \quad (2)$$

For Group A the conflict strategy will dominate if and only if $EV(C)_A > EV(P)_A$. Using this condition, we solve for:

$$\pi > \tilde{\pi} = \frac{\Delta y_A + z\left[1-\left((1-\Delta)\alpha\frac{N}{N_A}\right)\right]}{y_A(\Delta-\delta)+\frac{zN}{N_A}[(1-\delta)-\alpha(1-\Delta)]} \quad (3)$$

where $\tilde{\pi}(.)$ operates as a reservation value or threshold, in the sense that should the perceived probability exceed $\tilde{\pi}(.)$, Group A will initiate a conflict.

In turn, after simple, if tedious, algebra it can be shown that:

$$\tilde{\pi} = \pi(\underset{(-)}{\alpha}, \underset{(+)}{\delta}, \underset{(+)}{\Delta}, \underset{(+)}{N_A/N}, \underset{(+)}{y_A}, \underset{(-)}{z}) \quad (4)$$

Equations (3) and (4) suggest that the threshold probability for Group A winning the conflict ($\tilde{\pi}$) increases with inalienable income y_A; the economic depletion due to conflict, δ or Δ; or the share of Group A in total population $\left(\frac{N_A}{N}\right)$. This is because these factors tend to depress the Group A payoff from mounting an opportunistic grab which requires a higher probability of success for the conflict strategy (C,C) to become profitable relative to the sustained peace strategy (P,P). On the other hand, the lower will be the threshold probability the higher per capita share for Group A from the natural resource (α) under the (C,C) scenario; or the larger the natural resource base per capita (z). In this case these factors tend to promote the (C,C) payoff, thus suggesting that even a relatively low probability of success might still be high enough to trigger an opportunistic grab by Group A.

2.3 Group B strategy

Since Group B is a follower, the expected value of peace or conflict would depend on Group A's strategy vis-à-vis the appropriation of the common asset. The peace scenario for Group B occurs (a) if Group A does not initiate the grab, the sustainable peace scenario (P,P) or (b) if Group A initiates the grab and after paying the cost of conflict Group B decides not to retaliate and let Group A win over the natural resource rents, the exploitation scenario (C,P). The expected value is

$$EV(P)_B = (1-\pi(.))(y_B + z) + \pi(.)(1-\delta)y_B \quad (5)$$

The expected value in the continued conflict scenario (C,C) for Group B is conditional on Group A choosing to mount a grab on Z that triggers a conflictive response from Group B.

$$EV(C)_B = (1-\pi(.))(1-\Delta)\left(y_B + (1-\alpha)\frac{zN}{N_B}\right) \quad (6)$$

For Group B the conflict strategy will dominate if and only if $EV(C)_B > EV(P)_B$. Therefore we can compute the probability threshold for which Group B prefers to retaliate:

$$\pi < \ddot{\pi} = 1 - \frac{(1-\delta)y_B}{(1-\Delta-\delta)y_B + z\left[1-(1-\Delta)(1-\alpha)\frac{N}{N_B}\right]} \quad (7)$$

where in this case Group B will not decide to challenge an opportunistic grab by Group A unless the probability of the latter winning the conflict is below $\ddot{\pi}(.)$, which can be expressed in terms of the effects of its determinants as follows[3]:

$$\ddot{\pi} = \pi(\underset{(-)}{\alpha}, \underset{(?)}{\delta}, \underset{(-)}{\Delta}, \underset{(-)}{N_B / N}, \underset{(-)}{y_B}, \underset{(+)}{z}) \quad (8)$$

For Group B the probability threshold decreases with the higher rate of economic depletion (Δ) associated with the (C, C) scenario, while for the lower rate of economic depletion (δ), associated with the exploitation scenario (C, P), the effect on the threshold probability could not be signed a priori. Also the threshold probability decreases with higher inalienable income y_B as well as with larger share of Group B in the population (N_B/N). All the variables that enter negatively as determinants of the threshold probability tend to reduce the payoffs for Group B. Hence a relatively low probability of Group A winning the conflict (π) is required for Group B to play the conflict scenario in response to an attempted opportunistic grab by the former. The exception is the size of the resource rent (*z*) because a higher rent makes it more likely for Group A to engage in conflict and, at the same time, increases the alternative cost of capitulation for Group B.

Conflict will be a dominant equilibrium strategy if and only if, given the ex-ante institutions (I), there exists a true probability of success for Group A winning the conflict ($\pi(\tilde{\pi}, \ddot{\pi} \mid I)$), such that:

$$\tilde{\pi} < \pi(\tilde{\pi}, \ddot{\pi} \mid I) < \ddot{\pi} \quad (9)$$

This requires that $\tilde{\pi} < \ddot{\pi}$, which is satisfied subject to some relatively innocuous assumptions mentioned above.

The above characterization of the incentives for both groups indicates that conflict will most likely appear under the following conditions:

a) The lower the intensity and the losses received in a conflict (δ, Δ).
b) The smaller the population in Group A, (i.e. the lower the N_A/N ratio), since the benefits for the incumbent of a conflict leading to the grab of the common resource per capita would be bigger and the losses of the minority would be bigger.
c) The smaller the population in Group B, (i.e. the lower the N_B/N ratio), since the benefits for the weaker group in playing conflict in response to attempted resource grab by Group A would be bigger.
d) The lower the exogenous income of Group A and Group B (e.g., lower human capital).
e) The higher the probability of being successful in the conflict, i.e. the weaker the institutions in place are and/or the more impediments to peaceful conflict resolutions (e.g., grievance in the form of ethnic or religious fractionalization).

Our theory, therefore, suggest that both grievance as well as economic factors are relevant to the analysis of political violence. Next we describe the econometric strategy as well as the results obtained when testing our theory.

3. Empirical Analysis

In this section we take our theoretical model to the data. As discussed, the model is of a general nature and does not produce testable closed econometric specifications. This requires a careful econometric modeling which we describe below. Prior to the description of the

[3] Some of the partial effects on the threshold probability hold subject to relatively innocuous assumptions about orders of magnitudes of parameters: $(\delta < \Delta < \alpha < \frac{N_A}{N})$

econometric strategy and the results, it is convenient to describe the data both on armed civil conflicts and on their potential determinants. The choice of 101 developing countries and the time period (1970-2010) was dictated by the availability of data which is somewhat restrictive in the case of institutional variables (democracy, checks and balances, and the measure of capital account openness) as well as the natural resource rents. We exclude from the analysis post-socialist economies since data usually start after 1995 and is often incomplete. The list of countries, the data sources and its main characteristics are presented in Appendix A.

