# Military Expenditure, Security and Economic Factors. The Monadic Level of Analysis.

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Preliminary Version

**Abstract**

We have studied the empirical regularities of conflict, security and economic factors at the lowest unit level of analysis. This type of approach corresponds to the individual country level of analysis in international disputes which is less common in conflict studies. Dyadic and systemic analysis are in many cases more convenient for understanding some strategic considerations. But we could better understand the relations between security and economics by concentrating on the monadic level. In order to do that, we have constructed an index of hostility level for individual countries. As we described and analyzed the data, we found support for some theories of conflict and economics and contested others. We studied the impact of military expenditure on hostility for individual countries by factor analysis and panel data regressions. We found that military expenditure is highly correlated with the size of the economy and other macro economic variables, but not with the index of hostility as one would expect. We also found that the hostility level is related positively to the size of the economy and to some institutional variables.

# 1 Introduction

The USA defence budget for 2003 includes one of the largest increases since the days of high defence spending at the peak of the cold war. Following the end of the cold war, there was a period of peace and stability, international conflict was drastically reduced and many economies enjoyed the effects of what is being described as the *peace dividend* (Gleditsch [1]). After a decade of relative calm, it seems that we've gone back to the old habits of high conflict, high military spending. We are confronted with new economic tensions — an increasing gap between the rich and poor, tighter environmental constraints, new migratory pressures, etc. — and the emergence of old and new political hostilities. Subsequently, higher levels of conflict would bring about higher levels of military expenditure which may put further pressure in the system. But it is not clear if higher military expenditure will lead to a safer global environment.

Economist can contribute to clarify some of the issues derived from the effects on security of higher military expenditures. In this particular case, we concentrate on explaining the triad between military expenditure, hostility and economic factors. Many economic models have theorized about the relationships between economics and conflict. In these models, economic agents are confronted with two main activities that may lead to higher or lower levels of consumption (or utility in a more general framework). Given that resources are scarce and contested, these agents face two basic problems: how much effort they put into production and how much into appropriation of these resources (Hirshleifer [2]). Any agent that dedicates all the available resources to production cannot be following an optimal policy because another agent would appropriate all the resources by dedicating an small amount of effort into conflict activities. On the other hand, fighting for cannot be optimal either, since we could make a deal in order to avoid the cost of conflict. In this context, exchange can be used as an alternative to eliminate the cost of fighting. Thus, production and exchange take place under processes of both cooperation and conflict.

Even if we don't consider conflict as an economic problem, we can clearly establish that many of its main aspects are closely related to economic factors and processes. For

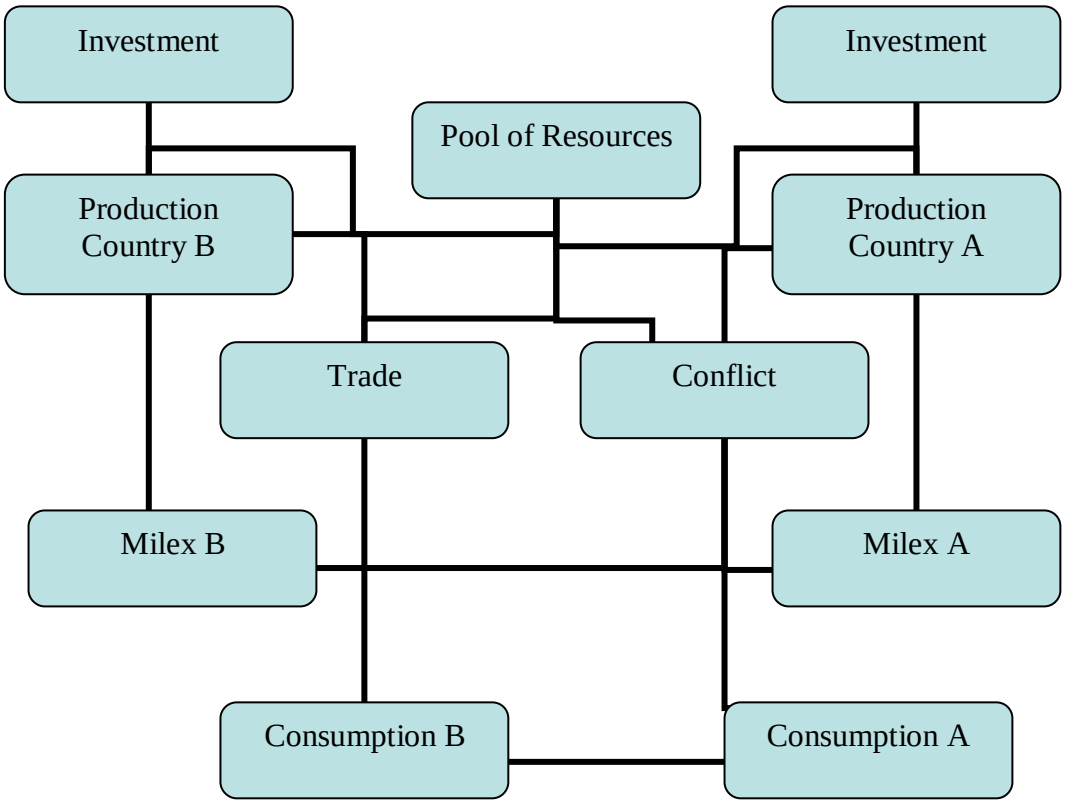



Figure 1: Economics and conflict relations

example, theories of political violence are often based on the relative depravation of one actor with respect to other actors (Gurr [3]). Even conflicts of an essentially religious or ideological nature are also rooted in a underlying problem of scarce resources. That is, no matter how ideologically or culturally opposite two countries may be, unless they have to dispute some resources, they will never fight. In fact the most common disputes in history of humanity happens to be a problem of land ownership (the resource that contains the rest of resources but one: human capital).

We do not suggest that the application of economic explanations to real conflict situations is a straightforward operation. If at the theoretical level conflict can be clearly modelled as an economic process, at the empirical level it is difficult to find conflicts influenced by economic factors only. It is even more complex if we focus on the levels of devastation generated by some conflicts. Besides, one of the most important attributes of

conflict which is the cost of destruction, hasn't been recorded systematically. [1]

A further problem in conflict analysis is that it never emerges in aseptic conditions. There are networks of agents and interlacing environments with overlapping time and spatial dimensions. A holistic representation of conflict should be based on a multilevel analysis, including internal and external conflict, as well as the possibility of systemic shocks and structural changes. This seems to be a massive task. Consequently, many researches restrict the scope of analysis to concentrate in one of this aspects while assuming that the influences form the others are constant over the time and spatial scope of the study.

As we can see, figure 1is an example of one of the most common choices of the many possible analytical frameworks. This is called a Dyad. It is a representation of the economic and conflict relations between countries A and B. Dyadic analysis has become increasingly popular in political science. But it is not the only approach. Many researchers focus on systemic analysis. For example: we can study the effects on conflict of power concentration, globalization or democratization. Therefore representing conflict in a dyadic format (as in figure 1) can be a very restrictive option, especially when we are interested on the economics aspects of conflict.

Most part of studies would choose either dyadic or systemic level of analysis but we decided to explore an alternative. First, we think that dyadic level of analysis works best when we try to provide explanations for the outbreak of hostilities. But if we want to decide if we are entering a more hostile period and what determines this type of environment we are better off choosing the systemic level of analysis.

