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Power Parity, Power Preponderance, and Violent Conflict

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ABSTRACT

A long standing question in the international relations literature is whether having system-level power parity, the situation in which the most powerful countries in the international system are approximately equal in power, or power preponderance, the situation in which one country has much more power than any other country, is conducive to peace or, conversely, exacerbates conflict. This paper attempts to answer that question by using an index of country power developed by the author to identify periods of power parity as well as periods of power preponderance and then relate those periods to the frequency of outbreaks of violent conflict. The paper finds that periods of power parity experience fewer major power-major power war initiations than would be expected when the number of years of being in that state is taken into account. In contrast, the paper finds that periods of power preponderance experience comparatively more major power war initiations. The paper also finds that neither power parity nor power preponderance have an effect on other types of violent conflict.

INTRODUCTION

A perusal of almost any textbook on international relations finds a discussion of the role of the international system and, in particular, characteristics of the system on the level of conflict or the degree of stability of the system. This discussion typically pertains to a broader discussion of the realist school of thought, the concept and measurement of power, or a description of neorealist theory. While the discussions appropriately comment on the limits of using system structure for explaining international relations, I have been struck at how little the textbooks describe what we actually know about the effect of system characteristics on the level of conflict and stability. While it is laudable for the textbook authors to discuss contending theoretical positions, one would hope that we would also provide our students an understanding

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of the state of the art with respect to the empirical evidence about those positions. At best we find assertions such as in Russett and Starr that the findings are not clear or consistent (Russett and Starr, 1989).

Statements such as Russett and Starr's should signal to us that we have not assembled the data (or possibly have not analyzed existing data using the proper techniques) to adequately constrain theorizing based on neorealist and structural realist models. This paper is one of a set of papers by the author to assemble new data and analyze it in new ways to try answer longstanding questions about the relationship between characteristics of the international system and the amount of violent conflict. I believe this effort is worth conducting because the new data enable sample sizes of variables describing the structure of the international system that were heretofore unobtainable. As we shall see later, this belief is well-founded.

One long running (and perhaps the most basic) debate regarding the effect of system structure in the international relations literature concerns whether power parity or power preponderance is a good property of an international system. With respect to power parity, this debate often is stated in terms of whether a balance of power or an equilibrium of power is a good situation for the international system to be in. I use the term 'power parity' in order to avoid ambiguity in the terms 'balance of power' or 'equilibrium' in this context.

Power parity is the situation in which the most powerful countries of the system (typically two or three) are approximately equal in power. This concept of power parity corresponds to the definition of balance of power that says a balance of power is the situation in which the major countries or their alliances are approximately equal in power and can thereby counterbalance each other.¹ In particular, the power parity concept is central to a hypothesis of balance of power theory which states that having a balance of power in a state system—balanced in the sense of the most powerful countries being approximately equal in power—is good in terms of violent conflict being avoided and stability being enhanced.

The alternative position or hypothesis is that stability emerges when a single country possesses a preponderance of power. To be more precise, power preponderance is the situation of one country having a high level of power and, moreover, a significant gap in power between itself and any other country in the system. Power preponderance enjoys its own set of supporters and is often called hegemonic stability theory.

¹This definition is in contrast to definitions focusing on the change in the power distribution or the act of attempting to reach an approximately equal distribution.

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Figure 1 presents two depictions of the relationship between the amount of conflict in a state system and the distribution of power in the system when the distribution is conceived in terms of power parity and preponderance. The first depiction in a very simple way portrays the basic hypothesis of balance of power theory. When the system is in a state of power parity, the amount of conflict is relatively low, and when the system moves from parity to the state of power preponderance, the amount of conflict increases. The depiction contains two variants of the hypothesis. The straight line describes a relaxed version of the hypothesis: the amount of conflict more or less smoothly rises as the system moves from parity to preponderance. The curved line describes an extreme version of the hypothesis: the pacifying effect of parity quickly vanishes as the system moves towards preponderance.

The second depiction states the sharply contrasting basic hypothesis of hegemonic stability theory. In this instance the amount of conflict either smoothly or sharply rises as the system moves from a state of power preponderance to one of power parity depending upon whether one believes a relaxed or extreme version of the hypothesis.

Figure 1 (a)

Relationship of Conflict to Parity versus
Preponderance Power Distribution According to
Balance of Power Theory

