

# Polarization and Interstate Conflict\*

Håvard Hegre

Centre for the Study of Civil War

International Peace Research Institute, Oslo

Fuglehauggata 11

0260 Oslo, Norway

Paper presented to the PAC Conference, Milan 16-17 December 2005

December 13, 2005

## **Abstract**

Social scientists argue that conflict is likely to be more intense when individuals in a society are divided into two clearly identifiable groups where differences within groups are considerably smaller than differences between groups. This concept of polarization is the point of departure for Esteban & Ray (1994), who define the concept precisely and introduce a theoretical basis for its quantitative measurement. This paper applies Esteban & Ray's (ER) measure of polarization on three international distributions: the world income distribution, the distribution of policy preferences as reflected in voting patterns in the UN General Assembly, and the distribution of political systems. The paper discusses extensions of the ER measure that renders it independent of the number of groups in

---

\*Thanks to Joachim Carlsen for assistance with the dataset, to Christin Mørup Ormhaug for research assistance, and to Joan Esteban and Gerald Schneider for comments. The research has been supported by the Polarization and Conflict Project CIT-2-CT-2004-506084 funded by the European Commission-DG Research Sixth Framework Programme. It reflects only the authors' views and the Community is not liable for any use that may be made of the information contained therein.

the system, and investigates empirically whether any of the three types of polarization is associated with conflict in the form of militarized interstate disputes. The results are rather inconclusive despite the fact that some of the micro-level regularities consistent with the polarization and conflict argument have solid support in previous studies.

# 1 Polarization and Conflict

Social scientists argue that conflict is likely to be more intense when individuals in a society are divided into two clearly identifiable groups where differences within groups are considerably smaller than differences between groups (Esteban & Ray, 1994; Reynal-Querol, 2002; Østby, 2005; Brown, 2005).

The concept of systemic polarization may also be applied fruitfully to the study of international conflict. The effects of various forms of polarity in terms of military power have attracted enormous attention in the International Relations literature. Here, I will investigate polarization in terms of two other variables that are likely to affect countries' preferences: income and political system.

The world is extremely polarized in terms of income: the 20% of the world's population living in OECD countries enjoy average incomes at least 20 times higher than the half of the world's population living in poor countries. Is variation in income polarization over time and across regions associated with variation in the frequency of interstate conflict? Since the 1990s, China and India have been growing considerably faster than the economies in the West. This growth is reducing world income polarization – does it affect the world's conflict levels?

The democratic peace literature shows that jointly democratic pairs of countries have a low risk of war between them, but wars may be most frequent in pairs consisting of one democracy and one non-democracy. This may imply that a world polarized in terms of political systems may be particularly conflict-prone.

This paper applies Esteban & Ray's (1994) concept of polarization on these two international distributions, and applies statistical methods to investigate whether high levels of polarization are reflected in high conflict levels. Conflict is measured as relative frequency of militarized interstate disputes (MIDs) and as voting patterns in the UN General Assembly.

Section 2 discusses theories of polarization and related theories of conflict in the

international relations literature. Section 3 discusses the measures of polarization and conflict, aggregated to the system level. Both measures are dependent on the number of countries in the system. I discuss the problems caused by this dependence and suggest ways to reduce this problem. I create and use two types of conflict measures, one based on the frequency of militarized disputes between countries, and one based on voting patterns in the UN. The original Esteban & Ray index is dependent on the number of groups in the system and on the average of values for the underlying variable. I discuss some extensions to their index that allow comparing systems across regions and over time even when these entities vary. I create and use two polarization measures, one measuring polarization in average incomes, and one measuring polarization in terms of democracy levels. I also briefly look into polarization in terms of UN voting patterns as an independent variable.

Section 4 presents the data used in the analyses reported in Section 5. Section 6 concludes.

## **2 Polarization and Conflict in the Interstate System**

As Esteban & Ray (1994:820–21) note, the idea that polarization is related to conflict has a long pedigree in social sciences. They lead this idea at least back to 19th-century writers such as Disraeli and Marx. Polarization is distinct from inequality: societies are inequal if a small fraction of the population is much richer than the remainder, but not polarized. Polarization exists when two groups of approximately the same size are unequal in terms of income or other relevant factors.

The concept of polarization also has received attention for a long time in international relations. Polarization is most commonly associated with alliance patterns and military power (e.g., Waltz, 1979). A system with two actors that either dwarf all other actors or have organized all other important actors in two tightly knit and mutually antagonistic alliances are referred to as bipolar. A system where one actor or alliance

is clearly more powerful than others is termed unipolar, whereas a system with several large actors or alliances that roughly balance each other in power is termed multipolar. Whether bipolar or multipolar systems are most prone to conflict continues to be a contested issue in the international relations literature. Waltz (1979) argues that bipolar systems are more stable than multipolar ones since the power balance is transparent. In transparent systems, war is less likely to result from uncertainties about capabilities and resolve.

This concept of polarization differs somewhat from how Esteban & Ray conceives of it. Esteban & Ray (1994) and students of internal conflict such as Reynal-Querol (2002) or Collier & Hoeffler (2004) focus on the underlying or exogenous differences between actors, such as differences between groups in terms of income levels, ethnic characteristics, or religion. The research on polarization in IR has rather targeted how actors create differences through their behavior to secure their interests in the international system. An actor is more likely to become another's enemy through a change in alliance affiliation than through changes in average income levels, not to speak of ethnic or religious affiliation.

## 2.1 The International Income Distribution and Conflict

Underlying differences between groups of states are important in other contributions to international relations scholarship.<sup>1</sup> The tradition often referred to as dependence theory or the structuralist school explicitly addresses the difference in *income levels* between North and South, or between the 'center' and the 'periphery' (e.g., Galtung, 1971). The difference in income levels is at the core of a conflictual relationship where the rich world profits disproportionately from economic exchange with the poor. The system of capitalism, structuralist argue, is premised on inequality being maintained at a high level. Modern imperialism is merely a continuation of colonialism with all the economic benefits but without the disadvantage of having to administer the peripheral

---

<sup>1</sup>See Hegre, Gleditsch & Gissinger (2003) for a more detailed review of the structuralist argument.

territories.

The poor world is locked into a role as producer of a narrow set of raw materials sold to a small group of rich countries that in turn process the material and sell the manufactured goods with a profit. Extraction of raw materials generates little spin-off economic activity in the producer country and therefore does not engender further economic growth or poverty alleviation. Only a narrow elite in the periphery profits from the relationship between the rich and the poor country. Hence, inequality among nations is also associated with inequality within the poor nations.

The dependence theory contrasts starkly with classic economic theory, which predicts that with trade poor countries should specialize in labor-intensive goods which in turn would push up local wages and reduce global inequality. Since capital is the scarce factor in poor countries, the developing world should attract capital, further reducing inequality. The expectation of income convergence has not manifested itself, though (Lucas, 1990). Economists such as Krugman (1981, 1994) point out that economies of scale in production, learning-by-doing effects, large rich countries' ability to manipulate terms of trade through strategic tariff policies, etc., serve to maintain global income differences.

In addition to the self-enforcing mechanisms in center-periphery economic relationships, dependency theorists maintain that the rich world uses its military superiority to further consolidate the advantage. Galtung (1971) outlines how economic, military, political, communication, and cultural imperialism work together. Hence, the underlying conflict between rich and poor countries may occasionally erupt in militarized interstate disputes. Obviously, when the elites in the periphery country function satisfactorily as 'bridgeheads' for the center country, military engagements by the center country only take the form of pro-government interventions, not interstate militarized disputes. However, dependency theory also implies interstate conflict in cases where periphery governments act against the interests of the center. Since the rich world profits from inequality, the argument goes, it is willing to use military force to maintain

it.

## 2.2 Distribution of Political Systems and Conflict

The literature on the democratic peace shows that pairs (or dyads) of democratic states have a much lower frequency of conflict than pairs of non-democratic states (Doyle, 1986; Maoz & Russett, 1993). However, pairs consisting of one democracy and one non-democracy have even higher risk of conflict than the non-democratic ones. These ‘mixed dyads’ are high-risk partly because of democracies’ strong tendency to side with each other in wars against non-democracies, thus forming several mixed dyads within the same war. But mixed dyads are also war-prone because several interstate wars are triggered by one state’s desire to change the political system in the other. Kant (1795/1991) explicitly warns against wars for the liberal purpose of spreading republican constitutions, implying that there is an intrinsic conflict between states that differ in their political system.

Gleditsch & Hegre (1997) show that aggregating these dyadic probabilities up to a system level – such as the share of countries in a region engaged in war in a given period – implies a curvilinear relationship between the number of democracies in the system and the amount of war. The introduction of one democracy in an entirely autocratic region implies replacing a set of intermediate-risk autocratic pairs with high-risk mixed pairs, without creating any low-risk double democratic pairs. Only when regional democratization has produced a sufficiently high number of pairs that are doubly democratic will they offset the conflict-generating increase in democratic-autocratic pairs. Exactly at what proportion of countries this happens is uncertain. Since the democratic peace implies that doubly democratic pairs are considerably more peaceful than autocratic ones, the most conflictual systems have less than 50% democracies. Gleditsch & Hegre estimate systems with 36% democracies to be most conflict-prone.

These systemic implications of the democratic peace resemble the logic of the polarization literature. Regions consisting of a roughly equal number of pure autocracies

and well-developed democracies should be most conflict-prone, whereas regions that are purely autocratic or democratic, or mainly consist of intermediate-type regimes, do not have any incentives to wage war over the nature of their neighbor's political system. I will therefore also apply Esteban & Ray's polarization index to differences in political systems to test this relationship.