Instead of these two common approaches, we have chosen the ultimate unit of analysis, the monadic level. That is, we take individual countries as the basic unit of analysis, regardless of who was the enemy and the type of conflict they face. Instead of focusing on the political attributes of international disputes we focus on the economic attributes. For that purpose we needed to construct a hostility index for each country that substituted the individual disputes on the dependent variable side. Then we can proceed to explore

[1] For a good review of other considerations about the applications of neoclassical economic methodology to conflict analysis see Varofakis [4] and Varofakis and Young [5]

possible patterns in the data set.

The purpose of constructing a hostility index can be better understood by a classic example in hostile environments: The head of a economics department perceives an increase in the amount of conflicts between all the lecturers. This may be the result of a pressure build up due to seasonal or environmental factors. Therefore, she could decide that providing free camomile in the coffee room may have a positive impact in a reduction of the number of disputes and an increase in the number of collaborations and publications. On the other hand, she might have obtained data over a time period for all the lecturers and finds that some of them get consistently in trouble with everybody else. She could rank these trouble makers and determine which are the common characteristics. Camomile may be of no use at all. She may conclude that reducing the number of collaborations with a few individuals may lead to a reduction in the number of clashes and an increase in number of publications. Whether conflict is caused by environmental or individual characteristics requires different types of policy.

Since we would like to determine the underlying relationship between economic and conflict processes we opted for the monadic level of analysis. Although we may loose information on some crucial strategic variables, we have the advantage that we get aggregate results based on detailed information at the micro level. We think that it is more suitable to study the underlying economic factors that drive countries into higher or lower levels of hostility.

With the available data, it would be difficult to predict conflict with only economic variables in the right hand side. It is also difficult to introduce controls for cultural and political factors in cross-sectional studies because of the heterogeneity of conflict. But if we focus on the national level of analysis, we should be able to find some regular features on the aggregate level.

If our assumption about the economic nature of conflict was right, we would always find a strong relation between security levels, conflict, military expenditure and other economic variables. Despite all the obvious obstacles, we would expect that military expenditure was determined by both economic and security factors. By looking at a large enough panel

with a large enough number of observations, we hope that the dyad specific factors would on average cancel each other, and clear patterns should emerge from the data.

In the next section we explain how we constructed the level of hostility for individual countries and the sources of data. In section 3 we try to find any hidden pattern in the data by factor analysis. This is complemented by panel regression in section 4.

# 2 Constructing monadic data

The application of economic methods to the study of political events is often conditioned by the availability of data. Data have normally been collected to study issues from the point of view of political science. Consequently, the basic events and their attributes are collected according to explicit definitions from politics and often overlook the economic attributes.[2]

In order to obtain a data set with conflict data and economic attributes we had to combine data from several sources. This led to two main type of problems.

- The dependent variables may not be the same in all data sets. The definition of conflict has a particularly relevant impact since different data sets have different thresholds and the boundaries between internal and external conflict have been disappearing[3]. Thus, the use of different thresholds may give different results for different time periods.

- There is a great disparity of attributes in the time and spatial dimensions of the data. On the one hand, the attributes of conflict events in political data sets are clearly different and have very poor representation of economic variables. On the other hand, economic data sets have in general very poor data on small and planned economy countries.

[2]There are several issues in compiling basic even data: definitions, coding and the treatment of the data sources. In order to compare definitions and methodology across the various data collections projects it is worth looking at some of the papers presented at the Uppsala Conference, *Identifying Wars: Systematic Conflict Research and It's Utility in Conflict Resolution and Prevention* http://www.pcr.uu.se/

[3]See Rupensinghe,[6]

Some of the most widely used data sets are the Correlates of War (COW)[7], the Militarized Interstate Disputes (MID) [8] and SIPRI's [9] data sets. We choose COW and MID's data because they record events of militarized disputes, which may involve actual fighting or not. We thought that this is an interesting property because we would expect economic motivated conflicts to have a great deal of threats and strategic moves and relatively less fighting.

We think that SIPRI's data may be better at reproducing levels of actual fighting because it records both internal and external conflict with very low death thresholds. This reflects more closely the changing nature of conflict. But we would loose data on militarized disputes. Moreover, if we wanted to use this data, we had to integrate both internal and external conflict which requires extra systemic and other types of new actors. Therefore, we decided to keep it simple and take COW's data while restricting the study to international conflict to a period of relative systemic stability.

Once we have a set of events we can proceed to construct the yearly index of hostility for each country in the sample period. Adding economic attributes to this data set was much easier because economic attributes are normally recorded by country and year.

## 2.1 Construction of the hostility level.

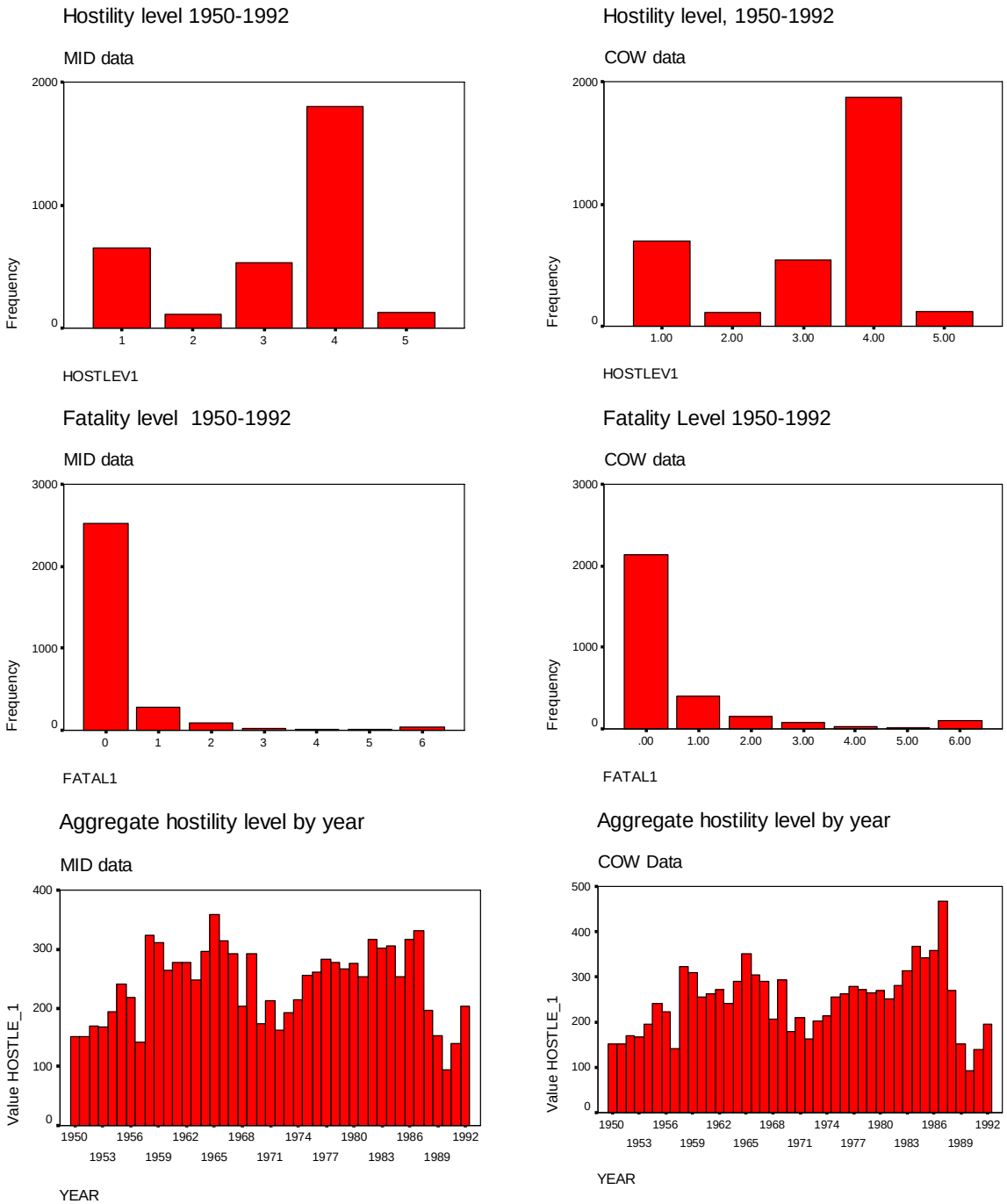
We used MID and COW's[4] data in order to compare cross-country experiences of conflict, economic and political factors. Since we are using individual data on individual disputes, we needed to construct a new variable that reflects the hostility level by aggregating the number of disputes in which every country was involved at that given year.