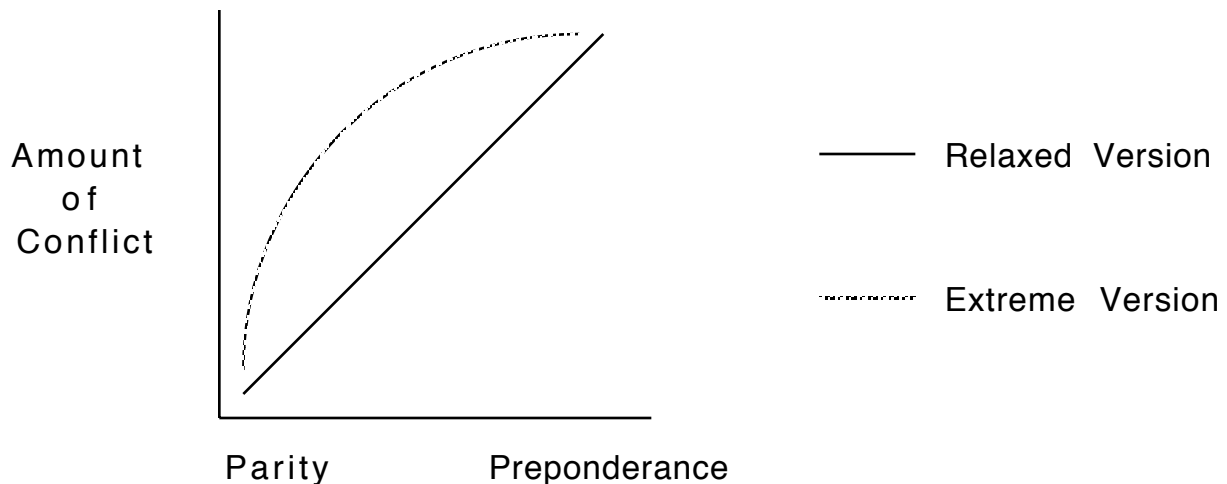
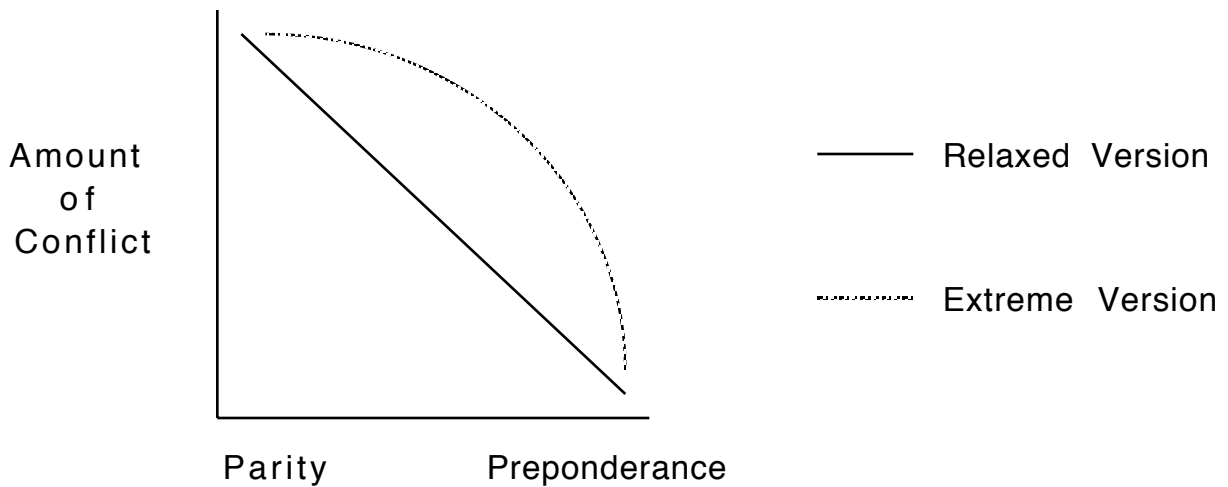


Figure 1 (b)

Relationship of Conflict to Parity versus
Preponderance Power Distribution According to
Hegemonic Stability Theory



Somewhat surprisingly, even though the structural realist school of thought would benefit from the constraint of having these hypotheses answered one way or the other, there has been no conclusive empirical test. We instead find in our textbooks discussions about the debate and the contending positions, but no discussion of what we know, in comparison with other sciences, a sad state of affairs.

Part of the problem is that this particular debate about the effect of the international system's structure on the level of conflict in or the stability of the system is often conflated with arguments regarding the effects of the polarity of the international system. Theorists appear to be unaware or ignore that power parity, power polarity, and power concentration, for example, are three separate traits of (and thus variables measuring) the structure of the international system.

Power parity is essentially a binary measure, the state system either has leading countries close to each other in power or not. Power preponderance is the same. Power polarity is an ordinal measure of the number of countries whose combined

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power surpasses the power of all other countries in the system (although the determination of polarity is not as simple as one might think). Power concentration measures (Ray and Singer, 1973; Mansfield, 1993) also provide a determination of how widely or narrowly held is the power in a state system, but they differ from power polarity, for example, because different polarity situations could have the same power concentration score.

While the ultimate goal must be to (re-)test structural realist hypotheses using a variety of measures, the goal of this paper is to test the two hypotheses presented above. What makes this test different is that it employs a new measure of country military power or capabilities that runs from 1494 to 1945 (Brecke, under review). Use of that measure enables the creation of alternative formulations of power parity and power preponderance, each with significant sample sizes. The alternative formulations make it possible to conduct what is essentially a sensitivity analysis of the impact of each system state, power parity or power preponderance. A second distinguishing feature of this test is that it uses three different conflict datasets encompassing different types or sets of interstate warfare. This makes it possible to determine which class of conflicts are appropriate to the hypotheses and theories behind the hypotheses.

The remainder of the paper follows this logic. It:

1. Briefly describes the measure of power used to determine periods of power parity and power preponderance.
2. Defines the alternative formulations of power parity and power preponderance
3. Portrays the consequences of the formulations in terms of the periods of power parity or power preponderance created.
4. Briefly describes the conflict datasets used.
5. Conducts the tests and presents the key findings.
6. Develops future refinements and extensions to the analysis.

THE MEASURE OF COUNTRY MILITARY CAPABILITIES

This paper utilizes the Military Power Index (MPI), a new measure of country capabilities relevant to conducting military operations. MPI has been operationalized for 12 countries [Austria(-Hungary), France, Prussia/Germany, Italy, Japan, Netherlands, Portugal, Russia, Spain, Sweden, United Kingdom, and United States] for the period 1494 to 1945. The countries comprise and contribute to the calculation of MPI only when they are major powers, which is when they embody at least 5% of the total system power.

MPI consists of four components divided into two groups. Two components, the

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number of major naval combat vessels and the number of field combat troops, comprise the direct military power grouping. The other two components, population and industrial production potential, make up the latent capabilities grouping. For each of the components, the number used in the calculation of MPI is each country's share of the sum of the major powers' values of the component. For the period 1750 to 1945, the MPI value for each country for each year is the arithmetic mean of the four components. For 1494 to 1749, MPI is the arithmetic mean of three components as the industrial production potential data begin at 1750.

The seapower (major naval combat vessels) component came from Modelski and Thompson (1988) and is annual data except for Sweden. Sweden's values were determined by interpolating from datapoints provided in an appendix. The landpower (field combat troops) component came from Rasler and Thompson (1994) and is for 5-year intervals (1490-1494, 1495-1499, etc.) Unfortunately, the interval nature of the data resulted in trajectories that exhibited a step-function character that created statistical artifacts in the calculations of power parity, power preponderance, and other variables such as power polarity. To eliminate those artifacts, I interpolated annual data values using the Rasler and Thompson values for the intervals at the midpoints of the intervals (1492, 1497, etc.)

