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Neighborhood effects of civil conflict. (1990 -2012)*

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Abstract: There have been many papers which have studied the causes of conflict, taking into account causes like natural resources, ethnicity, political problems, and commitment problems, among others. This paper focus on the Law of Universal Gravity of Newton (1687) for trying to see if there could be a neighboring country effect on the probability of a conflict or civil war onset and continuity in a given country, and the effect of the size of the border, and find significant evidence about the distance between countries in the probability of onset a conflict. This may suggest that peaceful countries must be very careful with the relationships with neighbors that are having an armed conflict.

Key words: Civil War, Gravity Model, Neighbor Effect, Distance

Resumen: Existe una cantidad considerable de trabajos que analizan de las causas del conflicto. Entre estas causas encontramos los recursos naturales, las diferencias étnicas y los problemas políticos, etc. Este artículo toma como punto de partida la ley universal de la gravedad propuesta por Newton (1687), con el fin de identificar la existencia de un efecto país vecino y un efecto distancia, en la probabilidad de que un país pueda entrar en guerra civil o tener un conflicto armado. Se demuestra que la distancia entre los países juega un papel en la probabilidad de entrar en

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guerra. Concluimos que un país en paz debe ser muy cuidadoso en sus relaciones diplomáticas con los países vecinos que tienen conflictos armados.

Palabras clave: Guerra Civil, Modelo Gravitacional, Efecto Vecino, Efecto Distancia.

Résumé: Il existe un ensemble considérable de travaux qui analysent les causes des conflits. Parmi ces causes nous trouvons les ressources naturelles, les différences ethniques et les problèmes politiques etc. Cet article adopte comme point de départ la loi universelle de la gravitation proposée par Newton (1687), afin d'identifier l'existence d'un effet pays-voisin et un effet distance, dans la probabilité pour un pays d'entrer en guerre civile ou bien d'avoir un conflit armé. Nous montrons que la distance entre les pays joue un rôle dans la probabilité d'entrer en guerre. Nous concluons qu'un pays en paix doit être très prudent dans ses relations diplomatiques avec ses pays voisins qui ont un conflit armé.

Mots clés: guerre civile, modèle de gravitation, effet pays-voisin, effet distance.

JEL Classification: F12, D74, C21, C29

Introduction

Nowadays there are 31 ongoing conflicts that are mostly domestic but that have been internationalized. The regions with the highest frequency of internal conflicts are Asia and Africa, with war as particularity in poorer countries. The arguments are clear to understand that economic and social prosperity is positively related with peace; therefore, those theories where the conflicts are established as necessary stages for development are doomed to failure.

War leads to mistrust, human, physical and social capital are destroyed, there's displacement and migration, there's no entry to foreign capital, investment falls, there's capital outflow, disease propagation and misery growth, poverty belts in the city are tightened, it scatters population and economic activity.

The mostly of the countries around the world have entered in periods of conflict, some more recently and with greater duration, speed and depth than others with favorable conditions that make them less likely to face them. Conflicts differ by their scope within the geographical limits. Some of them are international conflicts, which are less frequent, with shorter duration but they are more expensives during wartime. The other kind of conflicts are the local ones, which have become more frequent and have persistence over time (Collier, 2008).

Local conflicts destroy wealth, perpetuating poverty, often with perverse effects on economic development. In this sense, Collier (2004) has shown that civil wars hinder development, and equally, the failure in achieving economic goals increases the propensity to fall into one of these wars, namely, a vicious trap of poverty and conflict. Even, it has been argued that the growth rate of a country in conflict tends to reduce by about 2.2%, this means, that in a typical war period of seven years this decrease would reduce by 15% the income of individuals and increase by 30% the number of people living in poverty.

High-income countries with high economic performance hardly face a risk of coming into a conflict. While middle-income countries are four times more likely to engage into a war. And for those low-income countries, the reality is frivolous, facing a 15 times higher risk of war than high-income countries (Collier, 1999). This means that apart from being very poor countries depend on natural resources, they are uncompetitive, and don't get into the global markets making them even more likely to remain in war.