3.1 Armed civil conflicts

The data on civil armed clashes are scarce and there is little consensus of how to date conflicts and what is an appropriate measure of their intensity (from demonstrations to riots, violent coups, and civil wars).[4] It is not surprising, therefore, that different authors obtain conflicting results as to the causes and consequences of civil violence. Table 1 presents the episodes of armed civil conflicts that we investigate in this paper. The data was obtained from the UCDP/PRIO Armed Conflict Dataset.[5] We define an armed civil conflict as the case of internal violence resulting in at least 25 battle-related deaths in a given year (it therefore includes both UCDP/PRIO's categories of minor conflicts and civil wars). We exclude conflicts where there is intervention by third-party countries as they do not correspond to the type of conflict described by our theory (see the discussion in Balch-Lindsey et al., 2008). As noted by Miguel et al. (2004) this definition of conflict does not capture the types of organized violence that do not directly involve the state such as clashes among rural-based groups or crime related to the drug trade. And it disregards ethnic violence although we do examine the effects of ethnic diversity in the main econometric analysis below.

3.2 Natural resources

It has become customary to control for the presence of natural resources in the civil conflict literature (see Fearon, 2005; and Caselli and Coleman, 2013). Nevertheless, there is no consensus regarding their role in inducing or lengthening civil conflicts. Early papers used a dummy variable, which is tantamount to testing only for the existence of natural resources but not for the profit or economic rent collected from such natural resources (Fearon and Laitin, 2003). More recent studies used total resource rents computed by the World Bank (2012) as the total revenue that can be generated from the extraction of the natural resource in gross terms (e.g., Ulfelder and Lustik, 2005) or less the cost of extracting the resource, including a normal return on investment to the extractive enterprise (de Soysa and Neumayer, 2007). As shown in Figure 3, resource rents per capita in civil armed-conflict economies have been systematically higher than in countries that have avoided such conflicts.

However, the profitability of the different exported goods is heterogeneous, being typically much higher for hydrocarbons than for agricultural goods. Moreover, the returns for producers of essentially the same exported goods can be quite different depending on the conditions of exploitation of the natural resource, location, technology, etc. Consider, for example, that the cost of oil extraction (lifting and finding) in the Middle East is around one half of that in an on-shore US facility (EIA, 2011). We use the World Bank estimates of the

[4] Sambanis (2004) finds differences among authors in terms of the thresholds of violence required to be defined as a civil war; the dating of war beginnings and endings; and the treatment of civil wars when there is involvement by outside parties.

[5] See Gleditsch et al. (2002) and Themnér and Wallensteen (2012). The intensity of armed civil conflicts is coded in the UCDP/PRIO Armed Conflict Dataset in two categories: Minor (between 25 and 999 battle-related deaths in a given year) and Civil War (at least 1,000 battle-related deaths in a given year). The type of conflict is "*Internal armed conflict between the government of a state and one or more internal opposition group(s) without intervention from other states*".

natural resource rents in energy (oil, natural gas, and coal) and in non-energy products (forestry, agriculture and mining) which take into account cost differences.

Despite their importance, the level of resource rents is not the only potential determinant of civil conflicts. The difficulties in succeeding also are considered when attempting an opportunistic grab. Rents arising from natural resources that are concentrated in few hands – typically public entities exploiting oil, diamonds or gold—are more easily "lootable" than those pertaining to a large number of small size producers (e.g., fishing and agriculture). We therefore control for the lootability of resources using as proxy the share of energy (oil, natural gas, and coal) in total natural resource rents as estimated by the World Bank (2012). This database, unfortunately, does not include rents on gemstones or gold.

3.3 Political institutions

Political life can be thought of as providing solution to the best allocation of scarce public resources so as to improve the welfare of the majority of the population. There are, therefore, two dimensions that societies need to address in order to fulfill this mandate. In the first dimension, societies ought to provide a mechanism to determine social preferences as to the allocation of such resource. In the second dimension, societies have to make sure that such allocation is respected by the different public agencies and that, should deviations occur, they are corrected. The first dimension is usually associated with political participation, the second with political accountability.

In order to provide a quantitative measure of political participation we use the components of the Polity2 measure of democracy compiled by the Integrated Network for Societal Conflict Research (Polity IV Project, 2011). The Polity2 index is based on two concepts: "institutionalized democracy" (DEM) and "institutionalized autocracy" (AUT). The DEM score is coded according to four measures of regime characteristics: competitiveness of executive recruitment; openness of executive recruitment; constraints on the chief executive; and competitiveness of political participation. These measures, along with regulation of participation, contribute to the AUT score. The Polity score (POL) is computed by subtracting the AUT score from the DEM score, resulting in a score that ranges from -10 (strongly autocratic) to 10 (strongly democratic). We focus on the DEM measure, which ranges between 0 and 10.

In addition to political participation, political accountability is also crucial. We use the index of Political Constraints (POLCON-V) developed originally by Henisz and later refined and extended by Henisz and Zelner (2010). This index is a quantitative measure of the institutional constraints faced by authorities and evaluates the extent to which any one political actor or the replacement for any one actor (e.g., the executive or a chamber of the legislature) is constrained in his or her choice of future policies. Institutionalized checks and balances provide safeguards against potential manipulation or avoidance of rules. This political constraint index directly measures the feasibility of a change in policy given the structure of a nation's political institutions (the number of veto points) and the preferences of the actors that inhabit them (the partisan alignment of various veto points and the heterogeneity or homogeneity of the preferences within each branch).

3.4 Economic institutions

There are a large number of economic institutions that seem to play important roles in shaping modern economic life, ranging from the way in which individuals participate in economic activities (e.g., property rights) to the organization and regulation of markets and the role of the State. Measures for the quality of many of these institutions are difficult to obtain for a large number of countries and quantitative evidence is notoriously absent from an historical perspective.

We focus on two measures of economic institutions that are available and have been used successfully in the past both in the economic development and conflict literatures. The first variable relates to the insertion of the countries in the global economy in terms of trading goods and services. The evidence indicates that more open countries tend to also be those where institutions operate better and where recourse to arbitrariness and abuse is less likely to occur on systematic basis. Competition in globalized markets produces a type of discipline that largely inhibits rent-seeking behavior and also requires governments to provide conflict resolution mechanisms and property rights protection.

It is customary to measure trade intensity by the simple share of exports and imports in economic activity (GDP). This measure however is biased since large economies tend to trade less than smaller size economies as their internal markets are usually big enough to justify the development of indigenous industries. Likewise, trade patterns can be distorted when countries are landlocked or where hydrocarbons are the main source of exports. Our measure of openness is the volume of trade (real exports plus imports over GDP), adjusted for the economic development, country size (area and population), and the effects of being a landlocked economy or an oil exporter. Appendix B discusses the nature of this measure and the econometric model used to compute it.