## 3 Measuring Conflict and Polarization

### 3.1 Militarized Interstate Dispute

The Correlates of War project has collected data on militarized disputes between countries (Jones et al., 2001). The dataset records all militarized interstate disputes (hereafter MIDs) between independent states for the 1816–2001 period.

#### 3.1.1 Aggregation Into a System-Level Measure

The dispute data are at the dyadic level. It is not obvious how one should aggregate the pairwise militarized disputes into a global- or regional-level measure of amount of conflict in the system. One alternative is to use the share of dyads in MID as a proportion of all dyads in the system. The main disadvantage of this measure is that it is not independent on the number of countries. The number of MIDs is roughly proportional to the number of countries in the world – most MIDs involve only two countries and most countries are engaged in only a very small number of conflicts at the same time. The number of dyads, on the other hand, is increasing in the size of the system – there are  $\frac{N(N-1)}{2}$  dyads in a system with  $N$  countries.<sup>2</sup> This means that if a constant fraction of the countries in the world are involved in one bilateral MID, the share of dyads in MID is inversely proportional to  $N$ . This metric will tend to underestimate the amount of conflict in large systems relative to small systems.

---

<sup>2</sup>See Gleditsch & Hegre (1997) and Raknerud & Hegre (1997) for a further discussion of the size of the system and measures of conflict.



Another alternative is to use the share of countries in MID as a proportion of all countries in the system. This is the measure most commonly used in the interstate conflict literature (e.g. Chan, 1984; Gleditsch & Hegre 1997). However, this measure tends to overestimate the amount of conflict in large systems. In a small system, e.g. one with three similarly sized countries, a dyadic conflict between countries  $C1$  and  $C2$  implies that two thirds of the global population are enemies of each other. Put differently, each individual in two thirds of the global population perceives a third of the global population as their enemies. In a system with 200 countries, on the other hand, two thirds of the world's countries may be involved in disputes with their neighbors. This would be reflected as a similar share of countries in MIDs, but each of the countries would be engaged in very local conflicts. Put in dyadic terms, if the 200 countries are of equal size, two thirds of the global population would perceive a half percent of the global population as their enemies.

As a compromise, I calculate the number of dyads in conflict divided by the number of countries in the system:  $C = \sum_{i=1}^N \sum_{j=1}^N c_{ij} / N$  where  $c_{ij} = 1$  if there is a conflict between  $i$  and  $j$  and 0 otherwise. Since large multilateral wars such as the two World Wars involve a large number of dyads in conflict, they will weigh more heavily in this measure than in the share of countries in dispute measure. The variable is plotted over time for the global system in Figure 1 (the dotted line).

The disputes vary greatly in terms of severity, from threats to use force against another state or a deliberate display of military forces to the world wars, and in fatality levels, from no battle deaths resulting from the dispute to many hundred thousands. To partially account for this variation in severity I weight the disputes according to their fatality levels: dyads that are on opposite sides of MIDs with no fatalities are counted once. Dyads in MIDs with 1 – 25 fatalities are counted twice, those with 26 – 100 three times, those with 101 – 250 are given a weight of four, those with 251 – 500 fatalities five, those with 501 – 999 fatalities are give a weight of six and the dyads that are on opposite sides of MIDs with at least 1,000 fatalities are counted seven times. I will

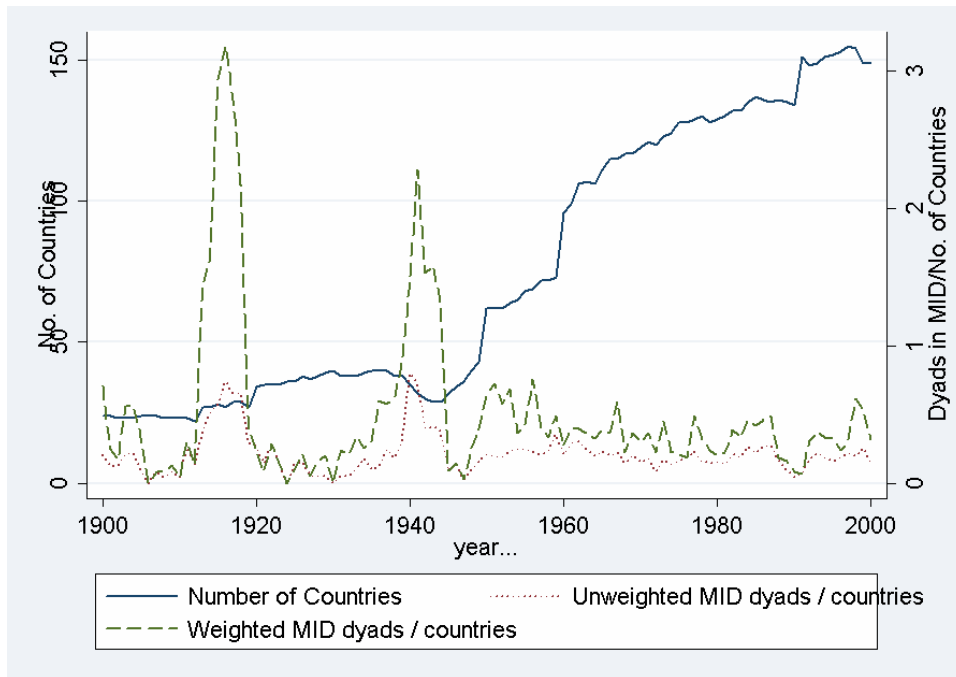


Figure 1: Global number of countries and conflict measures, 1900–2000

refer to this variable as 'Weighted conflict'. It is plotted over time for the global system along with the other series in Figure 1 (dashed line). In particular, note the difference between the two conflict measures for the first and second World War as well as the Korean War.

### 3.2 Measures of Polarization

In order to investigate the relationship between polarization and conflict we need a measure of polarization that is comparable over time and across regions. Esteban & Ray (1994) suggest a measure of polarization. This measure has desirable properties in terms of measuring the concept of polarization. Unfortunately, however, it is not independent of factors that are unrelated to polarization, and is therefore not suited to comparing regions or systems of different sizes. In this section, I will discuss these shortcomings and discuss some extensions that render the measure comparable over time and across region.

### 3.2.1 The Esteban & Ray (1994) Polarization Index

This concept of polarization is the point of departure for Esteban & Ray (1994), who define the concept precisely and introduce a theoretical basis for its quantitative measurement. Their polarization index is given by

$$ER_\alpha = k \sum_{i=1}^N \sum_{j=1}^N p_i^{1+\alpha} p_j |y_i - y_j| \quad (1)$$

where  $N$  is the number of groups in the system,  $p_i$  is the proportion of the total population in group  $i$ , and  $y_i$  is the variable along which we measure polarization (in the present application, log income or level of democracy). The ‘polarization parameter’  $\alpha$  is restricted to range between 0 and 1.6. I will refer to this as the  $ER_\alpha$  index.<sup>3</sup> Two special cases of the  $ER_\alpha$  index have been pointed out in the literature. When  $k = 4$  and  $\alpha = 1$ , the index is equivalent to Reynal-Querol’s (2002) index.<sup>4</sup> More relevant to the purpose here, is when  $\alpha = 0$ , in which case the ER index is proportional to the Gini index. The Gini index for data on  $M$  individuals is given by the formula

$$G = \frac{1}{2M^2\mu} \sum_{a=1}^M \sum_{b=1}^M |y_a - y_b|$$

where  $|y_a - y_b|$  is the difference in income between pairs of individuals, and  $\mu$  the mean income in the population (Sen, 1973; Weisstein et al., 2005). For grouped data, the Gini index is

$$G = \frac{1}{2\mu} \sum_{i=1}^N \sum_{j=1}^N p_i p_j |y_i - y_j| \quad (2)$$

Hence, (1), the  $ER$  index for individual-level data, is identical to the gini coefficient when  $k = \frac{1}{2\mu}$ .

---

<sup>3</sup>In the analyses below, I mostly set  $\alpha \equiv 1.6$ , referring to the index as  $ER_{1.6}$ .

<sup>4</sup>Reynal-Querol’s index is defined only for discrete distances, however, i.e.  $y_i - y_j \equiv 1$  if  $i \neq j$ ,  $y_i - y_j \equiv 0$  if  $i = j$

### 3.2.2 Dependence on Average $y_i$ and Log Transformations

In the grouped Gini index, the sum of differences is divided by  $\mu$  – the average  $y_i$  of the population. The  $\frac{1}{\mu}$  term ensures that the Gini index is comparable across populations with different average  $y$  levels. The ER index is not necessarily normalized in this manner – adding a constant to  $y_i$  for all  $i$  increases the measured polarization. This is in particular a problem when  $y_i$  is measured in absolute values, in which case the value for the index depends on whether income is measured in yen or in dollars. In the analysis of income distributions presented below, the income variable is log-transformed. This solves the problem, since multiplying a constant with the untransformed variable does not change the log difference or ratio. Still, in the extension of the ER index presented in Esteban, Gradin & Ray (2005), they normalize income to  $\mu = 1$ . I will do the same in the analyses using the *EGR* index reported below.