The effects of local conflicts go beyond borders, and of course, the spread to neighboring countries is faster. These are the countries that have to take care of refugees, combat the spread of diseases, increase military spending for the latent threat of armed groups, feel the shocks in trade which ends affecting economic growth.

Thus, the overall objective is to determine if there is a neighboring country effect on the probability of a civil war onset in a given country, and from the existence of this effect, consider whether there is any relationship between the size of the border that joins these two countries and the probability of initiating an internal conflict. Given the theoretical implications established by the gravity model and the fact that there may be different mechanisms for transmission at the time of infection.

I Problem

All civil wars contain interdisciplinary components related with psychology, the complex social and political phenomena that leave the strictly economic study. But, as stated by Collier and Hoeffler (2006) economics provides tools which provide information and useful explanation which could help to prevent the spread of individual situations that undoubtedly fall into error in an excess of highly polarized explanation.

Some authors argue that the war could be positive because it encourages the country to develop high-tech arms industry, and in turn, the impact of war becomes an opportunity to promote economic development and social justice. However, the literature agrees that the negative effects of war on growth have a greater impact than what these theories argue.

It has been attempted to show the relationship between conflicts and democracy. Generally, the strategy for the promotion of peace is accompanied by a promotion of democracy, and then exist a collective ideology positively relating these variables. However, Collier and Rohner (2007) have shown that democracy also limits the technical possibilities of government repression, and this makes rebellion easier. The authors also show that there is a relationship between income and democracy, and democracy in rich countries makes them safer. In this sense, the establishment of a government induced increases in military spending in the war to avoid *coup d'etat* (Collier and Hoeffler, 2007).

On the other hand, fragmentation in society is important. Civil society is immersed in war and the effects are disastrous. Holzman (2006) shows that men and women experience differently conflict and post-conflict,

depending on how culture induces gender roles. Even the same conflict determines the roles of men and women.

The question that arises is "What is the cause of it?" Without some consensus, has been attempted to explain civil war by GDP growth rates (not necessary to state that growth depends on many variables),by inequality and poverty rates, by degrees of social fragmentation or ethnicity, by commodities prices, by the dependency of commodities or natural *resources,* by the *institutions,* by the level of government spending, population growth, political involvement. However, the literature agrees that the conflict continues while rebel groups keep getting funding.

II. Theoretical framework

This paper defines civil war as does Collier and Hoefler (2004): "an internal conflict with at least 1,000 battle-related deaths per year. To distinguish civil war from massacres, both government forces and rebel groups must undergo at least 5% of these deaths. As Collier (2004a) civil war is considered as a local conflict.

After the Cold War, local conflicts have become more frequent. Correcting by per capita income, Fearon and Laitin (2003) showed that those countries with higher ethnic and religious diversity are more likely to experience a civil war, and they understood civil war as a consequence of violence from guerrillas or insurgents. But emphasize that war is not explained by ethnic or religious characteristics, but the conditions that favor insurgency, significantly poverty.

Meanwhile, Dube and Vargas (2013) have shown that price shocks in exportable goods affect conflict's intensity. For example, for Colombia the authors show that in periods where the price of coffee (labor intensive) fell, are precisely the periods where the conflict is more pronounced in areas where this is cultivated. And when oil prices (Intensive capital) rise, conflict increases in areas where is produced.

Fearon (2005) and Ross (2004) have found a link in the endowment and dependence than countries have in natural resources and conflict. However, the evidence shows that not all natural resources affect conflict, as legal agriculture. While energy resources, oil type, are essential in the beginning of the conflict, while resources in illegal economies are key to the duration of the conflict.

On the other hand, it is not so clear the impact that could have the International Aids for Development in the conflict. Crost, Felter and Honston (2010) and Nielsen, R *et al (2011)* explain that the rebel groups could seek funding through the resources allocated to development projects, this creates an unintended consequence because there are restrictive effects on the operation of this programs. Otherwise, it is considered that's not only necessary an International Development Aid but this must also increase as resources become an outlet for the populations most vulnerable to conflict.