The second variable summarizing institutional development relates to the openness of the economy to international financial transactions.[6] Well-functioning financial systems promote development in the long-run as they facilitate risk diversification, help identify profitable investment projects and mobilize savings to them. Insertion in international markets also requires an institutional framework that reduces risk for investors and minimizes opportunistic behavior on the part of the local operators and the government. The financial openness measure developed by Chinn and Ito (2008) is based on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions. It can be seen that the measure is largely of an institutional nature and, consequently, likely exogenous with respect to transient phenomena and, particularly, conflicts.

3.5 Other variables

Following our model and the acquired knowledge from previous studies, we also control in our regressions for the overall level of development of the country (i.e., the exogenous income stream from assets that cannot be expropriated), for which we use per capita GDP in real terms (US$ of 2000). Previous empirical evidence suggests that the less developed an economy is, the higher the chances of falling into armed civil conflicts. In Figure 4 we have plotted the average incidence of armed civil conflict by quintile of income per capita in the four decades between 1970 and 2010. Two elements clearly emerge. First, there is an evident unconditional negative correlation between income levels and the occurrence of armed civil conflicts. Note that within each decade the incidence of armed civil conflict is much lower for the last two quintiles than for the first three quintiles. This indicates the need to control for income levels. Second, there seems to be a temporal pattern by which the average number of civil conflicts increased markedly up to the 1990s and then declined steadily in the following decade. This suggests the need to control for time effects.

Some papers in the literature assign a role to foreign aid, ethnic and religious fractionalization and/or polarization as well as spillover effects from conflicts in neighboring countries as

[6] Other popular measures of the development of the domestic financial sector— such as financial credit to the private sector or foreign liabilities— were also included in preliminary analyses but later eliminated because their availability is somewhat limited and, more importantly, because they tend to be highly collinear with GDP per capita. The latter is preferred as an encompassing representative of economic development.

potential determinants of armed civil conflicts with mixed empirical results (see Dixon, 2009). Below we extend our model to control for these and other variables.

In Table 2 we present the sample correlation among the potential determinants of armed civil conflicts that we use in the empirical section. Results can be summarized as follows. First, in general there is low correlation among the potential determinants of armed civil conflicts (except for those noted below), suggesting that colinearity is unlikely to be a major issue in our estimated models. Second, as expected there is a relatively high correlation between the level of economic development and resource rents and some indicators of fractionalization. Third, and also expectedly, there is very high correlation between both measures of political institutions.

3.6 The econometric model

The existence of an armed civil conflict in a country is modeled using a discrete (binary) variable taking a value one in the occurrence of a conflict and zero otherwise using an annual database comprising around 100 developing economies in the period 1970-2010. We, therefore, estimate non-linear, discrete variable, panel-data models. There are, essentially, two estimators in this context: the fixed-effects conditional-logit model and the random-effects probit model.

In general, the fixed-effects estimator applied to non-linear panel data models suffers from the incidental parameter problem (Neyman and Scott, 1948) which makes the estimator biased when the time-series dimension (T) is fixed even if the number of countries (N) increases. However, the incidental parameter problem can be avoided altogether when implementing the conditional fixed-effects logit estimator (CLFE). This estimator uses information only from countries that have transited from a situation of armed civil conflict to peace or from peace to conflict and eliminates all cases of countries that have never fell into civil violence or that have had a permanent conflict for the complete period (e.g., Colombia). The CLFE estimator is consistent but it drops important information for our purposes: in particular, it precludes us from estimating the role of fixed country characteristics such as ethnic, language, and religious fractionalization (see Greene, 2009).

In light of the limitations of the CLFE estimator our empirical models are estimated using random-effects probit estimators. This estimator does not eliminate information from countries that have avoided altogether armed civil conflicts and it can handle the country-specific time-invariant variables mentioned above. The main limitation of random effects models is that they assume normal distributions for all unobserved components, a feature that may characterize most unobserved, random components in economic data, and also that the individual-specific effect is uncorrelated with the explanatory variables. Note that the fixed-effects probit model is not an option since there are no sufficient statistics to identify such model. [7]

We start our econometric analysis by estimating a simplified version of our theory whereby the probability of observing an armed civil conflict depends on the level of development of the country (which we proxy using real GDP per capita), the population density of the country, the size of the natural-resource rents per capita, and the share of energy in exports.

Benchmark regressions:

$$ACC_{it}(1 = yes, 0 = no) = f(\beta, \mu_i | x_{it}) \quad (7)$$

[7] Since the fixed-effects panel probit estimator does not exist it precludes us from undertaking Hausman tests to determine the appropriate treatment of individual effects.

where $ACC_{it}(1 = yes, 0 = no)$ is an indicator variable taking the value 1 if an armed civil conflict has occurred at time t. x_{it} is the set of all standard explanatory variables, and μ_i is a country-specific random effect.

We then extend the benchmark model to include institutional factors that, according to our theory, determine the probability of success of an opportunistic grab of the natural resource rents. That is, economic and political institutions.

Extended regressions:

$$ACC_{it}(1 = yes, 0 = no) = f(\beta, \mu_i | x_{it}, economic\ institutions_{it}) \quad (8)$$

$$ACC_{it}(1 = yes, 0 = no) = f(\beta, \mu_i | x_{it}, economic\ institutions_{it}, political\ institutions_{it}) \quad (9)$$

4. Econometric Results

Guided by the above econometric strategy we undertake the estimation of several random-effects discrete-choice models using a large sample of around 3,600 annual observations for 101 countries in the period 1970-2010, the longest for which consistent data is available. We estimate these panel-data probit regressions using all right hand side variables lagged one period to reduce potential biases arising from simultaneity. This bias, nevertheless, is not expected to be important since most of the variables are of institutional nature or move slowly in time, being usually less affected by conflicts contemporaneously or in the very short run. A detailed discussion of the econometric results follows in Tables 3 and 4. We report the marginal effects as they comprise sign, size and statistical significance.

4.1 The benchmark model

Starting with the benchmark regression (columns 1 and 2 in Table 3), the results lend strong support to our theory. First, and as customary, the level of economic development –proxied by real GDP per capita—is negatively associated with the probability of armed civil conflict. As noted by Fearon (2007) a striking regularity is that poor countries have been much more likely to have conflicts and civil wars than richer countries. However, such empirical evidence is typically obtained without controlling explicitly for the magnitude of resource rents nor institutional factors as we do below. Likewise, higher population density tends to increase the probability of engaging in armed civil conflicts.