When  $y_i$  is log-transformed, (2) differs somewhat in interpretation from the traditional Gini index of income differences. Since log transformation removes the polarization measure’s dependence on  $\mu$ , the  $\frac{1}{2\mu}$  adjustment in the Gini index is not strictly necessary when log income is the variable of interest. I will therefore not make this correction in the other polarization indexes reported below.

### 3.2.3 Dependence on the Number of Groups

The *ER* measure is not independent of the number of groups in the system, either. Reynal-Querol (2002: 53) notes that her polarization index is strictly decreasing in  $N$  when all groups have the same size.<sup>5</sup> The same holds for the *ER* index in the equal group size case:

---

<sup>5</sup>In the Reynal-Querol index, the  $|y_i - y_j|$  term denotes whether the individuals belong to the same ethnic group or not.

$$\begin{aligned}
ER_\alpha &= k \sum_{i=1}^N \sum_{j=1}^N p_i^{1+\alpha} p_j |y_i - y_j| = k \sum_{i=1}^N \sum_{j=1}^N \frac{1}{N}^{(1+\alpha)} \frac{1}{N-1} |y_i - y_j| \\
&= k \sum_{i=1}^N \sum_{j=1}^N \frac{1}{N(N-1)} \frac{1}{N^\alpha} |y_i - y_j| = \frac{k}{(N-1)N^{\alpha-1}} \sum_{i=1}^N \sum_{j=1}^N |y_i - y_j| \quad (3)
\end{aligned}$$

As  $N$  increases, this expression approaches  $\frac{k}{N^\alpha} \sum_{i=1}^N \sum_{j=1}^N |y_i - y_j|$ . If  $|y_i - y_j| = 1$  for all constellations as in the Reynal-Querol index, it is clear that the  $ER$  index is sensitive to how many different groups the population is divided into: If the  $N$  groups are divided into  $2N$  groups, the index decreases from  $\frac{k}{N^\alpha} \sum_{i=1}^N \sum_{j=1}^N |y_i - y_j|$  to  $\frac{k}{(2N)^\alpha} \sum_{i=1}^{2N} \sum_{j=1}^{2N} |y_i - y_j|$ . The polarization index assumes that the groups have a pre-existing identity with the group, independent of the income dimension: Esteban, Gradin & Ray (2005: 2) ‘suppose that each individual is subject to two forces: she feels *identification* with those she considers to be members of her “own group”, and alienation from those of “other groups”. The identification is pre-existing, but the strength of the antagonism increases with differences of the  $y$  variable.

In Reynal-Querol’s application, the relationship between ethnic polarization and conflict *within* countries, this dependence on the number of groups is a desirable property since it makes sense to argue that ethnic groups are distinct. In my application, this is less desirable. Individuals clearly identify with their states, and the political leaders that make decisions on issues leading to militarized interstate disputes even more so. But this identification does not hinder states in having joint interests with other states. If global or regional income inequalities generate interstate conflict, it should not matter whether there are one rich and two poor countries in a region, or ten rich and twenty poor ones. Esteban, Gradin & Ray (2005: 2) maintain that this should matter: ‘Effective antagonism increases with alienation, but this alienation is taken to be fueled by some sense of identification as well’. This limits the usefulness of the  $ER$  index somewhat. In general, a polarization index that is sensitive to the

number of groups in the system is unable to distinguish analytically between the effect of the pre-existing identification itself (ethnic groups or nation states) and the variable that is hypothesized to make them distinct (average income or political system, in that case). This is particularly problematic where we do not have any information on useful pre-existing identification criteria. Esteban, Gradin & Ray (2005) recognize this and develop an extension to the ER index to handle the problem, discussed below.

Note that there is no dependence on  $N$  in the special case where  $\alpha = 0$ , i.e. when the  $ER$  index is similar to the Gini index. When the objective of the measure is to characterize distributions in terms of categorical entities such as ethnic group affiliation, the Gini index is clearly of little use since it can only take the values 0 (all similar) or 1 (at least some different). The measure's dependence on  $N$  is less desirable when we measure  $|y_i - y_j|$  explicitly, e.g. as a difference in average income between group members. If we want to characterize a country's income distribution, we do not want the index to be overly sensitive to whether we have data on the province, county, or individual level. If average income differences between observational units  $|y_i - y_j|$  are roughly the same independent on how fine-grained our sample is, the polarization index will decrease with the number of such units. Now income levels are likely to be clustered within provinces or counties, such that  $|y_i - y_j|$  are smaller within higher-level units than between such units. This will reinforce the measure's dependence on  $N$ .

This is a problem for the present analysis, since the number of countries have increased considerably over the 100-year period for which I have data. Figure 2 shows the development of the number of countries for which I have data for the period. The number of countries with data is increasing from 24 in 1900 to 168 in 2000. The income polarization index ( $\alpha = 1.6$ ) is also plotted in Figure 2 (dotted line). It decreases from .11 to .013 over the same period. This decrease may of course be due to increased polarization since most of the new countries are poorer than the ones existing by the end of the 19th century. The break-up of the Soviet Union may be a better example. The region I refer to "Europe" in this paper had 30 countries in 1990 and a  $ER_{\alpha=1.6}$

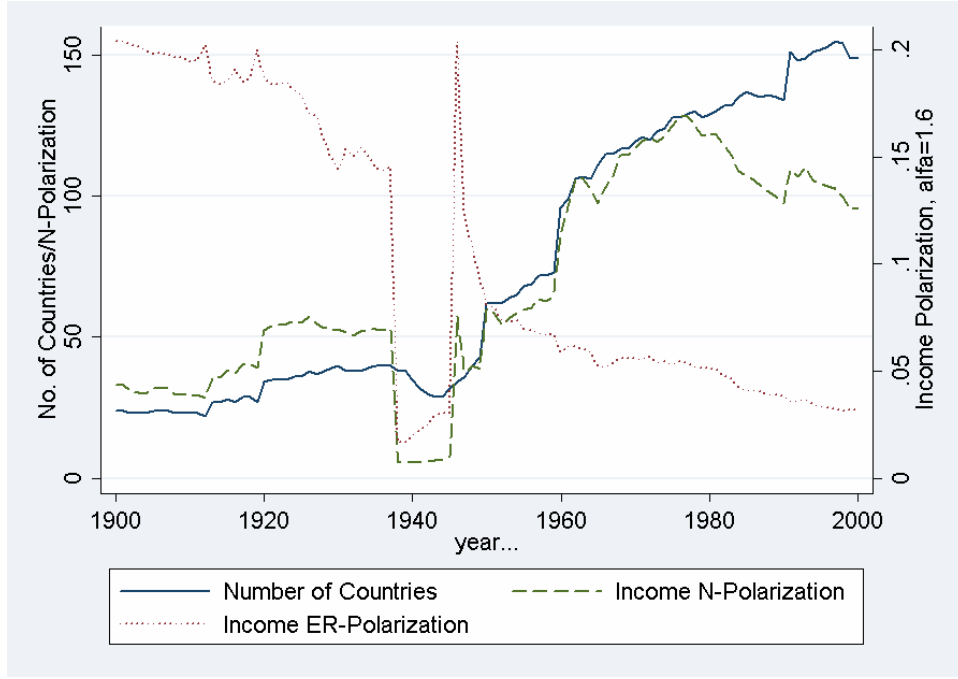


Figure 2:  $ER_{1.6}$  polarization and  $N_{1.6}$ -polarization measures, Global System, 1900–2000

index of .013. In 1991, this had increased to 39 countries and a polarization index of .010, a drop of more than 25%. The  $ER_{\alpha=0}$  index which is independent of  $N$  increases, on the other hand, from 1.11 to 1.25.

### 3.2.4 The Esteban, Gradin & Ray (2005) Index

Esteban, Gradin & Ray (2005: 5) suggest to handle this problem by pre-aggregating individuals and groups into a set of a pre-defined number of groups. Any distribution can be collapsed into a bipolar distribution, for instance. In my application, the original distribution –  $\rho_N$  – is the distribution of average income in the  $N$  states of a region or the world. Adapting Esteban, Gradin & Ray’s notation to my purpose, I will refer to the polarization index for the aggregated distribution  $\rho_M$  (or the ‘ $M$ -spike representation of the underlying income distribution’) as  $ER(\alpha, \rho_M) = k \sum_{g=1}^M \sum_{h=1}^M p_g^{1+\alpha} p_h |y_g - y_h|$ . This aggregation introduces an approximation error. Esteban, Gradin & Ray (2005) suggest to correct for that error by subtracting  $\beta (G(f_N) - G(f_M))$  from  $ER(\alpha, \rho_M)$ . In my notation,  $G(f_N)$  is ‘total inequality’ – the Gini index for the original  $N$ -group

distribution, or  $ER(0, \boldsymbol{\rho}_N) = \sum_{i=1}^N \sum_{j=1}^N p_i p_j |y_i - y_j|$ . Income is normalized to  $\mu = 1$ , and  $k \equiv 1$ .  $G(f_M)$  is ‘across-group inequality’ – the Gini index for the aggregated distribution, or  $ER(0, \boldsymbol{\rho}_M) = \sum_{g=1}^M \sum_{h=1}^M p_g p_h |y_g - y_h|$ .  $\beta$  is a free parameter, and is interpreted as the ‘sensitivity toward in-group cohesion’ (Esteban, 2005: 13). The  $G(f_N) - G(f_M)$  term – ‘total inequality minus across group inequality – measures internal inequality within the groups’ (Esteban, 2005: 13). The EGR index is thereby:

$$\begin{aligned} EGR_{\alpha, \beta} &= ER(\alpha, \boldsymbol{\rho}_M) - \beta (G(f_N) - G(f_M)) \\ &= \sum_{g=1}^M \sum_{h=1}^M p_g^{1+\alpha} p_h |y_g - y_h| - \beta \left( \sum_{i=1}^N \sum_{j=1}^N p_i p_j |y_i - y_j| - \sum_{g=1}^M \sum_{h=1}^M p_g p_h |y_g - y_h| \right) \end{aligned}$$

I will calculate the EGR index for the two-group aggregation in the analyses below. This index is clearly independent of variations in the number of countries, and are therefore comparable over time and across region. I will follow Esteban (2005) and set  $\beta \equiv 2$ .