Now, the literature agrees that failure in economic goals makes countries more likely to unleash local conflicts. But in more specific terms, combining ethnic pro-

blems, inequality and polarization makes the probability of war even greater. For example, Esteban and Ray (2008, 2011) and Montalvo and Reynal-Querol (2005) have shown that in the presence of economic inequality, there is a systematic bias towards ethnic conflict. Similarly, Fergusson and Vargas (2009) confirm this in the case of Colombia, and find that inequality impacts the conflict in two ways: the gap between rich and poor and the dispersion of wealth among these groups.

Acemoglu, Robinson and Santos (2013) have considered a new perspective on the importance of the presence of the state over the use of force, i.e, under the theory that an effective government is the one who holds the monopoly of violence. The authors show that paramilitary groups influence the policies of the executive and the legislative reducing the incentives for politicians to eliminate them.

Other variables not so visible could explain the cause of the conflict. Indeed, demographic growth could influence the unleashing of a local conflict (Acemoglu, Fergusson and Johnson, 2012) and the idea is Malthusian suggesting that demographic growth increases pressure for scarce resources.

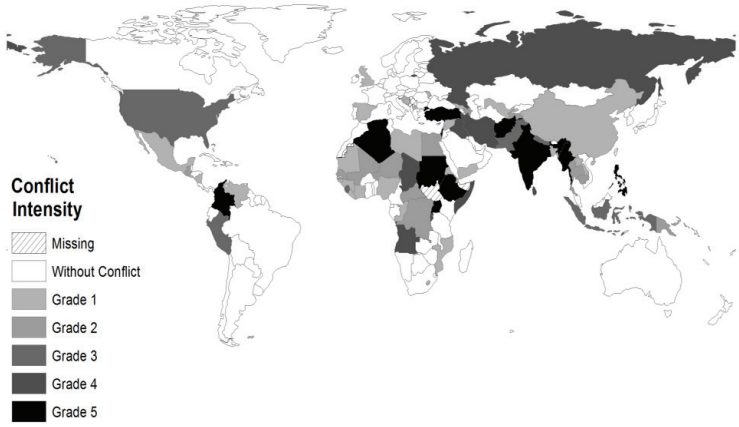
Now the question arises, and it is the purpose of this document corresponds to the spatial effects of the war. That is, how a country's local conflict affects its neighbors and what are the odds of that happening. The literature has suggested that share borders determine and impinges on observable variables such as immigration or military spending by the threat of a neighbor.

Spatial effects on Murdoch and Sandler (2004) analyze the impact of a civil war on the growth rates of the neighbors (nearby, not necessarily share a border) in the long and short term.

Graph 1 shows the presence of armed conflict around the world in the period from 1990 to 2012. Thus, grade 1 countries indicate the presence of conflict from 1 to 5 years, grade 2 shows those countries with 6 to 10 years of war, while grade 3, grade 4 and grade 5 denotes countries that experienced from 11 to 15, 16 to 20 , and at least 21 years of conflict respectively. Analyzing by regions, the middle east of Asia, and Africa shows the highest levels of conflict presence than any other. By country, Argelia, Sudan and Ethiopia in Africa, India, Myanmar and Afghanistan in Asia, and Colombia in South America rank among those with the highest grade of conflict. It should be noted that despite countries like United States, have not suffered internal conflict itself, the fact of invade other countries to fight wars, account to classify them according to the UCPD/PRIO parameters[1]. Furthermore, a glance around the world point out some clusters regions where conflict seems to persist and spread to neighboring countries.

1 Internationalized internal armed conflict occurs between the government of a state and one or more internal opposition group(s) with intervention from other states (secondary parties) on one or both sides.

Graph 1: Presence of internal conflict in the world (1990-2012).



Source: Own construction with UCPD/PRIO data.

