The Political Determinants of International Trade: The Major Powers, 1907–90

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We test three arguments about the effect of international politics on trade flows. The first argument states that trade flows are greater between states with similar interests than those with dissimilar interests, the second that trade flows are greater in democratic dyads than nondemocratic dyads, and the third that trade flows are greater between allies. We examine trade flows between the major powers from 1907 to 1990. This period provides variation on all three independent variables of interest and allows us to separate the three arguments empirically. We estimate a gravity model of trade with the above political variables added. Our results demonstrate that joint democracy and common interests increase trade in a dyad, but alliances generally do not, even when controlling for polarity of the system.

Politics shapes international trade. We evaluate and elaborate three broad arguments that seek to explain how international politics shapes trade between states. These arguments explicitly assume that political factors have observable effects on international trade flows. This is so since governments in free market economies still set the rules under which firms import and export, while governments in managed economies directly negotiate the terms of trade.

Although all three arguments relate trade to politics, their foundations are different. Two of the arguments address the differing responses of economic actors to politics. The first is that conflict and the anticipation of conflict reduce trade flows between states, because economic actors respond to the risk conflict adds to a trading enterprise (Pollins 1989a, 1989b). The second argument is that pairs of democratic states will trade more than other pairs of states (Dixon and Moon 1993). Limited government assures economic actors that their positions will be protected from government fiat, and democracies and limited government have gone hand-in-hand historically. The third argument centers on the direct effect of politics on trade. According to this argument a state will be reluctant to trade with another state that may use its added wealth to increase its military capability against it. Furthermore, this effect is argued to be stronger in a bipolar system than in a multipolar system (Gowa 1994; Gowa and Mansfield 1993).

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We test these three arguments simultaneously in this article. Separate tests could be misleading because the different factors driving each scenario often occur together in the historical record. In particular, democracies have tended to have close relations and formed alliances with one another (Siverson and Emmons 1991). A test of one of these arguments that does not control for the other two may produce spurious results. Our analysis assesses the political determinants of trade flows among the major powers during most of the twentieth century. Those powers encompass dyads with good and poor relations, democracies and nondemocracies, and alliances in both bipolar and multipolar systems. This set of states offers variance on the three candidate explanations for the political determinants of trade. The data provide annual observations on trade flows between all directed dyads of major powers between 1907 and 1990, except during the two world wars and the year immediately following the end of each.[1]

Briefly, our results indicate that close political relations increase trade in a dyad; a militarized dispute does not significantly reduce trade between the disputants; democratic dyads trade more than other types of dyads; and an alliance appears to reduce trade between its members, which was especially the case after World War II.

The first two results address the argument on political conflict and trade, the third the argument on regime types and trade, and the fourth the argument about security concerns and trade. These results hold even when controlling for the other arguments, the distance between trading states, and the size of their population and economy.

This research has important implications for the broadest theoretical arguments in international politics. Realists contend that the demands of state survival in the international system mean that domestic political systems are irrelevant to international politics. In

[1] By directed dyads we indicate that each case reports state *i*'s exports to state *j* in a given year. Our data begin in 1907 because the availability for all series before that date is irregular.

the realist view, states must be concerned with the distribution of the benefits of trade because economic strength can be converted to a military advantage. Our evidence challenges this view, a theme to which we return in the conclusion.

We begin with summaries of the three arguments and the existing evidence. Next, we specify our testable hypotheses from these summaries. We then describe our sample of the great powers, their trade flows, their economic characteristics that we use as control variables, and the relevant political characteristics. Because the data are a cross-section of time series, we explain our estimation strategy. The results are presented, and we conclude with an evaluation of the three arguments and a discussion of directions for further research.

HOW DOES POLITICS AFFECT TRADE?

In this section we review the arguments about how politics can affect trade, and from these we develop the set of hypotheses to be tested. The first argument is that the political relations of states affect their levels of trade. The second asserts that democratic dyads trade more than other pairs of states. The final broad argument is that alliances between states affect trade, but the strength of the relationship is contingent upon the polarity of the international system.

The State of Political Relations

Political relations between states can directly and indirectly influence their trade. When political conflict arises between two states, if one of them enjoys a position of economic strength over the other, then it may consider restricting trade to advance its side of the conflict (Hufbauer, Schott, and Elliott 1990). Short of war, interstate conflict can lead to embargoes in the place of overt military violence; for example, it is illegal to bring a Cuban cigar into the United States. This is a direct effect; political conflict leads to government policy to restrict trade.

Conflict also can have an indirect effect on trade flows, since individual economic agents assess the possibility of political disruptions of their business when they consider establishing and continuing a trading enterprise. Such disruptions create a political risk for actors in trade. The more likely the conflict, the more profitable the trade must be to compensate for the risk of disruption. Consequently, political risk rises with both the likelihood and probable intensity of conflict; war produces the greatest disruption of trade, even though it is the least likely form of conflict. In peacetime, the anticipation of conflict determines the risk premium that trade enterprises face. If agents believe that conflict is likely, then only the most profitable businesses engaged in trade can justify the added political risk. All else equal, pairs of states with good political relations should have more trade than states with poor political relations. They are less likely to be in conflict in the future, and so the political risk to trade is relatively small. This effect of conflict is indirect; the threat of future government action to restrict trade leads to less international trade.