### 3.2.5 An $N$ -normalized Polarization Index

This definitional relationship between the  $ER_\alpha$  index and  $N$  is highly problematic for the analysis of polarization and interstate conflict. Since the number of countries in the system varies greatly over time and across regions, and since it is very difficult to construct a measure of the magnitude of conflict in the system that is not dependent on  $N$ , we cannot analyze the relationship without taking  $N$  into account. In the time-series statistical analysis presented below,  $N$  may be entered as a control variable. However, to be able to present the relationship between polarization and conflict graphically it is preferable to use a measure of polarization that is independent of  $N$ . In the special case where all groups are of similar size, it can be seen from expression (3) that multiplying the index with  $N^\alpha$  would render the index independent of  $N$ . I will use this variation



of the polarization index in the remainder of this paper:

$$\begin{aligned}
 N_{\alpha\text{-pol}} &= kN^{\alpha} \sum_{i=1}^N \sum_{j=1}^N p_i^{1+\alpha} p_j |y_i - y_j| \\
 &= N^{\alpha} \sum_{i=1}^N \sum_{j=1}^N p_i^{1+\alpha} p_j |y_i - y_j|
 \end{aligned}$$

The dashed line in Figure 2 shows the global development in income  $N$ -polarization from 1900 to 2000. Note the increase in  $N$ -polarization accompanying the decolonization in Africa in the 1960s. This is intuitively appealing, since most of these new states were and still are much poorer than the states that existed before the second World War. The  $N$ -polarization index also indicates that polarization has been decreasing since 1990, most likely because of the strong growth in China and India.

### 3.3 Affinity: UN Voting Patterns

Countries' preferences in issues that are salient in international politics can be inferred from their voting patterns in the UN general assembly. Previous studies (e.g. Signorino & Ritter, 1999 and Gartzke & Jo, 2002) have employed data on such voting patterns to measure 'affinity' – the extent to which two countries have similar preferences. A polarized assembly would be an assembly where one large block of countries share the same preferences and regularly vote in opposition to another block. The 'affinity polarization' measure developed below is used partly as an independent variable, measuring the global or regional polarization of preferences, and partly as a dependent variable, measuring the amount of conflictual voting patterns in the assembly. The source for this variable is reported below.

## 4 Data

The dependent variable is based on the Militarized Interstate Dispute (MID) dataset from the Correlates of War Project (Ghosn, Palmer & Bremer, 2004). The MID dataset reports all militarized disputes countries have been involved in from 1816 up to 2001. Disputes include incidents of varying hostility, ranging from threats and displays of force up to full-scale wars. I weight the disputes according to their fatality level, using the following scheme; 1 for threats, displays, 2 for use of force w.o. fatalities, 3-8 for five levels of fatality.

### 4.1 Income and Population Data

Income and population data were taken from the Penn World Tables (PWT), version 6.1 (see Heston and Summers, 1992) and from Maddison, 1995. PWT data were used for the years 1950–2000. For earlier years, I used data from Maddison. PWT and Maddison both give GDP in constant dollars, but differ somewhat in terms of the base year used and other measurement choices. To make the data comparable, the two GDP series were merged by calculating the average ratio of Penn World Tables to Maddison for the years 1950–1952 and to multiply this factor with Maddison’s figures for the pre-1950 period.

A systemic analysis of polarization and conflict is sensitive to missing data. Maddison only records data for several countries approximately once every decade. This is the case for China. Given China’s large and poor population, its entry into and out of the dataset dramatically affects the polarization indices. To avoid this problem, missing GDP and population data for individual countries were filled in through inter- and extrapolation of logged values. Although extrapolation necessarily introduce errors that may produce undesirable results in country-level studies, these problems are small in a system-level analysis relative to the problems caused by incomplete measurement.

Some countries do not have data for any years (e.g. Cuba and Libya). These

countries were excluded entirely from the study.

As in Esteban & Ray (1994: 847), I use the logarithm of incomes.

## 4.2 Affinity Data

I used the data on ‘affinity’ compiled by Gartzke & Jo (2002). The variable is coded for all pairs of UN members for the 1946-1996 period. Values range from  $-1$  (least similar interests) to  $1$  (most similar interests), and were calculated using the ‘S’ indicator (Signorino & Ritter, 1999). ‘S’ is calculated as  $1 - \frac{2d}{d_{\max}}$  where  $d$  is the sum of metric distances between votes by pairs of UN members in a given year and  $d_{\max}$  is the largest possible metric distance for those votes.

## 4.3 Regions

I analyze the relationship between polarization and interstate conflict aggregating information to the global level, and to five regions. The regions are 1) the Americas, 2) Western Europe (including Russia and Turkey), 3) North Africa and the Middle East (also including Russia and Turkey), 4) Asia and Australia (again including Russia), 5) Oceania, and 6) Africa south of Sahara.

## 4.4 Democracy

I use the democracy index developed by Gates et al. (2003). The index is normalized to range from  $0$  (consistent autocracy) to  $1$  (consistent democracy). The index is a combination of the Polity IV index (Jagers & Gurr, 1995) and Vanhanen’s Polyarchy index (Vanhanen, 2000).

Region	Period	$N$	$ER_{1.6}$	$N_{1.6}\text{-Pol}$	$EGR_{1.6,2}$	$ER_0$	Conflict: weighted share of dyads in MID (%)	Affinity $N$ -polari- zation (1946– 1996)
World	1900-2000	75.0	.101	68.8		1.86	.51	
World	1919-1939	37.1	.151	48.3		1.86	.28	
World	1950-2000	117.5	.052	99.9		1.90	.37	10.71
Americas	1900-2000	15.6	.17	12.8	.98	1.12	.12	1.82
Asia	1900-2000	10.6	.21	6.07	.78	1.07	.82	2.47
SS Africa	1960-2000	37.0	.023	6.89	.44	.96	.29	2.32
Europe	1900-2000	23.2	.045	5.81	.72	1.05	.57	.56
Oceania	1950-2000	3.1	.119	1.07	.69	1.09	.00	.54
M. East	1950-2000	14.6	.077	4.88	.86	.80	.86	1.73

Table 1: Average income polarization and conflict by region and period

## 5 Results

### 5.1 Average Polarization and Conflict Over Time

#### 5.1.1 Income Polarization

Table 1 shows average values for the different income polarization variables for the world and for the six regions. Figures for the world are given as averages for three time-frames: 1900 – 2000, 1919 – 1939, and 1950 – 2000. Figures for Oceania and the Middle East are given only for the 1950 – 2000 period, and figures for Africa South of Sahara for the 1960 – 2000 period.

The first column reports the average number of countries ( $N$ ) in each region over time. The regions differ considerably in terms of size, from 3.1 for Oceania to 117.5 for the world after 1950. The three following columns report average scores for the  $ER_{1.6}$ , the  $N_{1.6}\text{-Pol}$ , and the  $EGR_{1.6,2}$  indices.

The three polarization indices give quite different comparisons of income polarization across regions. Since  $N$  varies so much, the non-adjusted  $ER_{1.6}$  figures are not comparable across regions. Oceania appears to be the most polarized region, but this is most likely because average  $N$  is very low. The  $N_{1.6}\text{-Pol}$  measure, on the other

hand, allows a more proper comparison. As one would expect, polarization is larger for the globe as a whole than for each individual region, and twice as large for the post-colonialism 1950 – 2000 period as for the 1919 – 1939 period. The Americas is by far the most polarized region, with a  $N_{1,6}$ -Pol score almost twice that of the second-most polarized region. Four regions have intermediate levels of polarization according to this measure, ranked in the order Africa South of Sahara, Asia, Europe, and the Middle East. Oceania is clearly the least polarized region using this measure.

The  $EGR_{1,6,2}$  index also shows that the Americas is the most polarized region, but ranks the remaining regions differently. According to this index, SS Africa is the least polarized region. The remaining regions are ranked in the order Middle East, Asia, Europe, and Oceania. Finally, the  $ER_0$  index shows that global ‘inequality’ is larger than intra-region inequality. The Americas is the most unequal region, but this index produces yet another rank ordering of the remaining regions.

The two right-most columns show the two conflict measures. According to the MID-based measure, Asia and the Middle East have had the most conflictual histories, followed by Europe and SS Africa. The Americas and Oceania have been the most peaceful regions. The measures for the world in the three different time periods lie in the middle of the distribution of conflict proneness. According to the N-polarization index based on UN voting patterns (affinity), the world is far more polarized than any of the regions. Asia and SS Africa have the most polarized voting patterns of the regions, followed by the Americas and the Middle East. Europe and Oceania have much less polarized voting patterns.