The population data came from four sources, McEvedy and Jones (1978), de Vries (1984), and Maddison (2001, 2003). The decisions made to incorporate these data are too numerous to be retold here and can be found elsewhere (Brecke, in preparation). The goal of the decisions was to:

1. Create population time series for the 12 countries appropriate to the countries' boundaries at each point in time as opposed to the populations within the countries' current boundaries.
2. Maximize the number of datapoints available for anchoring an interpolation process as there are no time series that have estimates or values for all years. This is done to best capture changes in population caused by especially destructive wars or boundary changes.
3. Use the most recent sources when possible given the two previous goals as those sources referenced the earlier works.

As an interpolation process was necessary to get estimates of yearly population values, I eliminated one notable source of error in such a process. A straight-line interpolation creates slope discontinuities at each datapoint, and such abrupt changes in slope do not accurately reflect the nature of phenomena exhibiting essentially exponential growth processes such as population. Elimination of that error entailed applying the common logarithm operator (\log_{10}) to each of the datapoints, interpolating between the logged values, and then applying the anti-log

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operator (10^x) to the entire series.

The industrial production potential data came from Bairoch (1982) and are quite desirable as a measure of a country's ability to support a war effort. As they are in significant part based on estimates of industrial capital stock, they give probably the best available measure—covering a long span of time—of a country's ability to produce the material needed to conduct a war. Like the population data, these data had to be interpolated, and the same error elimination procedure was applied.

More detail about MPI can be found in (Brecke, under review). I believe MPI is about as good as we can do at this point in time in terms of capturing country military capability over a very long (452 years) time span.

POWER PARITY

For the purposes of this study, power parity is defined as a situation of the international system where one or more countries have more than some threshold percentage of the power of the most powerful country. As there is no theoretical guidance as to what that threshold should be, any number chosen is effectively arbitrary. Moul (2003), for instance, uses as his definition of parity the situation where the second most powerful country has more than 2/3 the power of the most powerful country. This is a very generous definition. It is hard to believe two countries consider themselves to be at parity if one has only 2/3 the power of the other.

To address the concern that the findings are dependent upon the threshold value chosen, this study uses three different thresholds. This approach enables a sensitivity analysis to see whether there is a dependence. The three threshold values are: 80%, 90%, and 95%. The resulting three definitions of power parity will be referred to, respectively, as weak parity, medium parity, and strong parity.

Using the 80% threshold, there were 262 years of power parity in the 452 years from 1494 to 1945. Stated differently, 58.0% of the time the international system was in a situation of power parity among the system leaders. With the 90% threshold, the numbers are 132 years or 29.2%. With the 95% threshold they are 70 years or 15.5%. At least when using MPI as a measure, 80% seems to be a very accommodating threshold. With the international system in a state of power parity 58% of the time, the concept or state is beginning to lose any special status. Conversely, the 95% threshold with only 70 years of power parity seems a bit stingy. Together they provide plausible upper and lower bounds for the analysis.

Figures 2, 3, and 4 place the periods of power parity using the different thresholds into a graphical format, enabling the reader to get an overview of when the periods of parity occurred, where they clustered in the 452-year timeframe, and how long they lasted compared to periods of no parity.

Figure 2

Periods of Power Parity 1494-1945:

Weak Parity

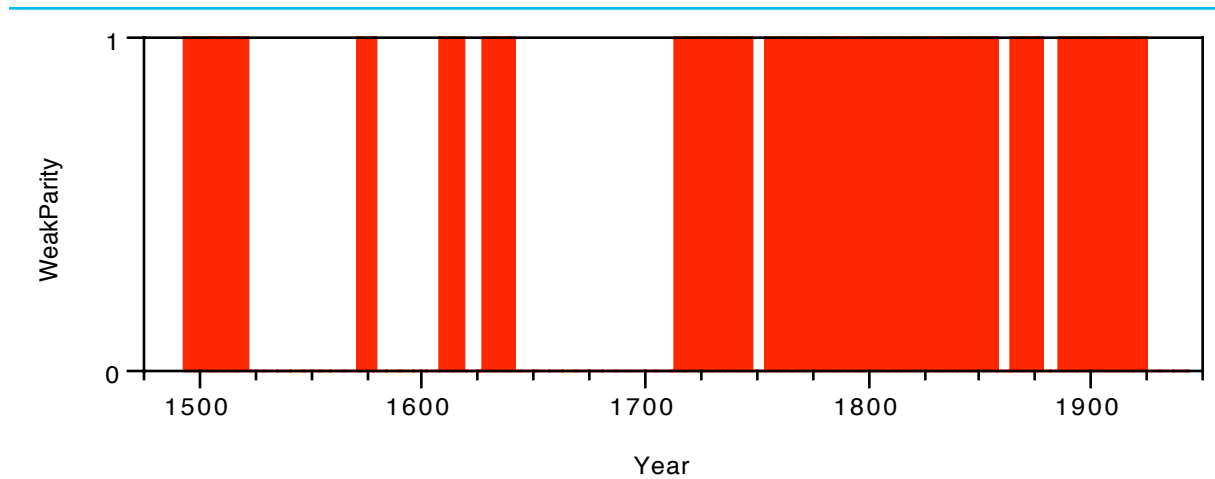
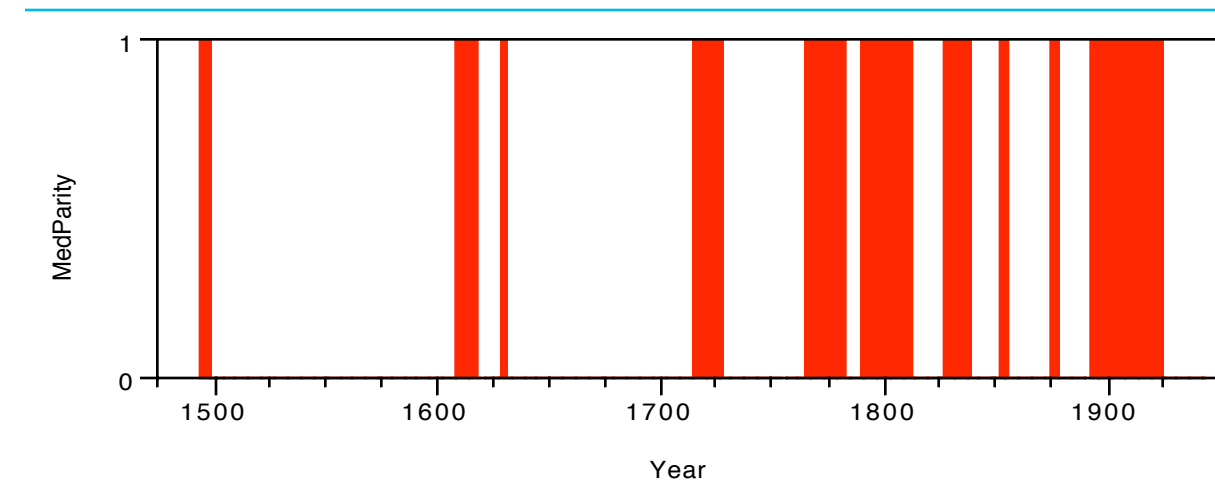