The original data sets provide a record of all disputes with all the participating countries. The data set has some attributes such as the start and end dates, the number of participants, the highest level of hostility reached, the outcome of the dispute, etc.

This data is in dispute level format as in the left hand side of table 1. This level includes

[4]There are some differences between these two. It seems that the cow data puts more weight in wars, and the resulting variance across time seem to be higher as well. However, in our statistical analysis we couldn't find significant differences and results are reported for the test with COW's data. See figure 2

Figure 2: This is graph1 which includes the hostility level summary



| | Data in Dispute format | | | | Data in Monadic format | |
|---|---|---|---|---|---|---|
| Year | CCode1 | CCode2 | Hostility1 | Hostility2 | CCode | Hostility |
| 1980 | ABC | DAB | 1 | 1 | ABC | 3 |
| 1981 | ABC | DAB | 3 | 2 | ABC | 8 |
| 1980 | ABC | FGH | 2 | 4 | DAB | 1 |
| 1981 | ABC | FGH | 5 | 5 | DAB | 2 |
| 1980 | FGH | DAB | – | – | FGH | 4 |
| 1981 | FGH | DAB | – | – | FGH | 5 |

Table 1: Aggregation of dispute data.

general information about the dispute at the individual participant level. We rearrange the data to create a new variable which contains the overall hostility level for a single country in a single year, independently of the type and number of disputes it took part and the nature of its enemies as in the right hand side of this table.

Extrapolating data can create serious problems as highlighted by Maoz and [10] Extrapolation from the individual level to the dyadic level by simple computerized means may cause considerable errors. Some of these problem are:

- Creation of non-existing dyads
- Inaccurate Levels of Hostility
- Absurd results: A state fighting itself.
- Wrong dates
- Distorted Dispute Outcomes, etc,etc.

Perhaps the most crucial problem for us is the possibility of creating inaccurate hostility levels. If we take Maoz's example, – dispute n.258 between the US and Hungary – we will notice that they both reached the highest level of hostility (War). While both sides did declare war on each other, they did not fight each other. In order to minimize this problem, we should control for the number of fatalities. Unfortunately, the number of fatalities isn't reliable either because of missing data. However, when we looked at the distribution of missing observations in the fatality variable, we realized that 97% of them correspond to

the level 4 of hostility in an individual dyad[5]. At the same time, we only have a 0.4% of missing observations for the hostility level of war. It seems that the case between Us and Hungary is a very rare event. This allows us to control for the problem highlighted by Maoz.

Since we were working at the individual level, the original data wasn't changed and the rest of problems mentioned were less likely to occur when we aggregated the data to create the index of hostility.

A more important issue is the specific formula used to aggregate from hostility levels of conflict units. This index of aggregate hostility puts quite a heavy weight on the number of conflicts. For example: A single country facing 5 different conflicts at level 1 would produce the same score that a single war, level 5.

We think that weighting the number of times that a country was involved in any level of conflict more heavily than its intensity is justified given the purpose of this project. Besides, only 0.2% of conflict reached the highest intensity.

Consequently, how high you score in the conflict level, depends on how many times you get in conflict weighted by the intensity of it. Since we expect that countries would rarely resort to full blast confrontation, this index puts more weight in typical events of non cooperative behaviour. Therefore it gives more importance to threats, and displays which could be considered signalling mechanisms. It is well suited to study mainly economic aspects of conflict.

We show the ranking of countries produced by our aggregated index in table 2.1. We think that the index reflects quite well real hostility although some particular cases should be explained.

The most obvious cases are new estates which have very few observations and therefore a very low aggregate index. For example Bosnia and Croatia are placed at the lower part of the hostility ranking in positions 116 and 117. However, if we calculate the average

[5]The hostility level reached by CCode1 versus CCode2 in a year ranges from 0 to 5 with the following values: 0 = no hostility, 1 = No Militarized Action, 2 = Threat to use force, 3 = Display of Force, 4 = Use of Force, 5 = War.

hostility by year, they jump in the rank of enmity to positions 8 and 9. This problem does not affect our study in the sections when we use factor analysis and unbalanced panels.

Many countries that suffered high levels of hostility due to internal conflicts also scored relatively low. For example, Colombia was ranked very low considering that suffered several internal wars against different guerrilla organizations. This is not a problem as long as we are trying to explain international disputes. Even if we think that the World was fairly stable during this period, if we try to extend the analysis beyond the end of the cold war, we would have to account for major changes in the international relations system.

A different problem takes place when we try to explain why Thailand has a higher ranking than Vietnam or Turkey a higher rank than Cyprus. This is a direct consequence of the nature of this index which aggregates the number of disputes per year. Thus, a country that suffered a single war with high severity will have a lower score than a country with many disputes of low intensity.

Take the example of Vietnam. To suffer a war against the world strongest military and economic power was an event of cataclastic magnitude and, quite rightly, takes a prominent position in our ranking. To a lower degree, the same can be said for Cyprus. The war against Turkey has conditioned the economic and social life of the Island.

On the other hand, Thailand was a key player in ASEAN, defending American interest in the area. The same can be said for Turkey and NATO. The prominent role that this two countries played in defending the interests of global players resulted in a continuous involvement in regional disputes. Although you may criticize that these type of activity carries too much weight, we think that it reflects more closely the level of hostility as a consequence of strategic factors that may be the subject of a general theory. On the other hand, the levels of destruction resulting from high severity wars could be better explain by other approaches that concentrated in the particular circumstances of each situation. If we look at figure 2we can see clearly that they seem to be a small proportion of the total number of conflicts. Thus, we still defend the validity of our index of hostility.