The Gravity Equation

Theoretical Fundaments

The gravity equation is commonly used for the statistic analysis of bilateral flows between two different components or geographic entities. Entire theoretical gravity model refers to the known *Law of Universal Gravitation* of Newton (1687), which holds that the attraction between two objects or bodies and is given by:

$$Fij = G\,\frac{Mi\,Mj}{Dij^{2}}$$

Where:

Fij Is the attraction force.

G Is a gravity constant.

Mi y Mj Represent the masses of and .

Dij Is the distance beween and .

However, Timbergen (1962) proposed that this equation could be used not only field of physics, but also to explain trade flows between countries; and since that moment, there have been different applications to this equation in topics like foreign investment, migration and tourism. Nevertheless, in this particular case, the application would be focused in the attraction force that may exist between two countries at the moment of export or spread any particular intern conflict to some of its peer countries.

Expressing the last equation in logarithm terms, we have:

$$\ln(F_{ij}) = \ln(G) + \ln(M_i) + \ln(M_j) - 2\ln(Dij)$$

So, taking into account the above, and taking for a basic empirical specification which let us see some of the main causes of the conflict found in the literature; given by:

$$C_{it} = \alpha_i + X'_{it}\beta + \varepsilon_{it}$$

Where:

C_{it} is a Dummy variable which is equal to one when country report an internal conflict at the period .

X_{it} is a set of variables identified in the literature as the commonly used in the gravity equation models.

ε_{it} is the error term.

Then, combining the two last equations, we derive the empirical structure for the paper:

$$C_{it} = \alpha_i + X'_{it}\beta + \gamma \ln(M_{it}) - \delta(Dij) * \tilde{C}_{jt} + \varepsilon_{it}$$

In this case:

M_{it} Represent the GDP of country .

$\tilde{C}_{jt}$ is a dummy variable which is equal to one if there is an intern conflict ongoing in country at moment .

And X_{it} is given by:

Y it is real GDP of country *i* in period *t*,

Dij is the distance between *i* and *j*,

$Lang_{ij}$ is a dummy which is equal to 1 if *i* and *j* have a common language,

$Cont_{ij}$ is a dummy which is equal to 1 if *i* and *j* share a land border,

$ComCol_{ij}$ is a dummy which is equal to 1 if *i* and *j* were ever colonies after 1945 with the same colonizer,

$CurCol_{ij}$ is a dummy which is equal to 1 if *i* and *j* are colonies at time t,

$ComNat_{ij}$ is a dummy which is equal to 1 if *i* and *j* remained part of the same nation during the sample (e.g., France and Guadeloupe, or the UK and Bermuda),

In this paper, variables and will be the interest variables in the different estimations.

III.Methodology and data

The paper uses three different sources for the data. Data for country conflict is taken from UCDP/PRIO Armed Conflict Dataset which is a conflict-year dataset with information on armed conflict where at least one party is the government of a state in the time period 1946-2011. But the paper uses just information for the period 1990-2012.

Data for GDP is taken from World Development Indicators of the World Bank. And data for gravity equation estimations (contiguity, distance, common colonizer,) are taken from CEPII gravity equations database.

All data is merged and reorganized to have a data base in a panel data form for proceeding by doing the estimations using a panel-probit model and a panel-logit model.

IV. Results

Table 1 shows results of four different models; Equations (1) and (2) correspond to panel probit estimations and equations (3) and (4) correspond to panel logit estimations. In equations (1) and (3) the variables of interest is the dummy of neighboring country having a civil war (In both cases for the period t and the period t-1), and for equations (2) and (4) the variables of interest are the distance in kilometers multiplied by the dummy of conflict (In both cases for the period t and the period t-1).

In general terms, we don't find any significance of the effect of a war in period *t* by a neighboring country in the probability of having a country in the same period. But in the case of the lagged country, there in both kinds estimations there are significance evidence of the effect of a neighbor's war in period t -1 on the probability of having a war, i.e. If my neighbor had a war in period t-1, the probability that country *i* have a war in period *t* is positive and significant (And if around 13% and 23%).