Figure 3

Periods of Power Parity 1494-1945:

Medium Parity

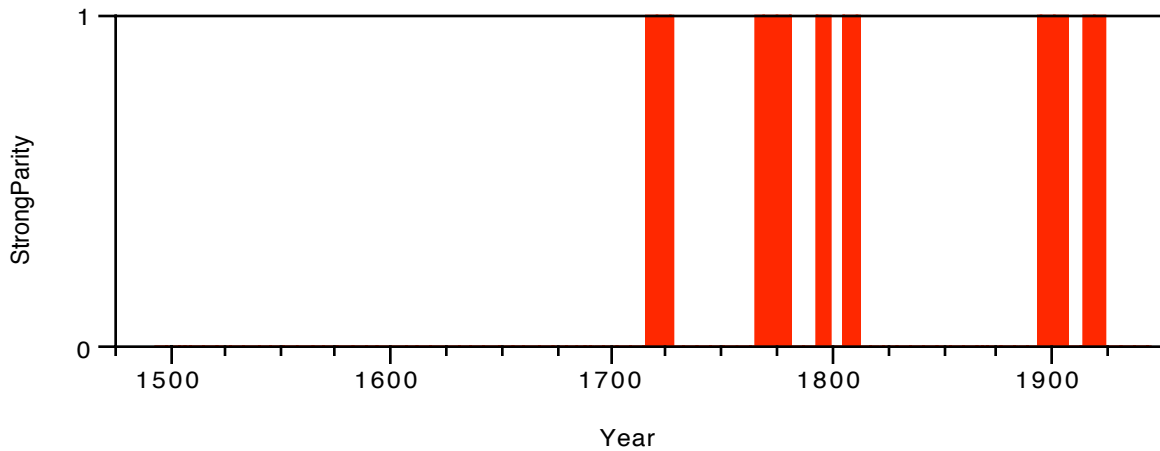


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Figure 4

Periods of Power Parity 1494-1945:

Strong Parity



POWER PREPONDERANCE

For the purposes of this study, power preponderance is the situation where one country has a very large portion of the total system power *and* there is a significant gap in power between that most powerful country and any other country. We need both factors to distinguish power preponderance, which is also called unipolarity, from bipolarity. Again, as there is no theoretical guidance for a precise definition, this paper will take a sensitivity analysis approach. The three alternative definitions of power preponderance are:

1. The most powerful state possesses at least 30% of the total system power, and the next most powerful state possesses a system share value at least 10% lower (namely, less than 20% of the total system power).
2. The most powerful state possesses at least 33.33% of the total system power, and the next most powerful state possesses a system share value at least 13.33% lower.
3. The most powerful state possesses at least 35% of the total system power, and the next most powerful state possesses a system share value at least 15% lower.

These three definitions will be referred to, respectively, as weak preponderance, medium preponderance, and strong preponderance.

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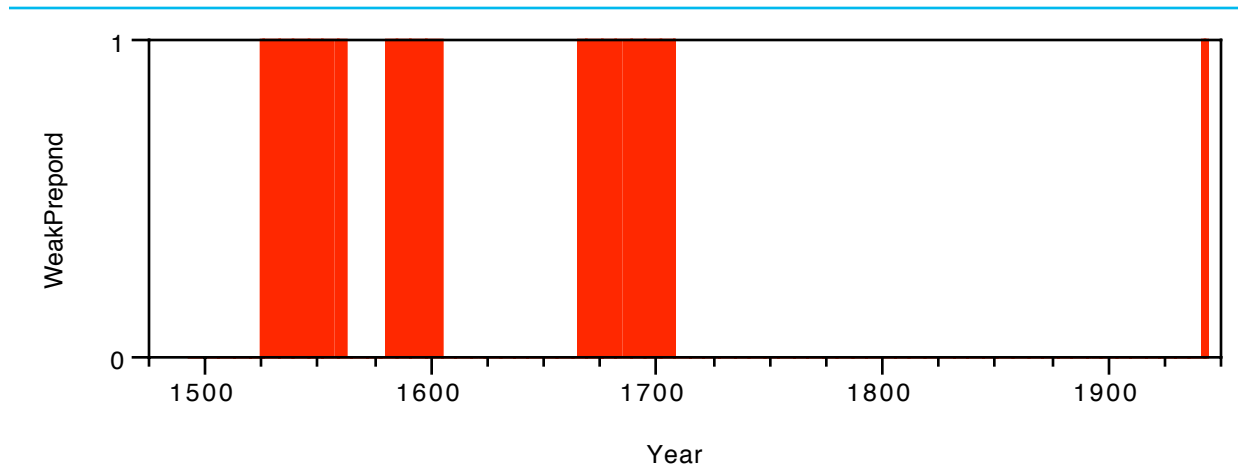
If one uses the power preponderance definition of one country having at least 30 % of the total system power and at least a 10 % gap between it and the next most powerful country, there were 112 years from 1494 to 1945 that met that criteria. That amounts to 24.8% of the time. If the greater than 33.33% of total power and greater than a 13.33% gap definition is used, the numbers are 83 years and 18.4%. If the at least 35% level and at least 15% gap definition is used, the numbers are 70 years and 15.5%. These numbers appear reasonable for a sensitivity analysis.