Second, the results also suggest that the level and composition of natural resource rents affect the likelihood of observing an armed civil conflict. As noted, we control for the amount of the resource rents and not for the presence of natural resources as would be the case if a dummy variable for oil exports is included. We find a strong and positive estimated parameter and marginal effect, indicating that for a given level of development and density, the higher the level of resources rents the higher is the probability of a civil war (as found also by Fearon and Laitin, 2003 and Collier and Hoeffler, 2004). However, a second result in this line is the finding that the nature of the resource rents also plays a role in affecting the initiation and maintenance of a civil war. The positive coefficient found for the share of hydrocarbons in exports indicate that, for the same level of resource rents in two countries, it is more likely to observe armed civil conflict if such rents are generated by oil and gas exports. Note that the share of agricultural goods in exports is not significantly correlated to armed civil conflicts. We, therefore, provide quantitative support to the conclusions by Ross (2004) that oil abundance increases the likelihood of civil conflicts.

Finally, the results for this benchmark model also lend support to the notion that estimating pooled-data models is inadequate. The LR test of the null hypothesis that all individual (country) effects are exactly the same is strongly rejected (at 99.9%) thereby indicating the need of using panel data techniques. This, of course, is not surprising when considering that

this type of models is at best a reduced-form specification estimated using a group of very heterogeneous economies.

4.2 The role of institutions

We extend our previous benchmark model to account for the role of institutions. We first add the variables that aim to capture economic institutions. In Column 3 to 5 of Table 3 it can be seen that the estimated marginal effects for the standard controls do not differ in any significant way to those obtained by the benchmark model in column 2. This results because the variables representing economic institutions are largely uncorrelated to the standard controls as shown in Table 2. Note that the estimated marginal effects for both economic institutions are strongly and negatively correlated with the probability of an armed civil conflict. That is, for any given level of resource rents, more open economies in both financial and trade terms are less likely to slide into armed civil conflict. In Columns 4 and 5 we add interaction terms designed to control for the joint effect of both economic institutions and resource rents on the probability of an armed conflict. It can be seen that both interaction terms are statistically insignificant and that the estimated marginal effects of trade and financial openness as well as that of the resource rent remain largely unaffected. This would suggest that there is a positive effect of economic institutions in reducing the chance of conflicts but it does not necessarily reflect that they can induce a better use of resource rents.

We extend the model to include political institutions. Columns 6 and 7 of Table 3 show the econometric results when including the two political variables separately to avoid the colinearity problems that would arise when including them together due to the high correlation between these two variables. It can be seen that none of the previous estimated marginal effects for both standard controls and economic institutions is affected in any significant way. It can be seen that both political variables are strongly and negatively correlated with the incidence of civil conflicts. The interpretation is straightforward: for equal levels of resource rents and economic institutions those countries with better political institutions in the form of more democratic rules and better control over government decisions are able to counteract the incentives to engage in civil strife. This is, in our view, a novel result.

We also include interaction terms to inspect potential joint effects. In Columns 8 and 9 it can be seen that the coefficients of both resource rents and institutional variables are affected and that interaction terms are positive and statistically significant. The evidence in Column 8 indicates that the effect of the resource rents is smaller than in the previous models (by around 25%) but the effect of checks and balances is much larger and quite significant. The positive interaction terms indicate that while higher levels of political accountability reduce the probability of a conflict, such beneficial effect is dampened in countries where resource rents are abundant. Likewise, the results in Column 9 also show that when introducing the corresponding interaction term, democracy continues to reduce the probability of a conflict but such effect is ameliorated in resource abundant economies as shown in a positive interaction term. This is a second novel effect.

Panels A and B in Figure 5 provide a graphical description of the margins of both types of institutions, economic and political, on the occurrence of armed civil conflicts. Margins are computed as the change in probability; when changing the variable of interest while keeping all other variables fixed at their sample mean. It can be seen that economic variables have a larger margins effect than political variables. For example, the margin of trade openness of an economy located at the average world openness (at 0.00) is around -1.5% while that of the most open 20% of countries (at 0.36) almost -3.0%. These are significant margins from an economic viewpoint since the unconditional probability of a conflict is 18.5% in our sample. On the other hand, an economy located at the world average of capital openness (at -0.25)

does not have a marginal effect substantially different than one located among the 20% most-open countries in the world (at 2.20); the marginal change in the probability of a civil conflict would fall by around two percentage points.

The margins of political institutions are more constricted. The margins of democracy are quite stable, since at every level it hovers around -1.8%. On the other hand, the margins of checks and balances are slightly more different since countries located at the world average (at 3.5) have a margin of -1.8% while economies located in the top 20% (i.e., at 7.5) have a margin of -2.0%. These responses continue to be quite significant from an economic viewpoint when considering the average probability of a civil conflict in the sample.

4.3 Controlling for other potential determinants of armed civil conflicts

The empirical literature on the determinants of civil wars has suggested other mechanisms linking institutions to the occurrence of conflicts. Savun and Tirone (2010) argue that one of the key factors that shelter some democratizing states from domestic political violence is the receipt of democracy aid. Democracy aid decreases the risk of conflict by reducing commitment problems and uncertainty. We use official development aid –which includes but is not limited to democracy aid—in our econometric regressions and find that aid (as share of GNI) is statistically insignificant. Furthermore, when including interaction terms with the political variables to test for possible transmission channels the latter proved statistically insignificant suggesting that external aid is also not instrumental in supporting institutions.

A second external source of conflict is the result of contagion effects from neighboring countries that are themselves in a situation of internal strife. These contagion effects are the result of refugee flows, disease, lawlessness, and the illicit trade of drugs, arms, and minerals (Collier et al., 2003). We coded a dummy variable indicating whether any neighbor of a country is in civil war (value 1) or not (value 0). When added to our econometric model with institutions, spillover effects turn out insignificant. Arguably, a dummy variable is not likely to capture the several, subtle mechanisms through which civil conflicts in one country can spillover into a neighboring society.

Some papers in the literature on the economics of armed civil conflicts –particularly, civil wars— has pointed to society's heterogeneity or *fractionalization* as a potential source of conflict (Brunnschweiler and Bulte, 2009). We extend our econometric model of institutions with three measures of fractionalization obtained from Teorell et al. (2010). Ethnic (religious) fractionalization corresponds to the probability that two randomly selected people from a given country will not belong to the same ethno-linguistic group (religion). The higher the index, the more fractionalized is society. Likewise language fractionalization reflects the probability that two randomly selected people from a given country will not speak the same language. In Table 4 it can be seen that while language heterogeneity increases the probability of an armed civil conflict religious heterogeneity actually reduces the occurrence of such conflicts. The estimated marginal effect for ethnic fractionalization is not statistically significant. Interaction terms, however, indicate that ethnic fractionalization reduces the ability of democracy to inhibit the occurrence of armed civil conflicts (since the estimated marginal effect is positive). On the other hand, language fractionalization does not impinge on the margins of democracy or checks and balances. Religious heterogeneity also marginally reinforces the conflict ameliorating the effect of democracy.