Table 1 does not indicate a close correspondence between income polarization and conflict. Some of the lack of correspondence is due to distance. Militarized disputes occur primarily between countries that are geographically proximate (Gleditsch & Singer, 1975), but the polarization index does not take any geographical factors into account. Taking that into account, the fact that global conflict levels are more than half of that of the most conflictual region can be seen as supporting the argument that income

polarization within a system increases the amount of conflict within it. The high levels of UN voting polarization in the global system underscores this impression.

Within regions, however, the relationship between polarization and conflict does not follow any clear patterns. Oceania is the least polarized region, and has had no intra-regional militarized disputes since 1950. The Americas, on the other hand, is the most polarized region, but has been a comparatively peaceful one. Asia and the Middle East have had frequent intra-regional conflicts, but are not particularly polarized.

### 5.1.2 Political System Polarization

Table 2 shows how the world and regions have been polarized in terms of political system.<sup>6</sup> As for income, global polarization is much more marked than intra-regional polarization. The democracy *N*-polarization index indicates that the pattern of political system polarization resembles that of income polarization. This is of course no coincidence, since democracy and income is highly correlated (Lipset, 1959; Burkhart & Lewis-Beck, 1994). The Americas has also on average been the most polarized region in terms of political systems, but the distance down to Asia, SS Africa, and Europe is much smaller. The Middle East is considerably less polarized than these regions, and Oceania is as close to being non-polarized as one can get.

There is no clear relationship between regional polarization in terms of political systems and conflict. Oceania may be peaceful because of its absence of polarization, but it is more likely that this is due to the fact that the countries in the region are all democratic and the absence of joint borders between island states. The Middle East is also relatively non-polarized, but is the most conflictual region. This is more consistent with the standard democratic peace hypothesis than the polarization argument, since, apart from Israel, all countries in the region are non-democratic. According to the democratic peace hypothesis, a non-polarized but autocratic region should have more

---

<sup>6</sup>The number of countries in each region differs somewhat from the number reported in Table 1 since a different set of countries falls out because of missing observations.

Region	Period	$N$	$ER_{1.6}$	$N_{1.6}$ -Pol	$ER_0$	Conflict: Weighted share of dyads in MID (%)
World	1900-2000	75.0	.017	15.5	.39	.51
World	1919-1939	37.1	.022	6.96	.37	.28
World	1950-2000	117.5	.013	25.4	.42	.37
Americas	1900-2000	15.6	.049	3.20	.32	.12
Asia	1900-2000	10.6	.047	2.70	.28	.82
SS Africa	1960-2000	37.0	.0080	2.35	.29	.29
Europe	1900-2000	23.2	.017	2.14	.38	.57
Oceania	1950-2000	3.1	.0037	.024	.013	.00
Middle East	1950-2000	14.6	.025	1.41	.25	.86

Table 2: Average political system polarization and conflict by region and period

conflict than the democratic counterpart.

## 5.2 Trends in Polarization and Conflict

Tables 1 and 2 portray a static picture of polarization and conflict. Both variables have varied considerably over time. In this section, I will investigate whether there is any systematic covariation between the two aspects of polarization and conflict within each of the regions over time. I will mainly rely on plots of the  $N$ -polarization and conflict measures. In the next section I use statistic models to investigate this relationship in more depth.

### 5.2.1 Income Polarization

Figure 3 overlays the two series 'Weighted conflict' and the  $N_{1.6}$ -Pol index.<sup>7</sup> As in Table 1, there is no trace of a positive relationship between polarization and conflict: Polarization was relatively low up to 1950 when the world saw the most serious conflicts ever. The strong increase in global polarization following decolonialization (1958–1978) was not associated with a corresponding increase in conflict.

Figure 4 plots the weighted conflict measure along with the  $N_{1.6}$ -polarization indices

---

<sup>7</sup>The  $N_{1.6}$ -Pol index drops considerably during World War II. This is mainly due to missing data.

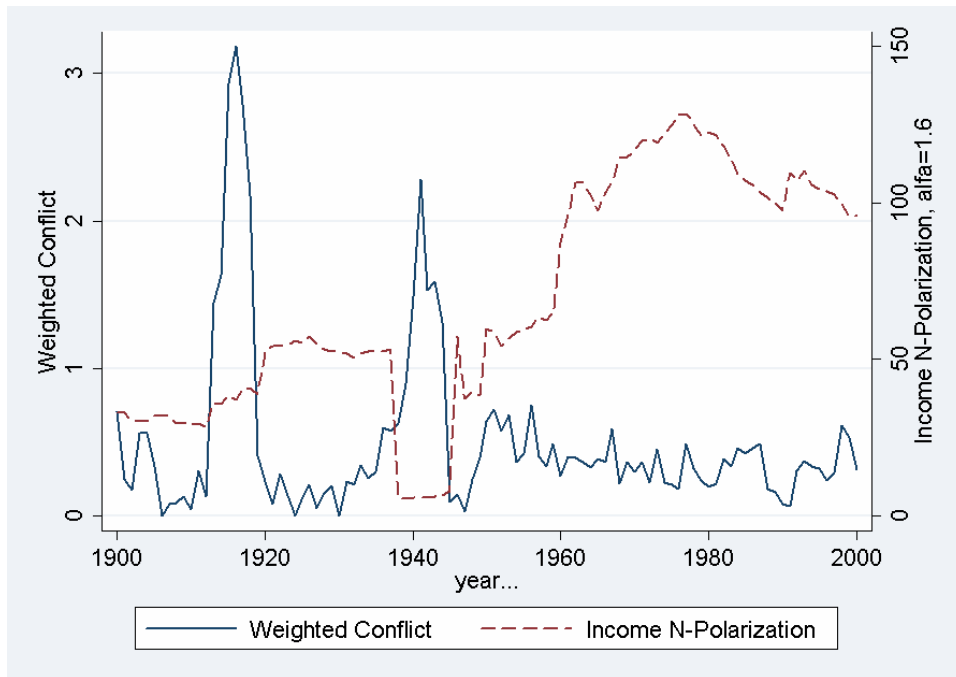


Figure 3:  $N_{1.6}$  income polarization and weighted conflict measures, Global System, 1900–2000

for affinity and income for the 1946 – 96 period. None of the series seem to co-vary systematically over time. The amount of militarized disputes show a clear decreasing trend since the Korean War. UN voting polarization jumped around the time of the oil crisis of the 1970s, whereas income polarization increased up to 1975 and decreased thereafter.

Figure 5 shows the development in income  $N$ -polarization for the six regions. Both the  $x$  and  $y$  axes have the same scale in each of the six sub-plots to facilitate comparison. The conflict measure (weighted share of dyads in MID) is labeled along the left axis, the polarization index on the right axis.

The plots show considerable increases in the polarization index for the Americas, Asia, and the Middle East around 1950. A large part of this increase is due to the inclusion of new countries in the post-1950 period because of better data availability. In the Americas, for example, I do not have income data for any of the Central American or



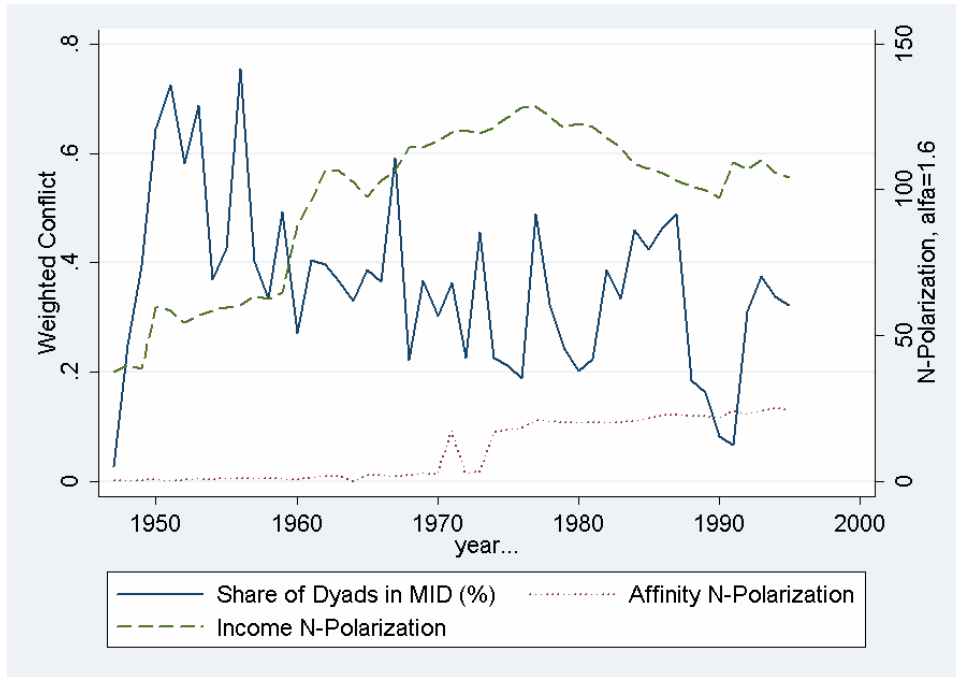


Figure 4: Weighted share of dyads in conflict, affinity  $N$ -polarization, and income  $N$ -polarization, 1946-1996