Figures 5, 6, and 7 portray the periods of power preponderance in the same manner that Figures 2, 3, and 4 portrayed the periods of power parity.

Figure 5

Periods of Power Preponderance 1494-1945

Weak Preponderance



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Figure 6

Periods of Power Preponderance 1494-1945

Medium Preponderance

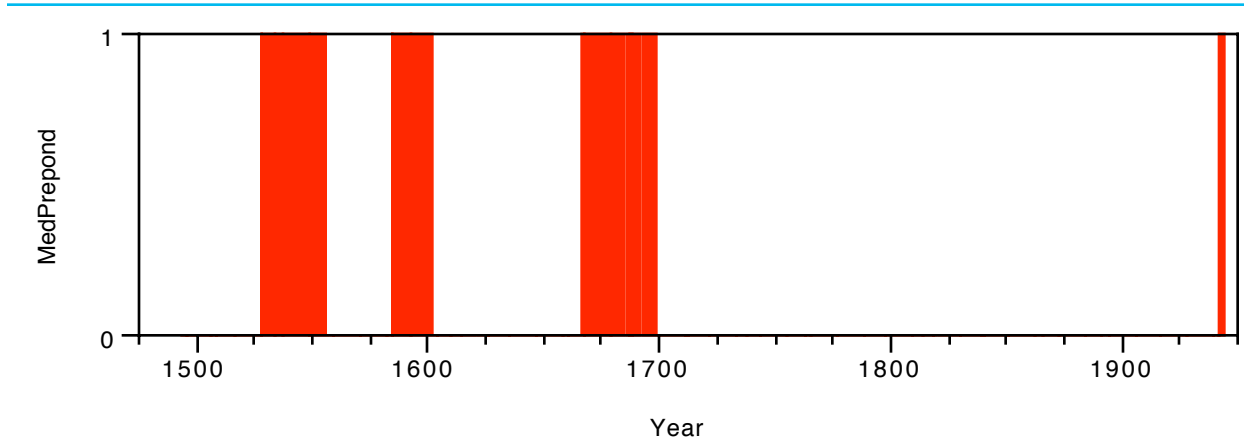
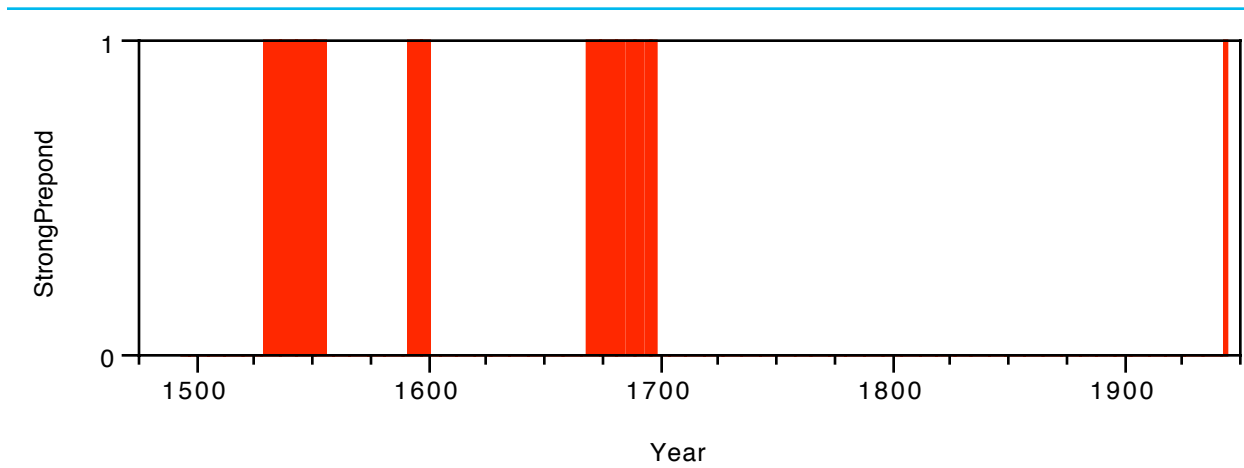


Figure 7

Periods of Power Preponderance 1494-1945

Strong Preponderance

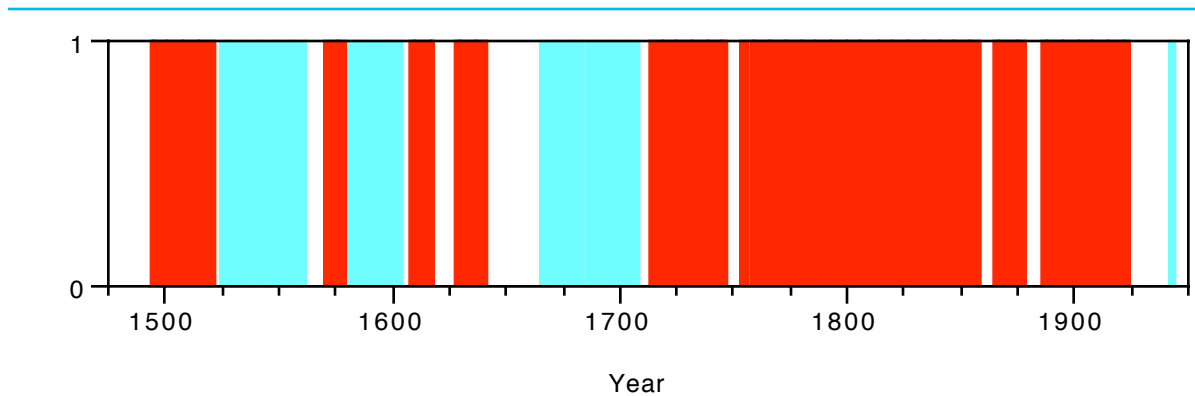


NO PARITY OR PREPONDERANCE

We need to check one more facet of the parity/preponderance debate. What about those times that cannot be said to be either periods of power parity or periods of power preponderance? To truly determine the impact of power parity or power preponderance, we need to ascertain whether those times of neither parity or preponderance experienced more or less conflict than would be expected. If the conflict/years ratio for these non-parity, non-preponderance years is not near one then the impact of parity or preponderance is suspect. Conversely, if the ratio is near one, that result tells us that the effect of system structure applies only to the situations of parity or preponderance.