Drawing his theoretical position from a model based upon the choices of individual economic agents, Pollins (1989a) presents clear evidence that political relations affect trade flows. He begins with an economic model that analyzes how prices affect trade flows between pairs of states and then adds a measure of the amity/hostility between those states based on the annual summaries of the Conflict and Peace Data Bank (COPDAB) data (Azar 1980). Drawing data from the yearly exports of twenty-five states to six carefully chosen importer states in the period 1955–78, he found that imports increased as political relations improved after controlling for price differences.[2] In a parallel study, using a slightly different research design based on a gravity model of international trade (which we discuss below), Pollins (1989b) obtained similar results.

While Pollins joins together both the direct and indirect effects of conflict on trade, we wish to test them separately in order to assess the sensitivity of trade to their individual effects. Our first hypothesis addresses the *direct effect* of conflict on trade:

HYPOTHESIS 1a: *States in conflict with each other will have lower levels of trade than states not in conflict.*

In particular, we will examine how militarized interstate disputes affect trade flows between the disputants. Such disputes are public political conflicts of the highest magnitude short of war; if disputes do not reduce trade flows, then it is unlikely that any conflict short of war has a direct effect on trade.

Pollins (1989b, 739) recognizes the possibility of indirect effects of conflict on trade, but he does not explicitly test for them. Dixon and Moon (1993), however, report evidence of these indirect effects. Their results indicate that states whose interests are closest to those of the United States, as measured by similarity of voting in the United Nations, have higher levels of trade with the United States than other states.

Our second hypothesis completes this picture by addressing the *indirect* effect of conflict on trade flows.

HYPOTHESIS 1b: *The greater the degree of common interests between a pair of states, the greater will be their trade flows.*

It is important to note that this hypothesis assumes that common interests are an indicator of less conflict in the future. Divergent interests reduce trade indirectly by increasing the risk premium to firms engaged in international trade.

Joint Democracy

Internal political factors may also affect trade flows. Dixon and Moon (1993) argue that pairs of states with

[2] The combined exports of the twenty-five states in the data used by Pollins is approximately 67% of the world total. The six importers are the United States, the Federal Republic of Germany, the Soviet Union, the German Democratic Republic, Egypt, and India. These states are also included among the exporters.

similar political systems should have more trade than those with dissimilar systems. Nations may manage their trade policy to direct trade flows toward nations with similar systems. Added trade could enhance the political stability of their trading partners or reward them for their prior cooperative actions. Barriers to trade, then, are likely to be lower between states with similar systems than between states with dissimilar systems. Moreover, states with limited government should be particularly conducive to developing trading relations, since these systems have open polities and judicial systems (North 1990). Firms considering foreign trade must assess the political risk posed by the domestic institutions of the countries in which they deal. Confiscation of assets by a foreign government is one such risk; the chance that a foreign firm's position will not be taken seriously in a legal dispute with domestic actors is another. These risks reduce the expected profitability of businesses in international trade and reduce overall trade flows because businesses with marginal profitability drop out of the market. Of course, exceptionally profitable trade will still be pursued in the face of this political risk; at the margin, however, limited government in democratic systems encourages trade by reducing the political risk of arbitrary treatment by the host government. Limited government based on the rule of law gives foreign firms greater confidence that their interests will not be handled arbitrarily. Foreign firms then should be more willing to operate in economies overseen by limited governments.

In the period we examine, democracies typically have limited government and provide greater protection for all firms than do other systems. Their visible political-legal systems increase the confidence of firms that their interests will be protected by law, thus reducing the risk and raising trade flows into democracies. Furthermore, democracies are less subject to political pressure to protect domestic firms from international competition. Although all governments provide some protection to domestic firms, the open political processes of democracies are more likely than other systems to render the costs of such protection visible and allow countervailing pressure groups to organize and lobby against such protection (cf. Root 1994, chapter 3). Leaders in other systems are more likely to rely on the provision of private goods to their supporting coalition to hold office than are democratic leaders, and trade barriers that favor particular firms are one way for leaders to provide benefits to their supporters (Bueno de Mesquita et al. n.d.). To be sure, democracies are not immune to protectionist pressures, but they are better able to contain them than are more closed systems of government.

Economic agents also have material incentives to prefer trade with countries that have political and economic systems similar to their own. Business disputes in international trade may be resolved in the legal and political system of a trading partner. Economic agents are more likely to understand how to operate within political systems similar to their own than in those that differ. Firms familiar with operating in corrupt systems are more likely to understand the rules of the game in other corrupt systems than are firms accustomed to operating under the rule of law.