| Rank | Country | Hostility | Rank | Country | Hostility | Rank | Country | Hostility |
|---|---|---|---|---|---|---|---|---|
| 1 | Israel | 672 | 52 | Netherla | 47 | 103 | Rwanda | 14 |
| 2 | USA | 549 | 53 | Tanzania | 47 | 104 | Mexico | 13 |
| 3 | Iran | 514 | 54 | Yemen's | 46 | 105 | Benin | 12 |
| 4 | China | 493 | 55 | Kuwait | 45 | 106 | Suriname | 11 |
| 5 | Russia | 490 | 56 | Kenya | 44 | 107 | Switzerl | 10 |
| 6 | Syria | 405 | 57 | Senegal | 43 | 108 | Austria | 10 |
| 7 | Iraq | 392 | 58 | Chad | 43 | 109 | Armenia | 10 |
| 8 | India | 319 | 59 | Botswana | 43 | 110 | Azerbaij | 10 |
| 9 | Egypt | 301 | 60 | Norway | 42 | 111 | Nigeria | 10 |
| 10 | Korea R. | 246 | 61 | Guatemal | 37 | 112 | Ivory Co | 9 |
| 11 | Thailand | 230 | 62 | Tunisia | 36 | 113 | Liberia | 9 |
| 12 | Korea De | 225 | 63 | Costa Ri | 33 | 114 | Paraguay | 8 |
| 13 | Vietnam | 221 | 64 | Cyprus | 32 | 115 | Ireland | 8 |
| 14 | Pakistan | 220 | 65 | Iceland | 32 | 116 | Croatia | 8 |
| 15 | Cambodia | 215 | 66 | Ghana | 32 | 117 | Bosnia | 8 |
| 16 | UK | 184 | 67 | Italia | 31 | 118 | Gabon | 8 |
| 17 | Taiwan | 163 | 68 | Guinea | 30 | 119 | Haiti | 7 |
| 18 | Turkey | 161 | 69 | Sweden | 29 | 120 | Uruguay | 7 |
| 19 | Laos | 142 | 70 | Guyana | 28 | 121 | Malawi | 7 |
| 20 | South Af | 141 | 71 | Germany/ | 28 | 122 | Qatar | 7 |
| 21 | Jordan | 132 | 72 | Algeria | 28 | 123 | Bolivia | 5 |
| 22 | Argentin | 128 | 73 | Banglade | 27 | 124 | Rumania | 5 |
| 23 | Libya | 125 | 74 | Philippi | 27 | 125 | Guinea B | 5 |
| 24 | Ethiopia | 120 | 75 | Panama | 26 | 126 | Equatori | 5 |
| 25 | Somalia | 114 | 76 | Germany | 26 | 127 | Gambia | 5 |
| 26 | Portugal | 110 | 77 | Czechosl | 26 | 128 | Grenada | 4 |
| 27 | Cuba | 109 | 78 | Albania | 25 | 129 | Germany | 4 |
| 28 | Indonesi | 109 | 79 | Mali | 24 | 130 | Moldova | 4 |
| 29 | Uganda | 105 | 80 | Bulgaria | 23 | 131 | Estonia | 4 |
| 30 | France | 103 | 81 | Mozambiq | 23 | 132 | Georgia | 4 |
| 31 | Myanmar | 103 | 82 | Mauritan | 22 | 133 | Sierra L | 4 |
| 32 | Zaire | 101 | 83 | Congo | 22 | 134 | Central | 4 |
| 33 | Zimbabwe | 95 | 84 | Lebanon | 22 | 135 | Barhein | 4 |
| 34 | Zambia | 94 | 85 | Angola | 21 | 136 | United A | 4 |
| 35 | Nicaragu | 87 | 86 | Oman | 21 | 137 | Mongolia | 4 |
| 36 | Yemen Ar | 83 | 87 | Nepal | 21 | 138 | Singapor | 4 |
| 37 | Chile | 79 | 88 | Canada | 20 | 139 | Malta | 3 |
| 38 | Morocc0 | 77 | 89 | Brazil | 20 | 140 | Solomon | 3 |
| 39 | Afghanis | 77 | 90 | Burkina | 20 | 141 | Finland | 2 |
| 40 | Saudi Ar | 75 | 91 | Dominica | 19 | 142 | Niger | 2 |
| 41 | Vietnam | 75 | 92 | Sri Lank | 19 | 143 | Lesotho | 2 |
| 42 | Ecuador | 70 | 93 | Denmark | 18 | 144 | Swazilan | 2 |
| 43 | Greece | 70 | 94 | Poland | 16 | 145 | Magalasy | 2 |
| 44 | Peru | 69 | 95 | El Salva | 15 | 146 | Bahamas | 1 |
| 45 | Japan | 68 | 96 | Colombia | 15 | 147 | Liechten | 1 |
| 46 | Yugoslav | 58 | 97 | Belgium | 15 | 148 | Ukrania | 1 |
| 47 | Honduras | 57 | 98 | Hungary | 15 | 149 | Djibouti | 1 |
| 48 | Sudan | 55 | 99 | Papua Ne | 15 | 150 | Comoros | 1 |
| 49 | Venezuel | 54 | 100 | Togo | 14 | 151 | Maldive | 1 |
| 50 | Spain | 54 | 101 | Cameroun | 14 | 152 | Australi | 1 |
| 51 | Malaysia | 48 | 102 | Burundi | 14 | 153 | New Zeal | 1 |

Table 2: Hostility ranking from 1950 to 1992.

We also added some extra political variables from the Eugene [11] program [6] in order to control for factors such a democracy, security indicators, alliance portfolios etc. We finally added standard economic attributes which we explain in the next section.

## 2.2 Economic attributes

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Once we have constructed a index of hostility, getting information for economic factors is much easier than getting factors for dyadic data. We used the World Tables of Economic and Social Indicators [12]. It contains data for 189 countries, 12 different regional and income groups and World aggregates covering the period from 1950 to 1992.

Economic data combined with the level of hostility should provide a better idea of the economic forces that drive individual countries towards higher or lower levels of conflict activity. It should be noticed that we do not have economic variables containing specific data for specific disputes. Adding extra variables to large data sets involve an huge collection cost, therefore, we rely on the data provided by both the World Bank and the main conflict data sets.

There is a problem when we tried to combined economic and political data. While both provided a large number of country attributes in their own fields, few of these attributes may be useful for a combined study.

One of the biggest problem is the lack of economic indicators in disputes attributes. In particular, there is no systematic record of the cost of conflict. During war, the population of a country suffers not only from battle casualties but also from diseases, famine and a decline in the birth rate. There is a direct destruction of physical and human capital, destruction of markets and foreign trade and other demand and supply effects associated with both direct and opportunity costs in the short and the long term.

There are also problems when joining observations for every country. Not all the coun-

[6]The Expected Utility Generation and Data Management Program (EUGene), originally a data generation program serves as a data management tool for creating data sets for use in international relations and contains information on Militarized Interstate Disputes and a variety of independent variables.

tries covered by the World Bank and COWs data set correspond. We dropped several countries from the data set because they were not covered by both sets. More importantly, data on former communist countries from the World Bank is generally poor and the sample was drastically reduced to produce a balanced panel in some of the regressions. In general, economic data is quite poor before 1971.

The final data set contains all variables and observations from the World Bank plus the constructed hostility levels, plus a set of political variables from Eugene. This data suffers from the data problems of both sets. In particular, from missing observations.

We described in detailed some possible patterns and correlation in this data using factor analysis in the next section, we also compared it to some general ideas in the literature of economics of conflict.

# 3 Factor analysis

The starting point of our analysis is to explore the relationships between the index of hostility and the economic factors. If we assume that the main use of the military budget is to fight or deter international conflict – specially the proportion dedicated to weapons of mass destruction – we would expect to find some positive correlation between hostility and military expenditure[7]. Given a political and social environment, economic approaches to conflict establish some stylized relationships between common resources and investment in military capability. This leads to a definition of the equilibrium conditions between conflict and production. If these models have any empirical application, we would expect to find some empirical regularities between conflict, military expenditure and economic attributes.