The sum of the periods of weak power parity and weak power preponderance total to 374 years or 82.7% of the period from 1494 to 1945. That leaves 78 years or 17.3% of the time in neither category, which makes this a rather narrow and thus firm definition of non-parity and non-preponderance. Figure 8 displays the periods of systemic power parity, power preponderance, and neither of those states. The red or darker bands are those of weak power parity; the light blue or lighter bands are the periods of weak power preponderance, and the white bands are neither.

Figure 8
Periods of Power Parity, Power
Preponderance, or Neither: 1494-1945



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CONFLICT DATASETS

To address the potential issue that the impact of parity or preponderance does not apply to all types of interstate violent conflict, the test is applied to three different conflict datasets. Those datasets are:

1. A dataset of wars among major powers. It consists of the Great Power wars compiled by Levy and Morgan (Levy, 1994) and the major powers wars in the Correlates of War datafile (Singer and Small, 1994). It contains 46 cases and is referred to as Major Powers below.
2. A dataset of significant interstate wars. It consists of the Major Powers wars (above) plus Midlarsky and Park's Major-Minor Power wars (Midlarsky and Park, 1995) plus the remaining wars from the Correlates of War datafile. It contains 109 cases and is referred to as Combined Conflicts below.
3. A dataset by the author striving to be a compilation of all recorded violent conflicts with 32 or more fatalities since 1400 AD (Brecke, 1999). The interstate wars in that dataset have been extracted for this analysis. That list contains 490 cases and is referred to as Conflict Catalog below.

POWER PARITY, PREPONDERANCE, AND CONFLICT

Now we turn to the question we really care about: which of the hypotheses posed earlier is supported by the evidence marshalled in this paper? The answer to that question can be found by determining whether the periods of power parity or power preponderance experienced more or fewer instances of violent conflict initiation than one would expect from the share of years of that the system was in that state if power parity or power preponderance had no impact. Namely, the method consists of:

1. Determining the number of years the international system was in the state of power parity (or power preponderance),
2. Calculating the share of the 452 years that were years of power parity (or preponderance),
3. Determining the number of conflicts that started during the years of parity (or preponderance) for each of the conflict datasets,
4. Calculating the share of the conflicts (for each dataset) that started during the parity (or preponderance) years,
5. Dividing the share of conflicts by the share of years of power parity.

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If the Conflicts/Years ratio calculated using this procedure is near 1.0, the conflicts are distributed across years of parity and no parity (or preponderance and no preponderance) about evenly, and the implication is that systemic power parity (or power preponderance) has no effect on the initiation of conflict. If the number is significantly less than one (and the sample sizes in terms of the number of years and the number of wars are not too small), power parity (or preponderance) appears to have an inhibiting effect on the initiation of wars. If the number is significantly greater than one, power parity (or preponderance) instead has an exacerbating effect on the initiation of violent conflict. Tables 1-7 present the calculations for the three different conflict datasets of the different definitions of power parity, power preponderance, and the situation of neither

Table 1: Weak Parity

<u>Conflict Dataset</u>	<u>Number of Conflicts</u>	<u>Share of Conflicts</u>	<u>Share of Years</u>	<u>Conflicts/ Years Ratio</u>
Great Power	19	41.3 %	58.0 %	.712
Combined	58	53.2	58.0	.917
Conflict Catalog	274	55.9	58.0	.964

Table 2: Medium Parity

<u>Conflict Dataset</u>	<u>Number of Conflicts</u>	<u>Share of Conflicts</u>	<u>Share of Years</u>	<u>Conflicts/ Years Ratio</u>
Great Power	8	17.4 %	29.2 %	.596
Combined	31	28.4	29.2	.974
Conflict Catalog	146	29.8	29.2	1.02

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Table 3: Strong Parity

<u>Conflict Dataset</u>	<u>Number of Conflicts</u>	<u>Share of Conflicts</u>	<u>Share of Years</u>	<u>Conflicts/ Years Ratio</u>
Great Power	2	4.3 %	15.5 %	.277
Combined	15	13.8	15.5	.888
Conflict Catalog	63	12.9	15.5	.829

Table 4: Weak Preponderance

<u>Conflict Dataset</u>	<u>Number of Conflicts</u>	<u>Share of Conflicts</u>	<u>Share of Years</u>	<u>Conflicts/ Years Ratio</u>
Great Power	19	41.3 %	24.8 %	1.665
Combined	29	26.6	24.8	1.073
Conflict Catalog	132	26.9	24.8	1.085

Table 5: Medium Preponderance

<u>Conflict Dataset</u>	<u>Number of Conflicts</u>	<u>Share of Conflicts</u>	<u>Share of Years</u>	<u>Conflicts/ Years Ratio</u>
Great Power	13	28.3 %	18.4 %	1.536
Combined	20	18.3	18.4	.997
Conflict Catalog	101	20.6	18.4	1.120

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Table 6: Strong Preponderance

<u>Conflict Dataset</u>	<u>Number of Conflicts</u>	<u>Share of Conflicts</u>	<u>Share of Years</u>	<u>Conflicts/ Years Ratio</u>
Great Power	11	23.9 %	15.5 %	1.543
Combined	17	15.6	15.5	1.001
Conflict Catalog	86	17.6	15.5	1.132

Table 7: Neither Parity nor Preponderance

<u>Conflict Dataset</u>	<u>Number of Conflicts</u>	<u>Share of Conflicts</u>	<u>Share of Years</u>	<u>Conflicts/ Years Ratio</u>
Great Power	8	17.4 %	17.3 %	1.005
Combined	22	20.2	17.3	1.167
Conflict Catalog	84	17.1	17.3	.991

Figure 9 presents the most notable findings of the analysis in a graphical format analogous to the hypotheses posed earlier in Figure 1.