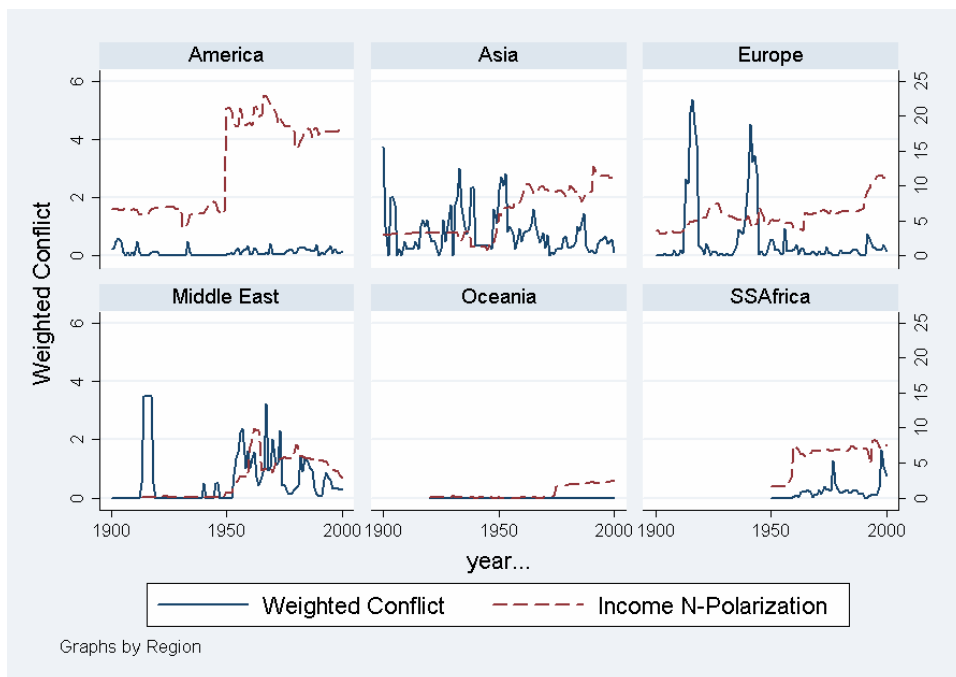


Figure 5: Conflict and  $N_{1.6}$ -Pol, 1900 – 2000.

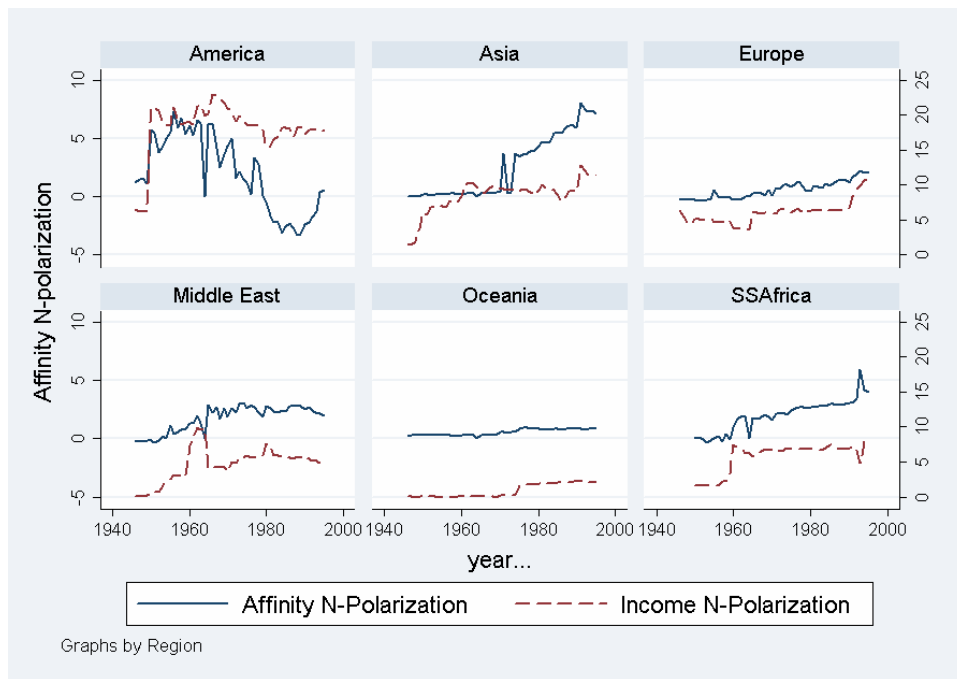


Figure 6: Affinity and Income  $N$ -Polarization, 1946–1996, by region.

Caribbean countries before 1950.<sup>8</sup> Since these countries are on the average poorer than the countries in North and South America, the polarization index more than doubles when these countries enter the dataset. Although this is a weakness of the data, the conflict index is calculated only for the countries that have data for the income variable in a given year. If there really is a relationship between polarization and conflict, we would expect the conflict index to increase when more poor countries enter the dataset for a region.

Asia shows a clearly increasing trend in polarization up to 1991, after which growth in China offsets the effects of the previous growth of the Asian tigers. Conflict has on average decreased during the 20th Century in Asia. Europe also shows a pattern of increased polarization and decreased conflict. In the Middle East and Caucasus region, one can discern a positive relationship between the two variables, with both variables increasing from the 1940s, peaking around 1960 and decreasing afterwards. The two remaining regions display no discernible patterns.

<sup>8</sup>These countries are included in the Penn World Tables dataset but not in Maddison (1995).

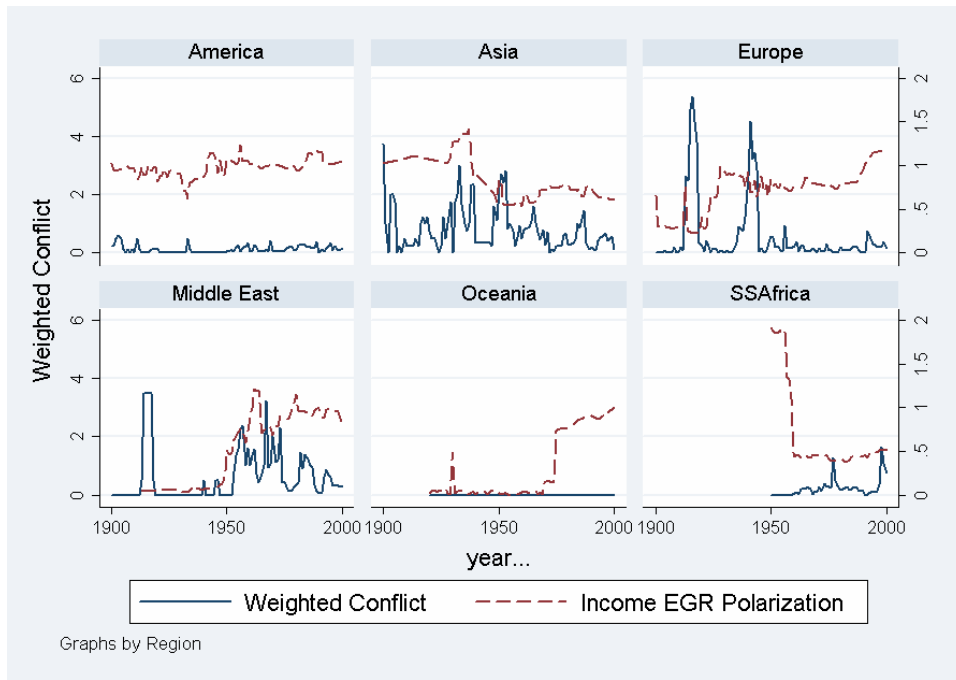


Figure 7: Conflict and  $EGR_{1.6, 2}$  polarization, 1900–2000, by region.

SS Africa increased in polarization just after decolonialization (up to 1957, the dataset only includes South Africa and Ethiopia), but has remained stable since then. There is an increase in conflict after the introduction of polarization, but this may simply be because it took some time before any pairs of SS African countries were sufficiently close to have reasons for interstate disputes.

Income polarization did not change much in Europe before the fall of the Soviet Union, when income data became available for the former communist countries. The income polarization variable does not present itself as a good candidate for explaining the two world wars, although polarization saw a small peak in the late 1920s.

Figure 6 shows the development in affinity and income N-polarization for the six regions in the 1946–1996 period.

Figure 7 shows the same relationship using the  $EGR_{1.6,2}$  index. As in Table 1, the two polarization indices give to some extent very different pictures of the regions. The  $EGR$  index indicates no increase in polarization due to increase in the number of countries in 1950 in America and Asia. For Asia,  $EGR$  polarization decreases from 1940