In this section we focus on finding patters of correlation amongst a set of variables that represent these relations. We concentrate in the use and origin of resources but we also look at other economic variables such as trade, government activity or foreign debt. Conflict

[7]We realize that most part of the killings are carried out with conventional weaponry. However, weapons of mass destruction take the biggest slice of the budget, which are rarely used in internal conflict. Therefore, we think that this assumption is justified

Table 3: Correlation between military expenditure and hostility levels

| | milex | host1cow |
|---|---|---|
| milex | 1.0000 | |
| host1cow | 0.2338 | 1.0000 |

has temporal and spatial dimensions as well, which are assumed to be non systematic and ignored in this section. [8] We will release this assumption in the next section when we use panel regressions.

Given the large number of variables, we initiate our study with two multivariate methods: factor and principal component analysis.

First we use factor analysis to reduce the number of variables and to detect the structure in the relationships between variables. In particular, we seek to discover if the observed variables can be explained largely or entirely in terms of a small number of factors. From factor analysis we extract the uniqueness, (last column of table 4) which is also known as the specificity or the part of the variance that is not related to the other factors.

After extracting the specificity of each variable, we use principal component analysis (first five columns of table 4) which is one of the simplest methods to describe the data. The object is to take $m$ variables $X_1, X_2, \ldots, X_m$ and find combinations of these to produce indices $Z_1, Z_2, \ldots, Z_m$ that are uncorrelated. The lack of correlation between these indices means that they are measuring different dimensions in the data.

The first two principal component $Z_1$ is a linear combination such as:

$$\begin{aligned} Z_1 &= a_{11}X_1 + a_{12}X_2 + \cdots + a_{1m}X_m \\ Z_2 &= a_{21}X_1 + a_{22}X_2 + \cdots + a_{2m}X_m \end{aligned}$$

[8] This follows a similar reasoning to the approach developed in *War and Reason* by Bueno de Mesquita and Lalman [13] with regards to the use of utility models of conflict. Here, we assume that, due to the emergence of arms trade, one cannot identify patterns of transmission between conflict technology and production and therefore, we shouldn't have any systematic cross-sectional cross-temporal variation.

subject to the constraints:

$$\begin{aligned} a_{11}^2 + a_{12}^2 + \cdots + a_{1m}^2 &= 1 \\ a_{21}^2 + a_{22}^2 + \cdots + a_{2m}^2 &= 1 \end{aligned}$$

Where $Z_1$ explains the largest proportion of variance in the sample followed by $Z_2$ (and all the rest of possible factors), and $a_{im}$ are the elements of the eigenvectors of the covariance matrix.

We are mainly concerned with the relations between military expenditure hostility and the origins and use of resources which are analyzed in detail in section 3.1. We extended the analysis to other economic indicators in section 3.2

## 3.1 Use and origin of resources

The focal point of this analysis are the relationships between military expenditure, hostility level and the list of variables under the category of use and origin of resources provided by the World Tables. This should reflect the underlying structural patterns mentioned above.

The first thing that draws our attention is the very low uniqueness for all but two variables, hosti1cow and GNP per capita. This could lead to say that Military Expenditure seems to be a phenomena that could be explained by economic factors, whereas the hostility and wealth levels have little in common we the use and origin of resources.

We know look in detail at tables 4 and 5. If we look at the first component, we realize that all economic variables that relate to the use and origin of resources seem to experience equal weight apart from hostility, GNP per capita and the resource balance (Equals exports of goods and nonfactor services less imports of goods and nonfactor services). This can be represented as:

$$Z_1 = 0.21milex + \cdots + 0.05host1cow - 0.002cdgnpcap - 0.06363cdlresba. \quad (1)$$

Where $Z_1$ is the factor that explains the highest proportion of the variation and the coefficients of the variables indicates their marginal impact. We can see that the impact of military expenditure is considerable while impacts of the hostility level, income per capita and the resource

| | Eigenvectors | | | | | |
|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 4 | 5 | Uniqueness |
| milex | 0.21319 | -0.34242 | 0.01604 | -0.09977 | 0.01058 | 0.00884 |
| host1cow | 0.04883 | -0.30443 | -0.18854 | 0.89406 | 0.07729 | 0.79996 |
| cdgnpcap | -0.00257 | -0.00567 | 0.97905 | 0.20099 | -0.02183 | 0.99418 |
| cdlgnpmp | 0.24116 | -0.01986 | 0.00550 | -0.02040 | -0.00349 | 0.00004 |
| cdlnetfc | 0.15304 | -0.19021 | 0.03748 | -0.09140 | 0.85422 | 0.00853 |
| cdlgdpmp | 0.24114 | -0.01818 | 0.00517 | -0.01961 | -0.01156 | 0.00004 |
| cdlnetta | 0.23752 | 0.00762 | 0.00435 | -0.02194 | -0.08962 | 0.00007 |
| cdlgdpfc | 0.24103 | -0.02035 | 0.00525 | -0.01943 | -0.00463 | 0.00004 |
| cdlvapag | 0.19257 | 0.01269 | -0.04180 | 0.25664 | -0.27511 | 0.09034 |
| cdlvapin | 0.23968 | 0.07602 | 0.00346 | -0.00348 | 0.04085 | 0.00009 |
| cdlvapma | 0.23838 | 0.10442 | 0.00442 | -0.00173 | 0.04862 | 0.00162 |
| cdlvapse | 0.23955 | -0.07468 | 0.00899 | -0.04713 | -0.00985 | 0.00025 |
| cdlresba | -0.06363 | 0.74395 | -0.04130 | 0.25047 | 0.27645 | 0.00000 |
| cdlexpgn | 0.21253 | 0.25147 | -0.01752 | 0.02316 | -0.17161 | 0.00000 |
| cdlimpgn | 0.22185 | 0.09949 | -0.00903 | -0.02703 | -0.22388 | 0.00000 |
| cdldomab | 0.24094 | -0.03654 | 0.00617 | -0.02577 | -0.01856 | 0.00004 |
| cdlconpr | 0.24034 | -0.05769 | 0.00721 | -0.02763 | -0.02407 | 0.00013 |
| cdlcongo | 0.23382 | -0.13649 | 0.00869 | -0.06426 | -0.06282 | 0.00002 |
| cdlinvgd | 0.23652 | 0.09563 | 0.00120 | 0.00880 | 0.03086 | 0.00008 |
| cdlinvfi | 0.23636 | 0.10269 | 0.00241 | 0.00430 | 0.03469 | 0.00044 |
| cdlgdsto | 0.23268 | 0.17929 | -0.00338 | 0.03673 | 0.06173 | 0.00009 |
| cdlgnsto | 0.23305 | 0.16884 | -0.00220 | 0.03440 | 0.09436 | 0.00006 |

Table 4: Use and origin of resources, principal component analysis.

balance (the last three variables) are minimal [9].

The first component captures about 78% of the variation in the data (table 5) while the second one only about 6%. If we look at the factor loads for the first fifth factors that account for more than 95% of the variation in table 4. The last column reports the uniqueness or the proportion of variance that cannot be explained by common factors.