Finally, some authors have suggested that political polarization could play some role in fostering armed civil conflict (Montalvo and Reynal-Queirol, 2005). We found no direct effect of polarization on the occurrence of armed civil conflicts but indirect effects through both types of political institutions. On one hand, political polarization reduces the effectiveness of checks and balances in reducing the negative effects of the resource curse on

the occurrence of armed conflicts. On the other hand, and somewhat surprisingly, political polarization supports the ability of democracy to reduce the resource curse.

5. Conclusions

There is now a near consensus among scholars and development practitioners alike that under certain conditions oil and mineral resource rents can be harmful to institutions and economic development, hence generating the so called natural resource curse. A growing, though relatively less compelling, evidence is also emerging on the manifestation of the curse in terms of the proneness of natural resource-dependent societies to conflicts. This paper is a contribution to this strand of the literature. Building upon recent work we develop a theoretical model that accounts for the role of natural resource rents, as a 'lootable' resource in promoting conflicts, especially in divided or polarized societies. Moreover, our model explicitly accounts for the potential role of institutions, both economic and political, in stemming the tendency of the opportunistic grab of such resources and hence ameliorating the vulnerability of these societies to conflicts.

We test the predictions of the model in a set of random-effects probit regressions, estimated using a panel of more than 3,500 annual observations over 1970-2010, drawn from 101 countries. The results of the econometric estimation lend strong support to the main predictions of the theoretical model. We confirm that resource-dependent societies are more prone to conflicts. Moreover, though there is only weak evidence that such effect is non-monotonic, it does nevertheless suggest that within the resource-rich societies those endowed with intermediate levels of rents per capita might stand to be the more vulnerable to risks of armed civil conflict. Instead, and as the model predicts, institutions of economic openness as well as the political institutions- as accounted for by the indexes of democracy and political checks and balances- were found to be robustly and negatively associated with the hazard of civil war. However, only checks and balances appear to weaken the rents effect, which was reduced in terms of order of magnitude and degree of significance when the former is included in the regression. Though the rents effect remains significant, nevertheless, this finding suggests that, while democracy is shown to be important on its own right as a factor in containing the risk of conflicts, the other institution that underpins checks and balances in the political process might hold more promise for directly weakening the resource rents effect in promoting proneness to conflicts.

Very importantly our findings confirm the standard relationship between income and the risk of civil war, which takes added importance in our model; as it could also be interpreted as a measure of the in-appropriable human capital, which is predicted by the model to have a negative impact on the risk of conflict. However, we fail to find robust association between other traditional civil war correlates, such as foreign aid, terms of trade shocks, conflictive neighborhood, or ethnic and religious polarization.

Finally, thinking ahead, this paper also suggests areas for future research at both the theoretical and empirical levels. For example, it would be interesting to extend the current theoretical model to account for the likelihood that the impact of the resource rents on conflict is subject to a scale effects. As our estimation results suggest, in all likelihood too small rents per capita will not be consequential. However, very high resource rents might as well be a deterrent to conflict, either through the 'Hobbesian' effect of providing the state with substantial resources to crush any potential insurgency or through strengthening the 'authoritarian bargain' that proved very effective in preempting incipient conflicts in highly resource endowed societies. Moreover, it would be important to probe further into the role of social polarization and its interactions with economic shocks that tend to happen at a relatively high frequency in resource-dependent economies. This more encompassing analytical framework would naturally entail a more involved econometrics that should test

not only for the levels effects of institutions, resource rents, social polarization and economic shocks but also for their potential interactions effects.

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Figure 1: The 2-Stage Game Tree

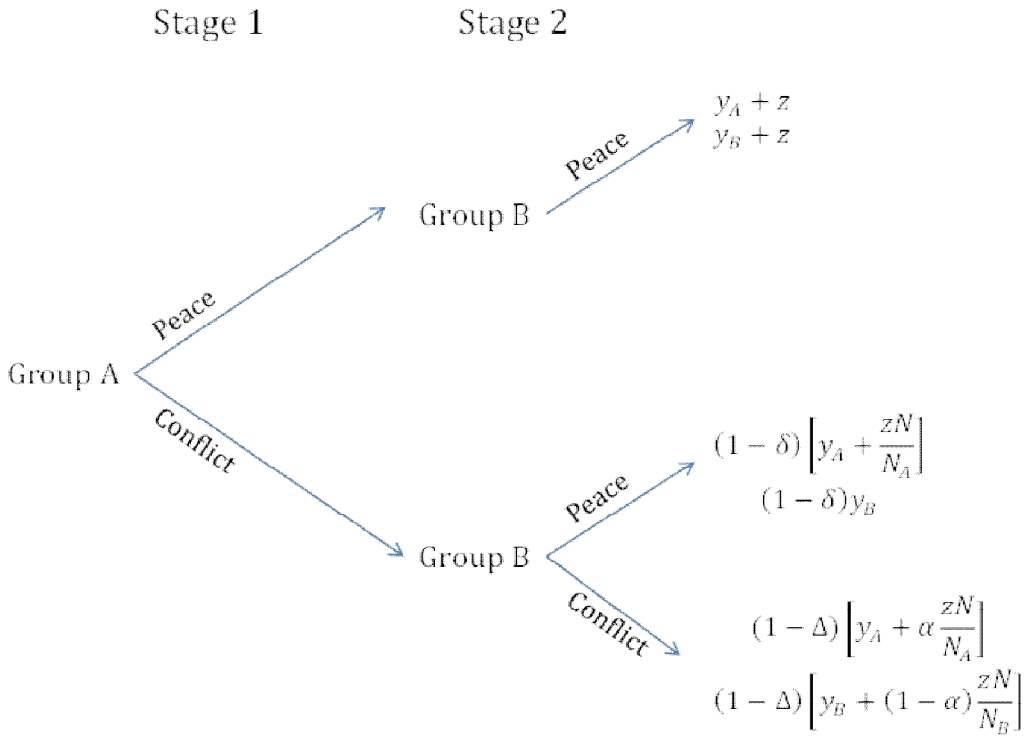
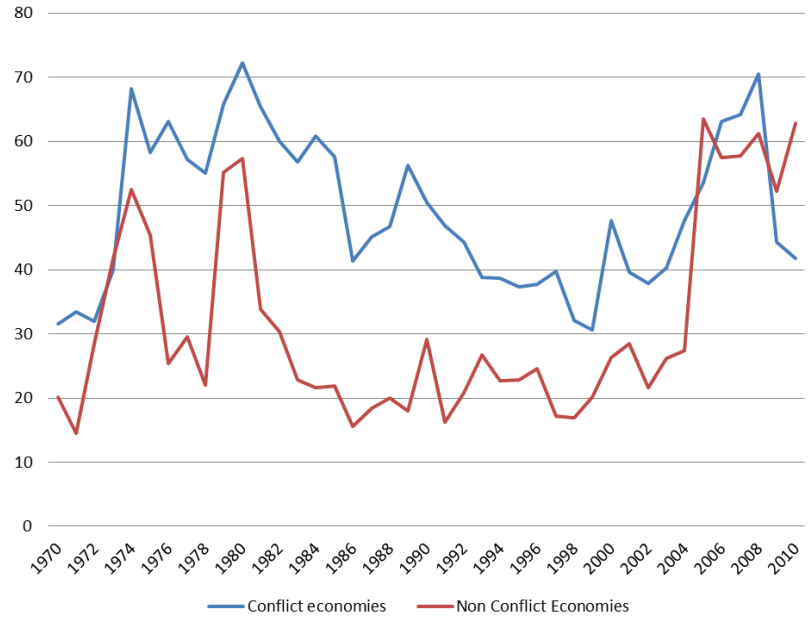