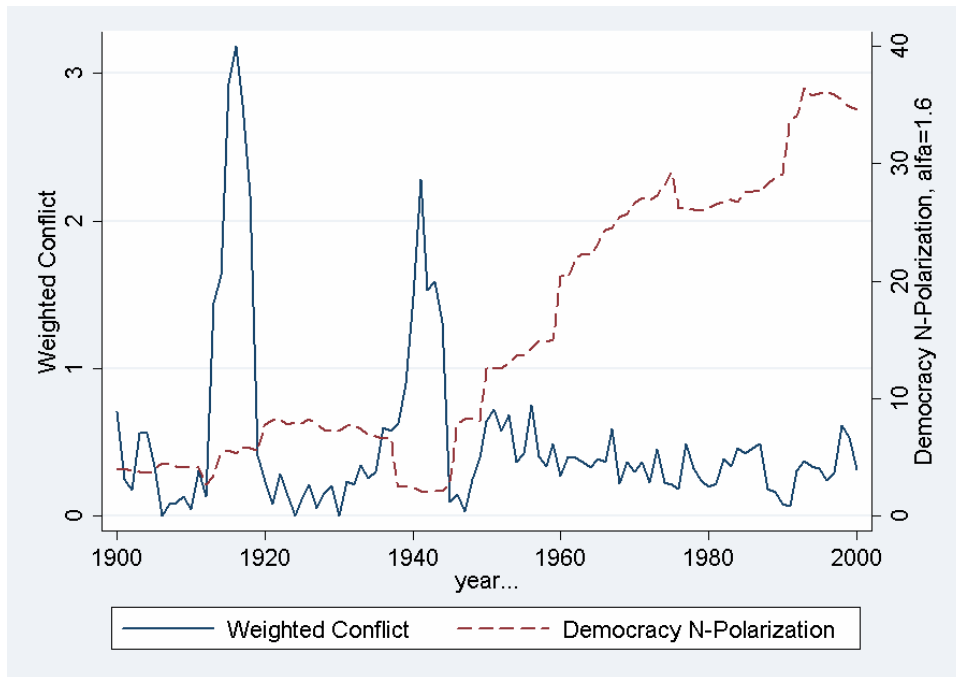


Figure 8: Weighted conflict measure and democracy  $N_{1.6}$ -polarization, 1900 – 2000

to 1960. The *EGR* index shows the same increases in polarization in post-World War II Europe, Middle East, and Oceania as the  $N$ -polarization index. These differences notwithstanding, only for the Middle East does the plot indicate any pattern that supports the hypothesis of a relationship between income polarization and conflict

### 5.2.2 Political System Polarization

Figure 8 shows the relationship between the conflict measure and political system  $N_{1.6}$  polarization. The Figure shows a pattern that resembles that for income in Figure 3. Democracy polarization increased only slowly from 1900 to 1950, but with decolonialization polarization surged tremendously. In contrast to income polarization, democracy polarization continued to increase after the 1970s, but may have reached a peak after the fall of the Soviet Union.

Figure 9 shows the same relationship for each of the six regions. Polarization patterns differ markedly over regions. The Americas evolved to become the most polarized region in the 1970s, but has become much more homogenous after that. Asia still con-

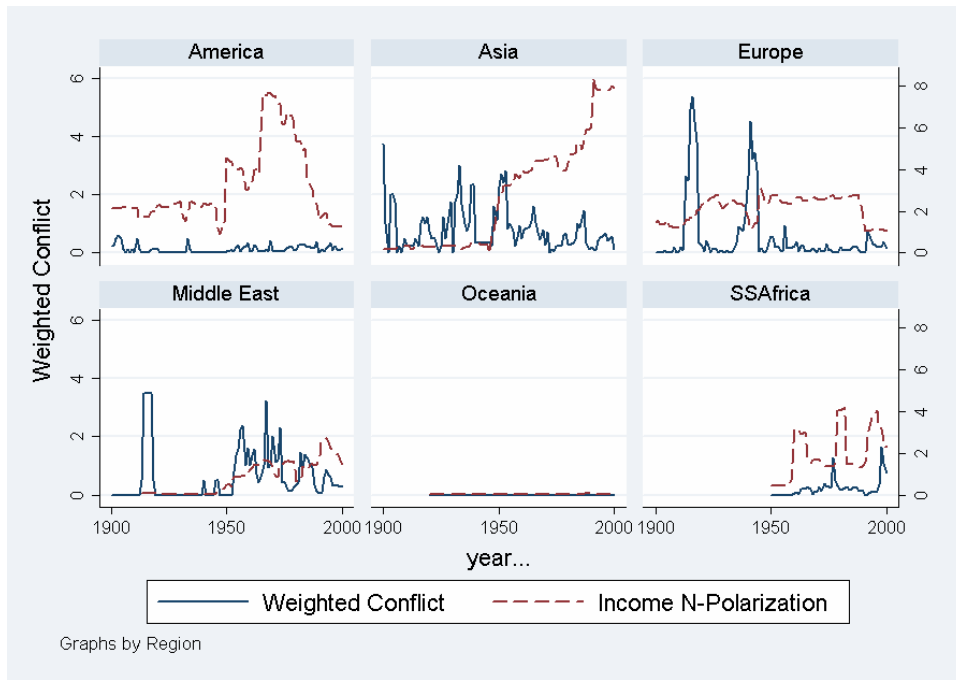


Figure 9: Weighted Conflict and Democracy  $N$ -polarization, by region, 1900 – 2000

tinues to become more polarized in terms of political systems, and is likely to remain so until China democratizes. Europe was quite polarized until after the fall of the Iron curtain, and is now quite non-polarized. The other regions display patterns similar to those for income.

### 5.3 ARCH Analysis

The graphical analysis indicated that there was no relationship between polarization and militarized disputes, neither globally (Figure 3) nor regionally except for the Middle East region (Figure 5). There did not seem to be any relationship between polarization in UN voting patterns and militarized conflict either (Figure 6) . A similar inconclusiveness resulted from the analysis of political system polarization.

In this section, I present more formal tests of these relationships using statistical time series analysis techniques. I use ARCH models for all the analyses since, as is evident from the figures shown above, the volatility of the series vary over time.<sup>9</sup>

<sup>9</sup>For most of the models presented below, Engle’s Lagrange-multiplier test of the null hypothesis of

Dependent variable: 'Weighted conflict'	$\hat{\beta}$	$\hat{se}$	$z - score$
Income $N$ -Pol $_{\alpha=1.6}$	-.00077	.00058	-1.34
Constant	.45	.049	9.23
$AR(1)$ term	1.30	.119	9.23
$AR(2)$ term	-.38	.093	-4.10
$MA(1)$ term	-.92	.062	-14.87
$ARCH(1)$ term	1.10	.27	4.05
$ARCH$ constant	.018	.0051	3.50
$N$	100		
$\log likelihood$	2.02		

Table 3: ARCH estimation of Weighted Conflict and Income N-Polarization, All Regions, 1900–2000

### 5.3.1 Income Polarization

Table 3 presents an ARCH analysis where global ‘Weighted conflict’ is the dependent variable and global income  $N_{1.6}$ -polarization is the explanatory variable. The estimate for polarization is not statistically significant, and the sign is in the wrong direction. This analysis does not indicate that income polarization between countries alters the amount of militarized conflict in the world, just as we inferred from Figure 3.

In Table 4, I show the same analysis for four of the regions.<sup>10</sup> The results pull in different directions. Polarization is estimated to significantly increase conflict in the Americas. This probably to a large degree reflects the change to higher levels of average conflict levels after the jump in polarization in 1950 shown in Figure 5. In Europe, in contrast, polarization is estimated to reduce conflict. For the other regions, the estimate for income polarization is not significantly different from 0.

### 5.3.2 Affinity Polarization

Table 5 demonstrates a similarly inconclusive relationship between polarization in UN voting patterns and militarized conflict. The results are just as inconclusive as Figure 

---

no autoregressive conditional heteroskedasticity were rejected by clear margins (see StataCorp 2005: 25). I report results for ARCH models throughout below for comparability, even though the ARCH terms occasionally are not significant.

<sup>10</sup>It was not possible to obtain results for the remaining two regions.

Dependent variable: 'Weighted conflict'	The Americas 1901 – 2000	Europe 1901 – 2000	Asia 1901 – 2000	Middle East 1951 – 2000
Income $N$ -Pol $_{\alpha=1.6}$	.0056**	-.100***	-.016	-.0057
Constant	.0024 .043 .0024	.011 .73 .062	.014 .61*** .073	.085 .85** .39
$AR(1)$ term	.38*** .14	.27* .15	.47*** .15	.57*** .17
$MA(1)$ term		.083 .15	-.21 .13	
$ARCH(1)$ term	.43** .21	3.63*** .59	1.23*** .37	.10 .26
$ARCH$ constant	.0097** .0023	.0075** .0030	.079** .035	.33** .061
$N$	100	100	100	50
log <i>likelihood</i>	72.31	-45.12	-74.13	-45.87
*: $p < 0.10$ **: $p < 0.10$ ***: $p < 0.01$				

Table 4: ARCH estimation of Weighted conflict and Income N-Polarization, By Region, 1900–2000

4 - there is no significant relationship between affinity polarization and the weighted conflict measure.

### 5.3.3 Political System Polarization

Finally, Tables 6 and 7 present the results of corresponding analyses for political system polarization and amount of militarized conflict, for all of the world and broken down

Dependent variable: 'Weighted conflict'	$\hat{\beta}$	$\hat{se}$	$z - score$
Affinity $N$ -Pol $_{\alpha=1.6}$	-.0041	.0035	-1.16
Constant	.39	.046	8.52
$AR(1)$ term	-.53	.26	-2.06
$AR(2)$ term	.41	.17	2.42
$MA(1)$ term	.91	.26	3.50
$ARCH(1)$ term	.048	.24	0.84
$ARCH$ constant	.018	.0051	3.44
$N$	51		
log <i>likelihood</i>	23.66		

Table 5: ARCH estimation of Weighted conflict and affinity N-Polarization, All regions, 1900–2000

Dependent variable: 'Weighted conflict'	$\hat{\beta}$	$\hat{se}$	$z - score$
Political System $N$ -Pol $_{\alpha=1.6}$	-.0024	.0026	-0.93
Constant	.41	.041	10.07
$AR(1)$ term	.42	.087	4.81
$ARCH(1)$ term	1.16	.31	3.78
$ARCH$ constant	.020	.0060	3.35
$N$	100		
$\log likelihood$	-2.97		

Table 6: ARCH estimation of Weighted Conflict and Political System N-Polarization, All Regions, 1900–2000

on regions. The results are equally non-conclusive, and give no support to an idea of a system-level relationship between polarization and conflict.