If we look at the highest factor loading for the level of hostility we can choose the fourth factor (column 4) that accounts for .4% of the variation. It can be represented as

$$Z_4 = 0.89host1cow - 0.01milex + 0.20cdgnpcap + 0.25cdlresba + \cdots + 0.26cdlvapag \quad (2)$$

[9]One can write down the whole representation of all the components by taking all the values of the eigenvectors provided in table 4.

| Component | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 17.13797 | 15.72942 | 0.7790 | 0.7790 |
| 2 | 1.40856 | 0.40654 | 0.0640 | 0.8430 |
| 3 | 1.00202 | 0.04084 | 0.0455 | 0.8886 |
| 4 | 0.96118 | 0.27466 | 0.0437 | 0.9323 |
| 5 | 0.68651 | 0.26512 | 0.0312 | 0.9635 |
| 6 | 0.42139 | 0.19202 | 0.0192 | 0.9826 |
| 7 | 0.22937 | 0.11647 | 0.0104 | 0.9930 |
| 8 | 0.11290 | 0.09361 | 0.0051 | 0.9982 |
| 9 | 0.01929 | 0.01023 | 0.0009 | 0.9991 |
| 10 | 0.00906 | 0.00164 | 0.0004 | 0.9995 |
| 11 | 0.00742 | 0.00511 | 0.0003 | 0.9998 |
| 12 | 0.00231 | 0.00105 | 0.0001 | 0.9999 |

Table 5: Percentage of variation explained by component.

Table 6: Variable definitions (World Bank)

| | |
|---|---|
| MILEX | Military Expenditure, (000 US $) |
| HOST1COW | Hostility index from COW's data |
| CDGNPCAP | Current prices Gross National Product per capita (US $) |
| CDLGNPMP | Current prices Gross National Product |
| CDLNETF | Current prices Net Factor Income |
| CDLGDPMP | Current prices Gross Domestic Product |
| CDLNETTAX | Current prices Indirect Taxes Net of subsidies |
| CDLGDPFC | Current prices GDP at factor cost |
| CDLVAPAG | Current prices Value Added in Agriculture |
| CDLVAPIN | Current prices Value Added in Industry |
| CDLVAPMA | Current prices Value Added in Manufacturing |
| CDLVAPSE | Current prices Value Added in Services |
| CDLRESBA | Current prices Resource Balance |
| CDLEXPG | Current prices Exports of Goods & NF Services |
| CDLIMPG | Current prices imports of Goods & NF Services |
| CDLDOMA | Current prices Domestic Absorption |
| CDLCONPR | Current prices Private Consumption, etc. |
| CDLCONGO | Current prices General Govt Consumption |
| CDLINVGD | Current prices Gross Domestic Investment |
| CDLINVFI | Current prices Fixed Investment |
| CDLGDSTO | Current prices Gross Domestic Savings |
| CDLGNSTO | Current prices Gross National Savings |

This results indicate a very low communality between military expenditure and hostility levels. The latent component of hostility seems to be represented by the fourth component because its loading is very high, 0.89. The variables with higher loadings that correspond to this latent variable are GNP per capita and value added in agriculture whereas military expenditure scores very low. Perhaps the latent relationships between conflict and the economy is poverty which could explain the high loads in this variables.

It seems that there is another latent variable affecting the resource balance heavily. It affects exports and savings positively while military expenditure and hostility levels negatively.

From the results in the table 4 we can conclude that: Military expenditure could be jointly explained with economic factors whereas the level of hostility doesn't seem to correspond to this set. From the 20 % of common variation of hostility levels with this set of economic indicators, we can say that the closest variables are GNP per capita and agricultural production followed, by military expenditure, exports and savings.

We carried out the same type of analysis for other economic variables. Perhaps it is worth mentioning that we found very little common variation of our index of hostility level with the rest of economic indicators in the set. We only reported some summary of the results in the next section.

## 3.2 Other economic factors

We explored all the rest of economic factors within the list of categories provided in the World Tables. After numerous trials we could not find any further reduction of the initial set of economic indicators that could help in explaining the variation in hostility levels.

Some of these negative results are puzzling because they contradict some of the stylized facts of economic theories of conflict. Take manufacturing activity: Some models would predict a higher conflict activity for economies with lower productivity relative to their conflict productivity. This would happen because those who have lower productivity would find relatively more profitable to engage in rent seeking activities. In table 7, the hostility index didn't show any significant correlation with productivity or the ratio of military expenditure and military personnel (Which would show high productivity in conflict).

We constructed a new ratio to find the natural tendency to conflict in the underline economic

Table 7: Military Expenditure and productivity

| | manroute | milex | ratio | host1cow |
|---|---|---|---|---|
| manroute | 1.0000 | | | |
| milex | -0.0294 | 1.0000 | | |
| ratio | 0.1984 | 0.4302 | 1.0000 | |
| host1cow | 0.0070 | 0.2491 | 0.0302 | 1.0000 |

parameters. This we called the conflict tendency:

$$CT = \frac{Conflict\ productivity}{Manufacturing\ productivity}. \tag{3}$$

In our data on international conflict, although conflict and hostility showed a positive correlation as expected, the correlation of CT with our hostility index came out surprisingly low, $\rho = 0.0081$.

Moreover, neither our index of hostility nor military expenditure seemed to have a great relationship with government activity, which is quite surprising when we consider that the correlation between military expenditure and government expenditure is very high $\rho = 0.955$. We couldn't find any latent pattern in the data set that could help explaining both the economic and military activities of states as reflected by long term debt and government expenditure, deficit or surplus.

So far, it seems that military expenditure is mainly an economic problem, while the level of hostility is unrelated to either military expenditure or other economic variables. However, that the procurement process doesn't seem to be explained by conflict may be too strong conclusion at this stage. We should seek for alternative explanations. Therefore, we need to look more closely at the time and spatial dimensions in the data set. In the next section we carry a couple of analysis using panel data techniques.

# 4 Panel estimation

The results in the previous section point towards no relationship between military expenditure and hostility levels. It is a bit surprising that military expenditure is autonomous of hostility levels. In order to establish if there is any causal relationship between these two variables, we need to use some of the spatial and temporal dimension in the data. For this purpose we consider the following dynamic fixed effects model up to $n$ distributed lags:

$$
\begin{aligned}
y_{i,t} &= \sum_{i=1}^{n} \gamma_i y_{i,t-1} + \sum_{i=1}^{n} \beta_i x_{i,t-1} + \eta_i + \epsilon_{i,t} \\
x_{i,t} &= \sum_{i=1}^{n} \gamma_i y_{i,t-1} + \sum_{i=1}^{n} \beta_i x_{i,t-1} + \eta_i + \epsilon_{i,t} \qquad (4)
\end{aligned}
$$

Where $\eta_i$ is a fixed effect, $y$ and $x$ are military expenditure and hostility level respectively and $\epsilon_{i,t} \sim N(0, \sigma_\epsilon^2)$ is a random disturbance.[10]

In spite of the fact that conflict memories and consequences my live on for generations, we expected that this influence — if there was any causality between conflict hostility and military expenditure, or vice versa — would be declining progressively over time. Thus, this time dimension couldn't be missed by the first four lags.

This panel includes most nations in the world from 1971 to 1992. The number of countries is as high as 133, which is close enough to the whole population [11]. Therefore, it is less likely to be a random sample. The fixed effects model has been chosen because the individual effects would peak some the the heterogeneity between countries.