For estimations (3) and (4) both variables (Distance * C_{jt} *and* Distance * C_{jt-1}) show significant coefficients. But the results may not be easy to understand. In the case of the lagged conflict, the coefficient is negative and significant, which says that those countries that had a civil war in t-1 and are further away doesn't affect the probability of country *i* of having a war, but if those countries are very close, the probability increases. However, in the case of the contemporaneous conflict, the coefficient is positive and significant, which would mean that those closest countries that have a civil war in period t decrease the probability of country *i* to have a civil war; and countries which are further away increase that probability. An hypothesis that may help to understand it maybe the fact that mass media could affect the short run world conflicts, even in large distances.6

The paper doesn't study hardly the causes of the main results, nut we may think that it could be related to migration problems, similar land conditions, similar development states, similar political ideologies and even historical reasons like a common colonizer and common languages. (In the case of countries that had the same colonizer the coefficient is both positive and significant).

And, finally, the probability of having a civil war decreases in the case of large levels of GDP.

Table 1
Estimation Results.

Dependent variable: (Conflict in country i)	(1) Panel Probit b/se	(2) Panel Probit b/se	(3) Panel Logit b/se	(4) Panel Logit b/se
1 for common official of primary language	-0.023 (0.03)	-0.023 (0.03)	-0.027 (0.07)	-0.027 (0.07)
1 for pairs ever in colonial relationship	1.059*** (0.20)	1.067*** (0.20)	2.082*** (0.38)	2.095*** (0.38)
1 for common colonizer post 1945	-0.347*** (0.04)	-0.347*** (0.04)	-0.656*** (0.08)	-0.655*** (0.08)

2 This is a hypothesis that authors let to other authors that maybe interested.

Dependent variable: (Conflict in country i)	(1) Panel Probit b/se	(2) Panel Probit b/se	(3) Panel Logit b/se	(4) Panel Logit b/se
1 for pairs currently in colonial relationship	-0.844* (0.49)	-0.852* (0.49)	-1.622 (0.99)	-1.634* (0.99)
1 for pairs in colonial relationship post 1945	-0.204 (0.25)	-0.209 (0.25)	-0.442 (0.47)	-0.449 (0.47)
1 if countries were or are the same country	0.192 (0.13)	0.202 (0.13)	0.391 (0.25)	0.407 (0.25)
Ln (GDP)	-0.148*** (0.00)	-0.147*** (0.00)	-0.270*** (0.01)	-0.270*** (0.01)
1 if a Neighbor is having a conflict in period t	0.029 (0.07)		0.031 (0.13)	
1 if a Neighbor is having a conflict in period t -1.	0.137* (0.07)		0.234* (0.13)	
Distance * Cjt		0.006*** (0.00)		0.008*** (0.00)
Distance * Cjt-1		-0.010*** (0.00)		-0.015*** (0.00)
Constant	0.139* (0.08)	0.139* (0.08)	0.306** (0.15)	0.310** (0.15)
lnsig2u				
Constant	2.089*** (0.01)	2.088*** (0.01)	3.311*** (0.01)	3.311*** (0.01)
Observations	848034	848034	848034	848034

* $p < .1$, ** $p < .05$, *** $p < .01$

V. Conclutions

According to the Newton's gravity law, an exercise applied to the probability of the onset of conflict in any country at a period t, knowing that in the same moment one of its neighbors is having a internal conflict, there is significant evidence of having an internal conflict when any of the country's neighbor had a conflict in the last year. Additionally, there are ambiguous interpretations in the case of distance. But it's important to note that the probability of having a war increases if any neighbor which is very close had a civil war in the last year.

Then, there is a neighboring country effect on the probability of a civil war onset in a given country that depends of the distance. However, given the theoretical implications established by the gravity model, there may be different mechanisms for transmission at the time of infection. And this paper doesn't focus on that, but it could be very interesting to try to identify the transmission channels.

Although, according to the conclusions of the model, it would suggest, in terms of political economy, that the State of any nations which has a neighbor that is having a civil conflict, must be very careful with his population, and with the relationship with the neighbor country.

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