## 6 Conclusion

Many social scientists argue that social systems that are highly polarized in terms of income distributions or preferences relating to salient issues have higher levels of conflict than less polarized systems. This expectation might also apply to global distributions between countries, such that this underlying conflict is reflected in patterns of overt militarized interstate conflict.

In this paper, I have investigated how polarization in terms of income, voting patterns in the UN general assembly, and political systems relate to militarized interstate conflict. I argued that dependence theory imply a positive relationship between conflict and income at the systemic level, and the democratic peace hypothesis a positive relationship between democracy polarization and conflict.

The polarization measure suggested by Esteban & Ray (1994) is the best tool for aggregating individual and group level data into a systemic score for polarizataion. The application of this measure necessitated a reformulation, however, since the ER index is not independent of the number of groups sampled except in the special case where their measure is proportional to the Gini index of income inequality. This is a problematic



Dependent variable: 'Weighted conflict'	The Americas 1901 – 2000	Europe 1901 – 2000	Asia 1901 – 2000	Middle East 1951 – 2000
Political System $N$ -Pol $_{\alpha=1.6}$	.013 .0079	-.17*** .049	-.027 .021	.047 .36
Constant	.078** .037	.60*** .11	.72*** .063	.75 .47
$AR(1)$ term	.46*** .12	-.32*** .012	1.27*** .19	.58*** .16
$AR(2)$ term		.79*** .019	-.52*** .089	
$MA(1)$ term		1.02*** .0031	-.64 .23	
$ARCH(1)$ term	.50** .23	6.68*** 1.22	1.20*** .36	.11 .26
$ARCH$ constant	.0091** .0023	.0062 .0043	.090*** .032	.33** .066
$N$	100	100	100	50
$\log likelihood$	71.29	-48.61	-74.15	-45.87
*: $p < 0.10$ **: $p < 0.05$ ***: $p < 0.01$				

Table 7: ARCH estimation of Weighted conflict and Political System N-Polarization, By Region, 1900–2000

shortcoming in studies of systems of sovereign states since the number of states vary both across sub-systems and through time. The dependence on  $N$  is probably also a serious problem for other applications of the measure where it is necessary to compare countries or regions that differ in terms of number of groups sampled. To overcome this problem, I develop an extension to the original ER measure called  $N$ -polarization that is independent of the number of countries in the system. I also analyze global and regional polarization patterns using the extension of the ER index formulated in Esteban, Gradin & Ray (2005).

I have reported a variety of different representations of the relationship between the three polarization measures and conflict: Simple comparisons of mean conflict and polarization levels across regions and over time, plots of the evolution of polarization and conflict over time, and GARCH analyses of the relationship at the global and regional levels.

The results are highly inconclusive. In some regions, I find a positive relationship

between income polarization and conflict as expected. In other regions, I find the opposite, and in most regions no relationship at all. The same ambiguity applies to democracy polarization and to polarization in terms of voting patterns in the UN general assembly.

There seems to be little basis for concluding that there is any relationship between the system-level measures of the three types of polarization and the intensity of militarized interstate disputes. This does not mean that the underlying logic is not warranted, however. The dual finding in the democratic peace literature that democracies do not fight each other but participate in war as much as non-democracies is well established, for instance. Aggregating the dyad and country level measures up to the regional and global level entails a severe loss of detailed information, however. When this information is available, it may be a better research strategy to estimate the micro-level relationships using disaggregated data and construct the aggregated relationship from the lower-level conclusions.

Another reason for the inconclusiveness is that transportation costs strongly constrains militarized conflicts to occur between neighbors. The polarization measures developed here do not account for such vicinity effects. Hence, even if two countries are as antagonistic toward each other as the polarization and conflict argument implies, they will not have the means to fight a militarized disputes if they are located on opposite sides of the globes. The regional analysis is less sensitive to this, but even within regions such as the Americas and Asia it may be fairly inconceivable that Bolivia fights Belize or that Turkmenistan fights Bhutan. Future work on polarization and interstate conflict must take these limitations better into account than is possible with the currently available measures.

## 7 References

Brown, Graham, 2005. 'Horizontal inequality or polarization? Inter-group economic disparity and its relationship with conflict'. Paper presented at the IGCC conference Disaggregating the Study of Civil War and Transnational Violence, March 7–8, San Diego, CA.

Chan, Steve, 1984. 'Mirror, Mirror on the Wall... Are the Freer Countries more Pacific?', *Journal of Conflict Resolution* 28(4): 617–648.

Collier, Paul & Anke Hoeffler, 2004. 'Greed and Grievance in Civil War', *Oxford Economic Papers* 56(4):563-595.

Doyle, Michael W., 1986. 'Liberalism and World Politics', *American Political Science Review* 80(4): 1151-1169.

Esteban, Joan, 2005. 'Economic Polarization in the Mediterreanean Basin: An Introduction to the Notion and Measurement of Polarization'. Typescript, Institut d'Anàlisi Econòmica, Barcelona.

Esteban, Joan; Carlos Gradin & Debraj Ray, 2005. 'Extensions of a Measure of Polarization, With an Application To the Income distribution of Five OECD Countries'. Typescript, Institut d'Anàlisi Econòmica, Barcelona.

Esteban, Joan & Debraj Ray, 1994. 'On the Measurement of Polarization', *Econometrica* 62 (4): 819-851.

Galtung, Johan, 1971. 'A Structural Theory of Imperialism', *Journal of Peace Research* 8(2): 81-117.

Gartzke, Erik & Dong-Joon Jo (2002). *The Affinity of Nations Index Version 3.0*. Codebook. Downloadable from <http://www.columbia.edu/~eg589/datasets.htm>.

Gates, Scott; Håvard Hegre, Mark P. Jones, & Håvard Strand, 2003. 'Institutional Inconsistency and Political Instability: The Duration of Polities'. Typexcript, Centre for the Study of Civil War, PRIO. URL: <http://folk.uio.no/hahegre/Papers/Institutions.pdf>.

Ghosn, Faten, Glenn Palmer, and Stuart Bremer. 2004. "The MID3 Data Set, 1993–2001: Procedures, Coding Rules, and Description." *Conflict Management and Peace Science* 21:133-154.

Gleditsch, Nils Petter & Håvard Hegre, 1997. 'Peace and Democracy: Three Levels of Analysis', *Journal of Conflict Resolution* 41(2): 283-310.

Huntington, Samuel P., 1991. *The Third Wave: Democratization in the Late Twentieth Century*. Norman, OK & London: University of Oklahoma Press.

Jagers, Keith, & Ted Robert Gurr, 1995. 'Transitions to Democracy: Tracking Democracy's Third Wave with the Polity III Data', *Journal of Peace Research* 32(4): 469-482.

Jones, Daniel M.; Stuart A. Bremer & J. David Singer, 1996. 'Militarized Interstate Disputes, 1816-1992: Rationale, Coding Rules, and Empirical Patterns', *Conflict Management and Peace Science* 15(2): 163-213.

Kant, Immanuel, 1795/1991. 'Perpetual Peace: A Philosophical Sketch', in Hans Reiss, ed., *Kant: Political Writings*. Cambridge: Cambridge University Press (93–130).

Krugman, Paul R., 1981. 'Trade, Accumulation, and Uneven Development', *Journal of Development Economics* 8: 149–161.

Krugman, Paul R., 1994. *Rethinking International Trade*. Boston, MA: Massachusetts International Press..

Lucas, Robert E., Jr., 1990. 'Why Doesn't Capital Flow from Rich to Poor Countries?', *American Economic Review* 80(2):92–96.

Maddison, Angus, 1995. *Monitoring the World Economy 1820-1992*. Paris: Development Centre of the Organization for Economic Co-Operation and Development.

Maoz, Zeev & Bruce M. Russett, 1993. 'Normative and Structural Causes of Democratic Peace, 1946-1986', *American Political Science Review* 87(3): 624-638.

Reynal-Querol, Marta, 2002. 'Ethnicity, Political Systems, and Civil Wars', *Journal of Conflict Resolution* 46(1):29–54.

Raknerud, Arvid & Håvard Hegre, 1997. 'The Hazard of War: Reassessing the Evidence for the Democratic Peace', *Journal of Peace Research* 34(4): 385-404.

Sen, Amartya, 1973. *On Economic Inequality*. New York: Norton.

Signorino, Curtis & Jeffrey M. Ritter, 1999. 'Tau-b or not tau-b: Measuring the Similarity of Foreign Policy Positions', *International Studies Quarterly* 43(1):115–144.

StataCorp, 2005. *Time Series. Stata Statistical Software: Release 9*. College Station, TX: StataCorp.

Summers, Robert & Alan Heston, 1991. 'The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988', *Quarterly Journal of Economics* 106(2): 327–368.

Vanhanen, Tatu, 2000. 'A New data set for Measuring Democracy, 1810–1998', *Journal of Peace Research* 37(2): 251–265.

Waltz, Kenneth, 1979. *Theory of International Politics*. Reading, MA: Addison-Wesley.

Weisstein, Eric W. et al., 2005. 'Gini Coefficient'. *MathWorld—A Wolfram Web Resource*. <http://mathworld.wolfram.com/GiniCoefficient.html>, October 27, 2005.

Østby, Gudrun, 2005. 'Horizontal Inequalities and Civil Conflict'. Paper proposed for the PAC special issue.