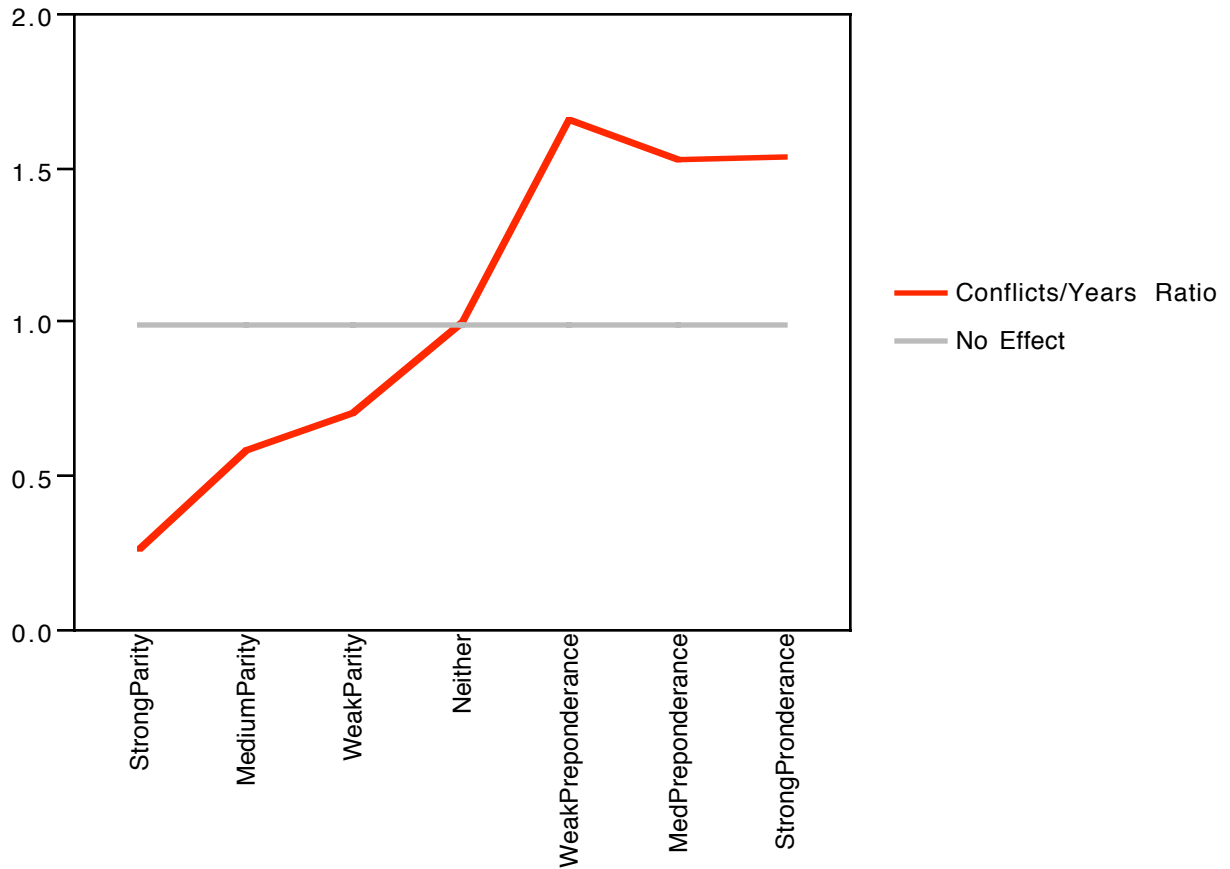
The respective margins of error are calculated using the formula $1/\sqrt{N}$:

70 years	10.78%	11.95%
78 years	10.1%	11.32%
83 years	9.73%	10.98%
112 years	8.04%	9.45%
132 years	7.18%	8.7%
262 years	3.93%	6.18%

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Figure 9

Power Parity, Power Preponderance, and the Amount of Warfare Associated with Each Type



These findings are surprisingly clear and consistent. In terms of the number of wars initiated, balance of power theory wins. Periods of systemic power parity, where there is a close balance of power among two or more countries, experience the initiation of significantly fewer wars among the major powers than periods of power preponderance or neither parity or preponderance. These findings hold across the different definitions of power parity. Notably, as we move from no parity to weak parity to strong parity, the pacifying effect increases. Proximity in power may indeed engender caution.

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The situation for power preponderance is more complicated. The first point is that power preponderance appears to lead to the initiation of more major power war, and the effect is quite strong. The complication is that there is not a smooth increase as we move from no preponderance to strong preponderance, the mirror image of the situation for power parity. The “worst” situation is that of weak preponderance with a slight improvement for medium and strong preponderance. A plausible interpretation of these results is that if a country enjoys only weak preponderance, it lacks the power to enforce peace and may even be subject to challenges by weaker countries. As the degree of preponderance increases, that constraint and threat subsides.

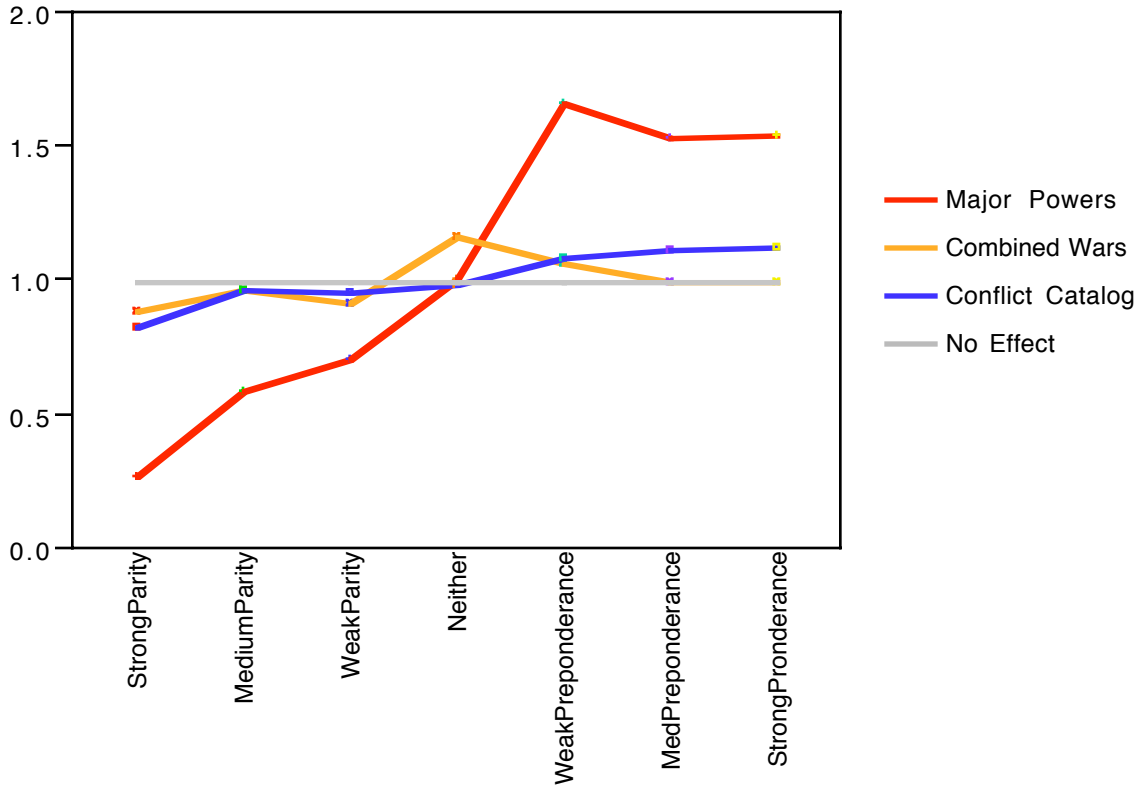
The situation for neither parity or preponderance supports these findings. If power parity and power preponderance have significant and contrary effects, one would expect the state of neither parity or preponderance to have no effect. The calculated value of 1.005 is as close to no effect as is reasonably possible.