Figure 2: Payoff Matrix

	Sustained Peace Scenario	Exploitation Scenario	Continued Conflict Scenario
Payoff for Group A	$y_A + z$	$(1-\delta)\left[y_A + \frac{zN}{N_A}\right]$	$(1-\Delta)\left[y_A + \alpha\frac{zN}{N_A}\right]$
Payoff for Group B	$y_B + z$	$(1-\delta)y_B$	$(1-\Delta)\left[y_B + (1-\alpha)\frac{zN}{N_B}\right]$

Figure 3: Annual Natural Resource Rents per Capita US$ of 2005



Source: Authors' elaboration based on data from World Bank World Economic Indicators and Table 1.

Figure 4: Incidence of Armed Civil Conflicts by Quintile of Income per capita (1970-2010, 137 countries)

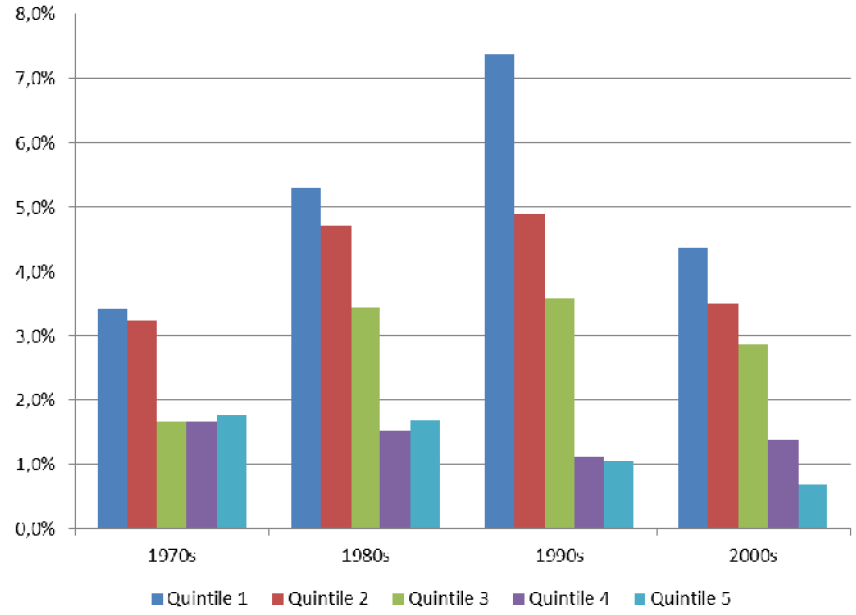


Figure 5: Margin Effects of Institutional Variables on the Occurrence of an Armed Civil Conflict

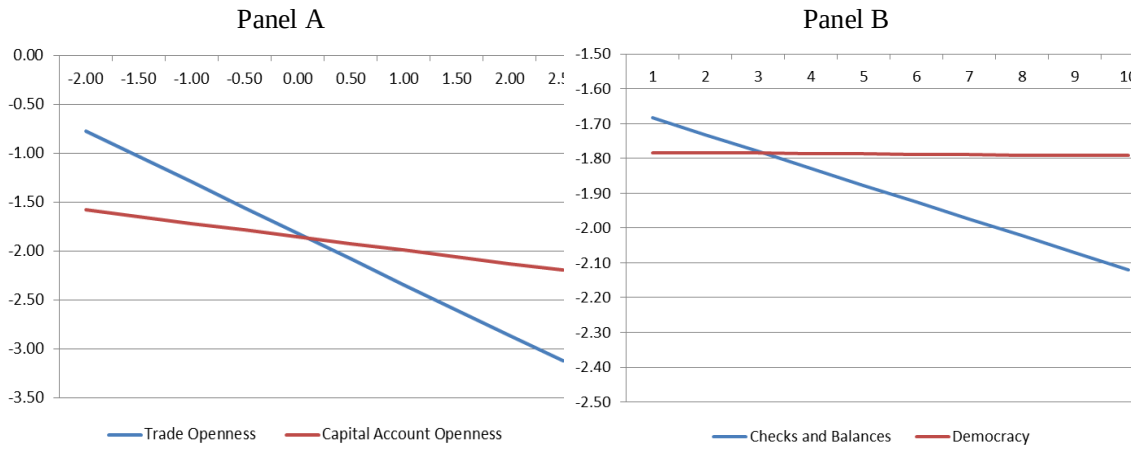


Table 1: Armed Civil Conflicts, 1970-2010

Algeria (1991-08)	Malaysia (1974-75, 1981)
Angola (1975-01)	Mali (1990, 1994, 2007-09)
Argentina (1974-77)	Mauritania (1975-78)
Bangladesh (1975-92)	Mexico (1994-96)
Burkina Faso (1987)	Morocco (1971, 1975-89)
Burundi (1991-08)	Mozambique (1977-84, 1991-92)
Cambodia (1990-98)	Nepal (1996-06)
Cameroon (1984)	Nicaragua (1977-79, 1982-90)
Central African Republic (2002, 2009-10)	Niger (1991-97, 2007-08)
Chad (1976-79, 1982, 1989-94, 1997-02, 2005-10)	Nigeria (2004, 2009-10)
Chile (1973)	Pakistan (1971, 1974-77, 1990, 1995-96, 2004-10)
Colombia (1970-10)	Panama (1989)
Comoros (1989, 1997)	Papua New Guinea (1989-96)
Congo, Dem. Rep. (1978, 2006-08)	Paraguay (1989)
Congo, Rep. (1993)	Peru (1982-99, 2007-10)
Cote d'Ivoire (2002-04)	Philippines (1970-10)
Croatia (1995)	Rwanda (1991-94, 1996-02)
Djibouti (1991-94, 1999)	Saudi Arabia (1979)
Egypt, Arab Rep. (1993-98)	Senegal (1990, 1992-93, 1995-98, 2001-03)
El Salvador (1972, 1979-91)	Sierra Leone (1991-99)
Ethiopia (1970-10)	South Africa (1970-88)
Ghana (1970-95)	Sri Lanka (1984-09)
Guinea (2000-01)	Sudan (1970-72, 1976, 1983-10)
Haiti (1989, 2001, 2004)	Syrian Arab Republic (1979-82)
India (1970-71, 1979-10)	Thailand (1974-82, 2003-10)
Indonesia (1975-05)	Togo (1986)
Iran, Islamic Rep. (1979-88, 1990-93, 1996-01, 2005-10)	Trinidad and Tobago (1990)
Iraq (1970, 1973-96)	Tunisia (1980)
Israel (1970-10)	Uganda (1971-08)
Kenya (1982)	Uruguay (1972)
Lebanon (1975-76, 1982, 1985-86)	Venezuela, RB (1982, 1992)
Liberia (1980, 1989-90, 2000-03)	Yemen, Rep. (1994)
Madagascar (1971)	Zimbabwe (1973-79)

Source: UCDP/PRIO Armed Conflict Dataset (2012).