The results are reported in table 8. If hostility levels Granger causes military expenditure the coefficients of the lags of hostility level should be significant where military expenditure is the dependent variable. The coefficient of the first lag of hostility level "lhosti" is significant. However, the other lags were not significant at all, and the overall hypothesis that $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ can only be rejected at the 10% confidence level. We concluded that the causal relationship from hostility to military expenditure is very week and could be rejected at standard significance levels.

The direction of causality seems to be much stronger when we test hostility levels against

[10] At this stage we follow the common assumptions about the disturbance term: for example the expectations of the error term for $y_{i,t}$ in equation (4) are:

$$
\begin{aligned}
\sigma_\epsilon^2 &\leqslant 0 \\
E(\epsilon_{i,t}, \epsilon_{j,s}) &= 0 \;\; i \neq j \; or \; t \neq s \\
E(\eta_i, \epsilon_{j,t}) &= 0 \forall \; i, \; j, \; t \\
E(x_{i,t}, \epsilon_{j,s}) &= 0 \forall \; i, \; j, \; t, \; s
\end{aligned}
$$

[11] Most part of the missing countries are so small that cannot take part in international conflict. There may be some selection bias, specially for small countries. We haven't establish if all the countries are fully independent in their international relations, specially if they are small.

Table 8: Granger test

| Dependent Variable | $H_0$ | $F(4, 3927)$ | $Prob > F$ | R-Squared |
|---|---|---|---|---|
| milex | lhosti = 0.0<br>l2hosti = 0.0<br>l3hosti = 0.0<br>l4hosti = 0.0 | 2.10 | 0.0785 | 0.9723 |
| host1cow | lmilex = 0.0<br>l2milex = 0.0<br>l3milex = 0.0<br>l4milex = 0.0 | 5.65 | 0.0002 | 0.5584 |

| | lmilex | l2milex | l3milex | l4milex | lhosti | l2hosti | l3hosti | l4hosti |
|---|---|---|---|---|---|---|---|---|
| milex | | | | | | | | |
| Coef | 9.78E-01 | -1.65E-02 | 4.21E-01 | -4.40E-01 | 4.51E+04 | -3.38E+04 | -4.42E+03 | -4.42E+03 |
| Std. Err. | 1.60E-02 | 2.29E-02 | 2.30E-02 | 1.65E-02 | 1.81E+04 | 2.07E+04 | 2.08E+04 | 1.81E+04 |
| $P > \|t\|$ | 0.0000 | 0.4690 | 0.0000 | 0.0000 | 0.0130 | 0.1030 | 0.8320 | 0.2100 |
| host1cow | | | | | | | | |
| Coef | -2.73E-09 | 8.52E-09 | -6.35E-08 | 4.65E-08 | 5.66E-01 | -8.13E-03 | 7.05E-02 | -3.17E-02 |
| Std. Err. | 1.40E-08 | 2.01E-08 | 2.02E-08 | 1.45E-08 | 1.58E-02 | 1.58E-02 | 1.82E-02 | 1.58E-02 |
| $P > \|t\|$ | 0.8460 | 0.6710 | 0.0020 | 0.0010 | 0.0000 | 0.6550 | 0.0000 | 0.0450 |

military expenditure. The overall significance was accepted; specially, the third and fourth lag came out significant but not the first and second, which may rule out the possibility of confusing the effect of military expenditure on conflict with preparations for war.

We finally estimated a dynamic regression for hostility and military expenditure controlling for some exogenous variables. It is well known that using dummy variables to estimate fixed effects models in a model that includes a lagged dependent variable produces biased estimates, specially if T is small. Nickell [14] shows that the bias gets closer to zero as T approaches infinity. Other authors (Judson, Owen [15]) find that the bias of the least squares dummy variable estimator can be significant even when the time dimension of the panel is as large as 20.

The basic equation specification follows the general model:

$$y_{it} = \gamma y_{it_{-1}} x'_{it} \beta + \eta_i + \epsilon_{it} \tag{5}$$

where $y$ will be the dependent varialbe (hostility in results table 9 and military expenditure in table 10); The vector $x$ contains the choice of exogenous variables, and $\eta_i$ are the fixed effects.

We estimate both hostility levels and military expenditure introducing some economic variables and controlling for some sociopolitical factors. In particular we focus on the liberal peace paradigm. Accordingly we pick the democracy level, a variable to control for the populations size and several indicators for trade.

Equation 5 was estimated for hostility level first because it seems that the direction of causality goes from military expenditure to hostility. Alongside military expenditure, we chose a small set of trade indicators from the World Tables plus the index of democracy (dem) from the Polity data set [12] to control for political regime and the size of the population (tpop).

The macro variables chosen are: exports (cdlepgn), imports (cdlimpgn), GNP at market prices (cdlgnpmp), GNP per capita (cdgnpcap), export of fuels (cpexpfue), exports of manufactures(cpexpman), imports of fuels (cpimpfue) and imports of manufactures (cpimpman) [13]. We could include many exogenous variables to test for the impact of other economic indicators in conflict hostility. But it creates more problems than benefits given the amount of missing observations for some specific countries. This is exacerbated by the need to have a balanced panel in order to correct the bias using Kiviet's consistent estimator [18]. Therefore, we decided to restrict the analysis to the liberal peace paradigm.

The need for a balanced panel reduced drastically the original data set. We choose a set of 41 countries with 15 observations. [14] There are some final considerations regarding this reduction. We are not convinced that the results can be extrapolated to all countries because it cannot be strictly considered a random sample. Many of small and poor countries don't have good data, specially in times of war which poses the problem of selection bias.

In order to compute consistent estimators for $\gamma$ and $\beta$ we follow a routine to implement Kiviet's bias corrections for dynamic panel data generated by Adam [19]. This is based in both Kiviet's correction and Anderson & Hsiao [20] consistent instrumental variable (IV) estimator.

When we controlled for other factors military expenditure was irrelevant to explain the level of hostility. The only variables that came significant were lag hostility, democracy, current exports, GNP per capita and the size of the country. The negative sign of democracy index was expected as well as the positive sign of lag hostility. The positive sign of GNP per capita is strange. We would expect poor countries to have more incentive in conflict. Could this be interpreted as a sign

[12]The polity data set is supplied by the Eugene, but can also be found at Isere [16].

[13]Given the importance of trade and conflict highlighted by models of the liberal peace paradigm [17], we introduced extra variables in this category. There are many other things that could have been part of the equation such as external debt or government deficits but this didn't seemed to be supported by factor analysis

[14]Estimating the biased looses a considerable amount of degrees of freedom. From 4067 to 615 observations and from 137 countries down to 41.