Figure 10 clarifies a point alluded to in the two previous paragraphs. There is no effect of power parity or power preponderance on the initiation of wars when one includes wars that are not between the major powers. The graph lines hover close to the line demarcating no effect.

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Figure 10

**Power Parity, Preponderance, and Warfare
Using Three Different Conflict Datasets**

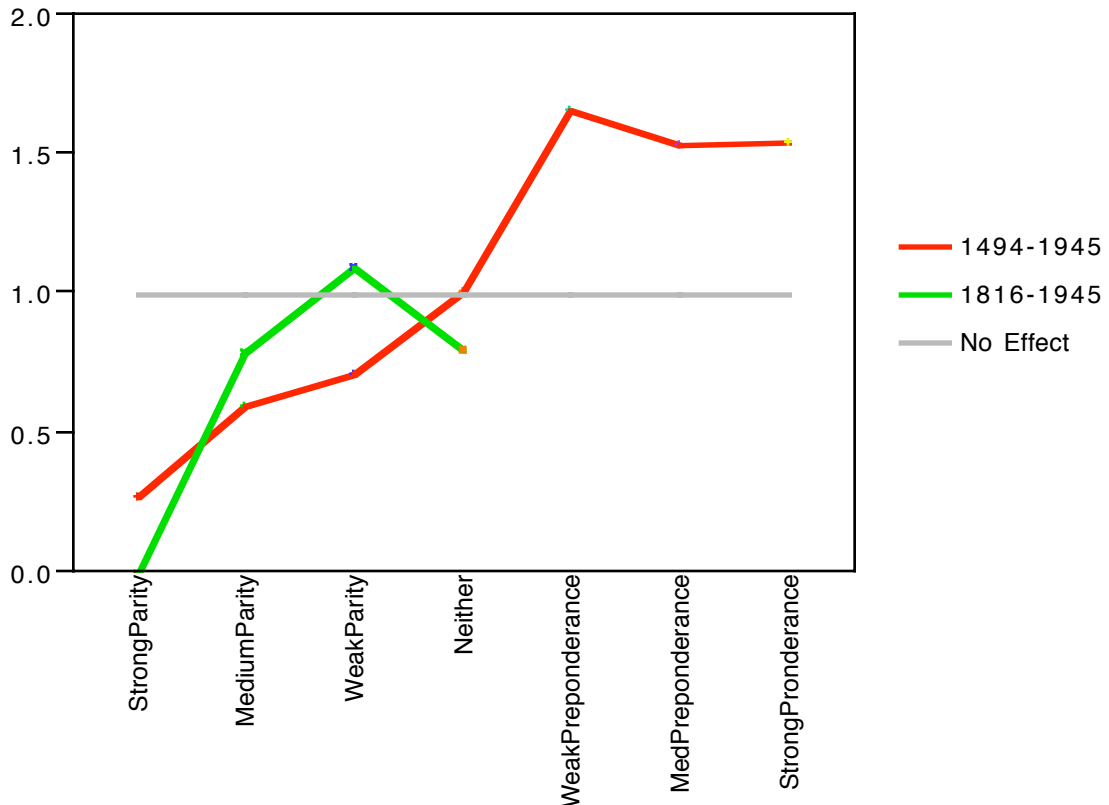


Finally, Figure 11 presents the findings that result if one limits the timeframe of the analysis to 1816-1945 instead of 1494-1945. The intriguing findings presented above do not emerge. The problem is one of sample size. For international system-scale phenomena such as power parity or power preponderance, the timeframes that researchers have been using up to this point do not provide enough observations to delineate clear patterns. The goal of the MPI used in this study was to provide that large enough number of observations to identify relationships that have up to this time remained murky.

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Figure 11

**Power Parity, Preponderance, and Warfare
Using Different Time Frames**



CONCLUSION

The findings in this paper support the basic tenet of the structural realist school that the structure of the international system significantly influences the amount of conflict in the system. However, the findings place constraints on individual theories within the school. Those advocating power parity now have non-negligible evidence that a balance of power leads to fewer major power wars. Supporters of power preponderance do not enjoy validation from this research. While there is some

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evidence that strong preponderance has a pacifying effect, it is only in comparison to weak preponderance, and in any case the number of wars when there is power preponderance is significantly higher than when there is power parity or neither parity or preponderance. As some have asserted, the structural realist arguments apply only to wars between the leading powers of the international system.

This analysis will be extended in subsequent work to address several limitations in this preliminary analysis. For example, what happens when alliances are taken into account? What about the severity of the wars in the different system types? Is there a difference when there are three or four states at near parity as opposed to when there are two? To what extent are the most powerful countries the ones involved in the major power wars? Much remains to be done.

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