Table 2: Correlation Matrix of the Determinants of the Occurrence of Armed Civil Conflicts

	GDP per capita	Population density	Resource rents	Share of energy	Trade Openness	Capital Openness	Checks & balances	Demo-cracy	Ethnic Fractional	Religious Fractional
Population Density	0.03									
Resource rents	0.54	-0.28								
Share of energy	0.41	0.07	0.43							
Trade Openness	0.00*	0.00*	0.09	0.01						
Capital Openness	0.42	0.04	0.25	0.06	0.01					
Checks and balances	0.38	0.16	0.03	0.10	0.06	0.38				
Democracy	0.33	0.22	-0.07	0.07	0.07	0.37	0.85			
Ethnic Fractional.	-0.37	-0.34	-0.00*	-0.03	-0.02*	-0.18	-0.38	-0.41		
Religious Fractional.	-0.15	0.08	-0.00	-0.05	0.01*	0.01*	0.07	0.02	0.26	
Language Fractional.	-0.47	-0.15	-0.22	-0.04	-0.01*	-0.19	-0.34	-0.35	0.71	0.30

Note: All correlations significant at 90% confidence except those marked with an asterisk.

Table 3: Estimated Marginal Effects of the Determinants of Armed Conflicts (Probit Model, Random Effects, Panel Data, 1970-2010)

Variables	Benchmark Model		Economic Institutions				Political Institutions			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Real GDP per capita (logs)	-0.030 *** (0.014)	-0.043 *** (0.016)	-0.032 ** (0.013)	-0.032 ** (0.013)	-0.032 ** (0.013)	-0.027 ** (0.012)	-0.031 ** (0.013)	-0.028 ** (0.013)	-0.029 ** (0.013)	
Pop. density (logs)	0.018 *** (0.010)	0.018 ** (0.010)	0.025 ** (0.011)	0.025 ** (0.013)	0.025 ** (0.011)	0.030 ** (0.013)	0.028 ** (0.012)	0.031 ** (0.013)	0.031 ** (0.013)	
Resources rents (logs)	0.014 ** (0.006)	0.012 ** (0.006)	0.019 ** (0.008)	0.019 ** (0.007)	0.019 ** (0.007)	0.017 ** (0.007)	0.018 ** (0.008)	0.013 * (0.007)	0.014 ** (0.007)	
Share energy in exports	0.029 * (0.012)	0.022 * (0.012)	0.012 (0.014)	0.013 (0.013)	0.012 (0.013)	0.012 (0.013)	0.011 (0.013)	0.011 (0.013)	0.011 (0.013)	
Share agriculture in exports	-0.003 (0.035)									
Trade openness (logs)			-0.047 *** (0.019)	-0.045 ** (0.018) *	-0.043 * (0.026)	-0.043 ** (0.017)	-0.041 ** (0.017)	-0.040 ** (0.017)	-0.041 ** (0.017)	
Financial openness			-0.012 ** (0.005)	-0.019 * (0.010)	-0.012 ** (0.010)	-0.012 ** (0.005)	-0.012 ** (0.005)	-0.012 ** (0.005)	-0.012 ** (0.005)	
Checks and balances						-0.040 ** (0.020)		-0.100 ** (0.005)	-0.036 * (0.020)	
Democracy							-0.002 * (0.001)	-0.001 (0.001)	-0.005 * (0.003)	
Inter 1: Rents*Finance Open.				0.002 (0.002)						
Inter 2: Rents*Trade Open.					-0.001 (0.006)					
Inter 3: Rents*Checks &Bal.								0.018 * (0.010)		
Inter 4: Rents*Democracy									0.001 * (0.0008)	
Observations	2,615	3,646	3,426	3,426	3,426	3,423	3,363	3,360	3,360	
Countries	100	101	101	101	101	101	101	101	101	
Estimated σ_μ^2	1.770 (0.22)	1.550 (0.17)	1.685 (0.19)	1.712 (0.19)	1.703 (0.19)	1.691 (0.19)	1.698 (0.19)	1.688 (0.19)	1.698 (0.19)	
Estimated ρ	0.758 (0.044)	0.706 (0.044)	0.740 (0.043)	0.745 (0.043)	0.744 (0.043)	0.740 (0.043)	0.742 (0.042)	0.740 (0.043)	0.742 (0.043)	
Test Random Effect vs Pooled Model	954.93	1,248.33	1,696.55	1,146.37	1,197.01	1,195.15	1,186.33	1,139.67	1,147.37	

Note: standard errors in parenthesis (*,**,***)= significant at 90%, 95% and 99% confidence, respectively.

Table 4: Estimated Marginal Effects of the Determinants of Armed Civil Conflicts: Extended Models (Probit Model, Random Effects, Panel Data, 1970-2010)

Variable	External Effects		Fractionalization		Political Polarization	
Standard controls omitted						
Foreign Aid (% of GDP)	0.010					
	(0.006)					
Inter 5:	-0.001					
Foreign Aid* Democracy	(0.001)					
Inter 6:	-0.001					
For. Aid*Checks and balances	(0.11)					
Neighbor country at civil war		0.006				
		(0.009)				
Ethnic Fractionalization			-0.219			
			(0.087)			
Inter 7:			0.025	**		
Ethnic Frac*Democracy			(0.012)			
Inter 8:			-0.199			
Ethnic Frac*Checks&Balances			(0.134)			
Language Fractionalization			0.127	*		
			(0.070)			
Inter 9:			0.004			
Language Frac*Democracy			(0.003)			
Inter 10:			0.038			
Language Frac*Checks&Balances			(0.086)			
Religion Fractionalization			-0.139	**		
			(0.070)			
Inter 11:			-0.019	**		
Religion Frac*Democracy			(0.009)			
Inter 12:			0.054			
Religion Frac*Checks&Balances			(0.068)			
Political polarization					0.032	
					(0.022)	
Inter 13:					0.065	**
Polarization*Democracy					(0.036)	
Inter 14:					-0.007	**
Polarization*Checks&Balances					(0.003)	
Observations	3,117	3,330	3,239		2,278	
Countries	95	101	97		101	
Estimated σ_μ^2	1.706	1.685	1.493		1.891	
	(0.20)	(0.19)	(0.17)		(0.217)	
Estimated ρ	0.744	0.739	0.690 (0.048)		0.781	
	(0.044)	(0.04)			(0.039)	
Test for Random Effects vs Pooled Model	1,027.78	1,127.89	874.46		1,058.73	

Note: standard errors in parenthesis (*,**,***)= significant at 90%, 95% and 99% confidence, respectively.