Table 9: Hostility level

| host1cow | Coef. | Kiviet | Std. Err. | t | $P > \|t\|$ |
|---|---|---|---|---|---|
| lhosti | 0.1806972 | 0.24531733 | 0.0419035 | 4.312 | 0.000 |
| milex | 5.65E-08 | 5.46E-08 | 3.94E-08 | 1.434 | 0.152 |
| dem | -0.1345579 | -0.13693845 | 0.047518 | -2.832 | 0.005 |
| cdlexpgn | 8.12E-11 | 8.08E-11 | 4.03E-11 | 2.016 | 0.044 |
| cdlimpgn | 1.60E-11 | 1.74E-11 | 5.72E-11 | 0.28 | 0.779 |
| cdlgnpmp | -2.51E-12 | -2.58E-12 | 2.39E-12 | -1.052 | 0.293 |
| cdgnpcap | 1.55E-06 | 1.43E-06 | 3.45E-07 | 4.49 | 0.000 |
| cpexpfue | -4.93E-11 | -4.80E-11 | 6.98E-11 | -0.707 | 0.480 |
| cpexpman | -6.16E-11 | -6.11E-11 | 4.33E-11 | -1.421 | 0.156 |
| cpimpfue | -2.40E-11 | -2.83E-11 | 7.46E-11 | -0.321 | 0.748 |
| cpimpman | -7.15E-11 | -7.21E-11 | 7.21E-11 | -0.991 | 0.322 |
| tpop | 0.0000222 | 0.00001764 | 9.38E-06 | 2.364 | 0.018 |
| cons | 0.457758 | 3.34E+13 | 0.508877 | 0.9 | 0.369 |

| | | |
|---|---|---|
| Number of Obs | = | 615 |
| F(12,562) | = | 7.30 |
| Prob >F | = | 0.000 |
| R-squared | = | 0.3094 |

that rich countries are more aggressive? In economic models of conflict, poor countries should be more aggressive. But with the presence of trade, they would have more to win from cooperating with the rich ones, providing that rich countries show high enough levels of deterrence. This would explain the negative sign.

However, another surprise is that only exports seem to be significant. This contradicts to some extent the liberal paradigm. These theories establish a negative correlation between trade openness and conflict. While we didn't test this hypothesis, the positive sign of exports is clearly contradictory.

Finally, the size of country seems to be clearly positive and significant. Which reinforces the idea that there are some economies of scale in war.

In our last regression (table 10), we estimated the equation for military expenditure including the same set of exogenous variables. [15]

[15]There is no theoretical to assume that both hostility and military expenditure should be determined by the same set of exogenous variables. In fact there are many models that look at the determinants of military expenditure.

Table 10: Military Expenditure

| milex | Coef. | Kiviet | Std. Err. | t | $P > \|t\|$ |
|---|---|---|---|---|---|
| lmilex | 1.055898 | 1.05995 | 0.0134563 | 78.469 | 0.000 |
| host1cow | 38805.91 | 37295.119 | 20702.81 | 1.874 | 0.0610 |
| dem | -6759.826 | -5535.2462 | 8449.362 | -0.8 | 0.424 |
| cdlexpgn | 0.0001302 | 0.00013179 | 0.0000138 | 9.416 | 0.000 |
| cdlimpgn | -0.0000948 | -0.000092 | 0.0000208 | -4.555 | 0.000 |
| cdlgnpmp | 1.77E-06 | 1.61E-06 | 6.61E-07 | 2.674 | 0.008 |
| cdgnpcap | -0.0239028 | -0.02377216 | 0.1665548 | -0.144 | 0.886 |
| cpexpfue | -0.0000806 | -0.00007983 | 0.0000222 | -3.626 | 0.000 |
| cpexpman | -0.0000872 | -0.00008711 | 0.0000117 | -7.48 | 0.000 |
| cpimpfue | 0.000081 | 0.0000739 | 0.0000291 | 2.786 | 0.006 |
| cpimpman | 0.0000131 | 6.83E-06 | 0.0000267 | 0.491 | 0.624 |
| tpop | -0.1599059 | -0.10173109 | 0.5649817 | -0.283 | 0.777 |
| cons | -187407.7 | 1.59E+18 | 88047.81 | -2.128 | 0.034 |

| | | |
|---|---|---|
| Number of Obs | = | 615 |
| F(12,568) | = | 2450.34 |
| Prob >F | = | 0.000 |
| R-squared | = | 0.9979 |

When we have military expenditure as the dependent variable we found a much better fit. Most of the economic indicators were significant and with the expected sign. It is worth noticing that three of the coefficients that were significant in explaining hostility — democracy, GNP per capita and population size — have no impact in explaining military expenditure.

While military expenditure can be mostly explained by its own lag, we can clearly see the use of economic factors it also highly relevant. More precisely, exports and imports seem to be highly significant while GNP per capita isn't.

Finally, we can hardly support the idea of a relation between military expenditure and the hostility index of individual countries. It seems that we need a completely new framework to explain why, on the one hand military expenditure and economic factors are highly correlated, and in the other hand, none of these are correlated to hostility levels. [16]

[16]However, it's worth noticing that the coefficient of the lag of military expenditure – $\gamma$ in equation 5– is close to 1. This violates one of the assumptions. In fact, it seems that military expenditure is non-stationary. This is well supported by the literature of military expenditure and the many developments of the Richardson model of arms races [21]. The presence of arms races indicates the need for further research into stationary problems with panel data.

# 5 Conclusion

In this project we have concentrated our efforts on describing common patterns of military expenditure, security and economic factors by focusing on the monadic level of analysis. We found little support for theories of economics and conflict which are based on the optimal allocation of resources to production and fighting activities.

When we compare the hostility index with military expenditure patterns we find very little evidence of a causal relationship between these variables. We could not support that hostility and military expenditure can be jointly determined by latent economic processes either.

We also found that military expenditure seem to have a common variation with other economic factors, specially related to the size of the economy. Hostility seem to be more related to economic factors that point in the direction of the size on the country (number of habitants), poverty and lack of development. Despite the obvious incentives of poor economies to extract rent from more productive countries it seems that poor countries get seldom involve in international conflicts, which is in direct contradiction to the main economic-conflict paradigm.

This poses the question of whether security is determined by military capability or not. It may be the case that military expenditure is determined not by the aggregate hostility level, but by the highest hostility level possible which could be the underlying determinant of security. It seems that the procurement policy of many countries could be to prepare for the worst and hope for the best. This short of approach would be the equivalent to the European Bank establishing the interest rates based on the German inflation of the early 1920's, the stock exchange crash of 1929 and the first oil shock in 1973, while it is hoping that the economy would still grow at an average rate of 5%, consumer spending would be at its usual level and the economy would be close to full employment. If that it the case, is it possible to design an efficient procurement policy?

One thing is clear, the short of weaponry that takes most of the expenditure is of little use for the majority of conflicts. Increases in the military burden seem not to be a poor answer to the rise hostility levels. Given that the nature of conflict has changed drastically, some estates may be tempted to increase their military budget in order to answer to the new types of threats. At the same time they try to maintain the capability to intervene in the old conflicts. However, based on the results of this paper, we can say that maintaining the capability cannot be efficient because the

relation between hostility and military expenditure was non existence in the first place. Moreover, increases in military expenditure seem to bring about more conflict. Therefore, rather that an increase in military expenditure we should seek a conversion of military and economic strategies that aims to satisfy real security needs.

A final warning, our security index only reflects interstate hostility. This is only an approximation to the real hostility level of a country. At this stage, it is difficult to integrate several measures of political violence such us internal conflicts, assassinations or terrorist attacks. But some of these processes are clearly linked. The fact that we may experience an increase in one of this expressions of violence is not unrelated to the others. A possible way to integrate all levels of political violence would be to look at the aggregate numbers of fatalities and the real cost of conflict. Unfortunately, apart from a few case studies, very few institutions provide detailed information on what we consider two of the main conflict attributes.

It is possible that we are entering a more violent world. Consequently, some institutions may support the claim for higher military expenditures. But since we have no objective measure of this and we can not see a direct connection between hostility and military expenditure, we are entitled to have doubts about the necessity of this increase.

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