Appendix A: List of Countries, Data Sources and Characteristics

List of Countries

East Asia and the Pacific	China, Indonesia, South Korea, Malaysia, Mongolia, Papua New Guinea, Philippines, Thailand.
Eastern Europe	Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Slovenia.
Latin America and the Caribbean	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela.
Middle East and North Africa	Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Lebanon, Morocco, Oman, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Yemen.
South Asia	Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka.
Sub Saharan Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Dem. Rep., Congo, Rep., Cote d'Ivoire, Equatorial Guinea, Ethiopia, Gabon, Gambia, The, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Data Characteristics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Armed civil conflict	4,141	0.18	0.39	0	1
Checks and balances	4,445	0.25	0.29	0	0.89
Democracy	4,361	3.18	3.75	0	10
Ethnic polarization	3,772	0.56	0.22	0.017	0.98
Ethnic fractionalization	4,610	0.51	0.25	0	0.93
Financial openness	3,936	-0.22	1.44	-1.83	2.50
Foreign aid (% of GNI)	3,572	0.79	2.03	-9.21	5.22
GDP per capita (logs)	4,077	6.94	1.29	4.13	10.81
Language fractionalization	4,510	0.44	0.30	0.002	0.92
Population density (logs)	4,547	3.65	1.37	-0.21	7.13
Religion fractionalization	4,674	0.42	0.24	0.002	0.86
Resource rents per capita (logs)	4,023	3.67	2.01	-4.03	10.56
Share of energy in resource rents	4,049	0.40	0.56	0	8.33
Trade openness	3,895	0.00	0.27	-1.63	2.29

Sources and definitions

	Variable definition	Data sources
Armed Civil Conflicts	The intensity variable is coded in two categories Minor (between 25 and 999 battle-related deaths in a given year) and War (at least 1,000 battle-related deaths in a given year).	UCDP/PRIO Armed Conflict Dataset v.4-2012, 1946–2011.
Checks and Balances	Institutional constraints faced by authorities; extent to which any one political actor or the replacement for any one actor is constrained in his or her choice of future policies.	The methodology is in Henisz and Zelner (2010). The database was obtained from Henisz webpage and corresponds to version 2013.
Democracy	Democracy and Polity2 indices of the Polity IV project	Polity IV Project (2011)
Ethnic polarization	Index measuring how far the distribution of the ethnic groups is from the bipolar distribution, which represents the highest level of polarization	Montalvo and Reynal-Querol (2005), extended.
Ethnic, language and religious fractionalization	One minus the Herfindhal index for ethno/linguistic/religious heterogeneity.	Alesina et al (2003).
Financial Openness	Chinn-Ito KAOPEN measure (based on restrictions on cross-border financial transactions as reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions.	Chinn and Ito (2008) updated by the authors to 2010.
Foreign aid	Net official development assistance (disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies) plus Net official aid refers to aid flows (net of repayments) from official donors. Expressed as share to GNI.	World Bank World Development Indicators (2012)
GDP per capita	GDP per capita in constant 2000 US$.	World Bank World Development Indicators (2012)
Population density	Total population divided by area in square kilometers	World Bank World Development Indicators (2012)
Resource Rents	Total revenue that can be generated from the extraction of the natural resource at international prices, less the cost of extracting the resource, including a normal return on investment to the extractive enterprise.	World Bank World Development Indicators (2012)
Share of Hydrocarbons	Share of Hydrocarbons in Total Exports	World Bank World Development Indicators (2012)
Trade openness	See Appendix B	Own elaboration based on World Bank World Development Indicators (2012)
Trade volume	Sum of merchandise exports and imports divided by the value of GDP, all in current U.S. dollars.	World Bank World Development Indicators (2012)

Appendix B: Measuring Openness

Assessing the degree of openness of an economy is notoriously difficult. Empirical studies have used varied approaches in the attempt to capture, via a summary measure, the multifaceted nature of trade policy. David (2007) surveys the literature and identifies six types of measures of openness: Trade ratios, Adjusted trade flows, Price-based, Tariffs, Non-tariff barriers and Composite Indices. The first three categories focus on outcomes while the last three focus on policies. Ideally, one would want to measure trade restrictions directly to determine the level of protection of a country. However, in general, it is easier to measure flows and prices than barriers. Flows are observable and quantifiable and for many countries data are available extending back several decades (at least back to 1970 for a large number of the developing countries). Conversely, data based on the observation of trade restrictions themselves is much harder to collect and work with. Gathering data on tariffs can be challenging. Countries do not report their weighted average tariff rate or even their simple average tariff rate every year, so the most recent data may be several years old. The quantity of data required for calculating weighted tariffs and ERPs is daunting. The data for tariffs are measured with error and there are frequently problems with missing data due to activities outside the formal market such as smuggling. Quantifying and aggregating non-tariff restrictions suffer from the same problems to a greater degree, as the researcher must calculate and combine the effects of what are frequently fundamentally different types of instruments as well as problems arising from the use of qualitative data.

Our measure follows Pritchett (1996) and Loayza and Soto (2005) and is based on the notion that highly protectionist policies should reduce the amount of economic activity that is traded. To estimate the size of this reduction he proposed "structure adjusted trade intensity" measures, which are the residuals from a regression of trade intensity on structural characteristics such as population, land area, level of per capita GDP, trade composition and a dummy for landlocked economies which usually face higher transport costs. The residual from the equation implies by how much a country's openness differs from what would be expected of a country with the same characteristics. We use a panel of 164 countries in the period 1970-2010 to run a fixed-effects model using around 5,500 observations. Appendix Table 1 presents the estimation results.

Appendix Table 1: Fixed Effects Estimation: Log of Total Trade Volume (as % of GDP) (number of countries 164, number of observations 5,526)

Variable	Estimated Parameter	Standard Deviation
Log GDP per capita	0.228	0.014
Log Area	-0.882	0.449
Log Population	0.345	0.016
Share of oil in exports	0.297	0.032
Landlocked economy	0.085	0.115
R squared (within)		0.2013
Hausman test on fixed vs random effects		259.59