Economic systems themselves also matter, and they are closely connected to political systems. In particular, trade between an open and a managed economy presents special problems, since firms in open economies are likely to be privately owned, as opposed to state-owned firms or agencies in closed economies. Each type is accustomed to operating under a different system, free markets versus centrally planned economies, and neither type deals with the other frequently except in international trade. Different economic systems resolve disputes between economic agents in different ways, undermining trading agents' ability to predict their legal vulnerability. Open economies and open polities typically occur together, so the coincidence of these political systems reinforces higher levels of trade. Mansfield, Milner, and Rosendorff (1997) argue that pairs of democracies negotiate lower barriers to trade than do nondemocratic dyads precisely because legislatures in democracies often represent protectionist interests. The threat of trade war, and the higher barriers that would result, give democratic leaders the ability and motivation to negotiate lower trade barriers than leaders in other systems would negotiate.

Dixon and Moon (1993) test the effect of joint democracy on trade flows by analyzing U.S. exports to a range of countries between 1966 and 1983. They estimate the effect of common political systems on trade by determining whether the importer was democratic, as measured by the Polity II democracy scale (Gurr, Jaggers, and Moore 1989, 1991). Because the United States was a democracy during this period, the dyad was democratic if the importing nation was also democratic. The results indicate that U.S. exports were greater to democratic trading partners.[3]

Bliss and Russett (1998) draw upon a body of data that includes between 882 and 1,042 pairs of states in the period 1962 to 1989 to assess the extent to which shared democratic political institutions have an effect on trade between states. Though they use a broader sample of states and employ different control variables, they arrive at results fully consistent with those of Dixon and Moon: Democratic states trade more with each other than they do with states that have other

[3] Their results are more complex than this summary. Dixon and Moon report that the coefficient for institutionalized democracy has the correct sign but falls short of conventional levels of statistical significance. By examining the interaction of democracy and UN voting agreement, they conclude that joint democracy is contingent upon voting patterns; that is, joint democracy has its greatest effect when similar UN voting patterns are absent. That said, their initial judgment about joint democracy may be too conservative for two reasons. First, their hypothesis is clearly directional, and under the appropriate one-tailed test, the reported t-ratio of 1.8 is significant at the .05 level. Second, their data set includes only states that actually received exports from the United States. Nondemocracies such as North Korea, North Vietnam, Cambodia, Mongolia, Iran, and Cuba are missing, given the period of the study (1966–83). The inclusion of these states would undoubtedly have strengthened the relationship between democracy and trade.

types of political systems, even when controlling for such things as distance, the size of the economy, and alliance bonds.

Our next hypothesis deals with the effect of political systems on trade.

HYPOTHESIS 2: *Democratic dyads have greater trade flows than nondemocratic dyads.*

Limited government encourages trade by reassuring foreign firms that their trading interests will be protected from arbitrary treatment. Since democracies, in our sample, are generally also limited governments, they should be more able to resist pressure to shield domestic firms from international competition than are other political systems. Trade flows between democracies should be greater than between similar nondemocratic nations or pairs of states with differing systems. Because democracies tend to have limited government and an open economy, democratic dyads have matching economic and political systems that encourage trade.

Security

International trade may affect national security. Since trade increases both states' wealth, if a state were to invest its gains from trade into increased military capability, then it would gain a military advantage over its trading partner. Trade then could create a "security externality." A state might impede trade with another for fear that the latter would use the benefits of the trade to build up its military and so pose a greater threat to the former.

Gowa (1989, 1994) and Gowa and Mansfield (1993) develop a rigorous argument based on this idea. Enemies have good reason to fear what one another might do with their gains from trade, but allies presumably pursue similar ends and so could gain from increases in one another's military. Put another way, trade poses a negative externality between enemies and a positive externality between allies. The former must fear what each other would do with the gains from trade, while the latter can only benefit from greater military spending by their trading partner.

The polarity of the international system adds a further dimension to this argument. It is widely recognized that alliances do not always last, and today's ally may be tomorrow's enemy. Nations should be more willing to trade with their allies when they believe in the credibility and durability of their mutual commitment. When a nation fears that its ally will exit their alliance for the other side, it will be reluctant to allow that ally to gain the benefits of trade. Neorealists assert that alliances are more reliable in a bipolar system than in a multipolar system, and so the fear of exit is less in bipolar systems (Waltz 1979). Consequently, allies in a bipolar system should have higher trade than other dyads, since they anticipate that their alliance will persist and so do not fear the security externality that trade poses. In contrast, alliances should have little effect on trade in a multipolar system. According to neorealists, this is so since systemic pressures make one's ally as likely to be one's future enemy as any other state. Given the propensity for changes of alliance partners in a multipolar system, trading with one's ally can be as dangerous as trading with one's enemy.

Gowa and Mansfield (1993) test this state-centered argument by examining trade flows between the major powers in nine different years between 1905 and 1985. In their cross-sectional design they estimate the effects of alliances on trade flows in each of the nine years in their sample and find that bilateral alliances in the bipolar era have the strongest positive effect on trade, followed by multilateral alliances under bipolarity. Alliances in the multipolar era generally have no statistically discernible effect on trade between the major powers. Interestingly, Gowa and Mansfield use their data to explore other reasonable explanations for trade flows, including, most notably, joint democracy, but they report that the results show a positive effect for this in only one of their nine cross-sections.

The following two related hypotheses test this argument.

HYPOTHESIS 3a: *In a multipolar system, trade between allies should not differ from trade between nonallies.*

HYPOTHESIS 3b: *In a bipolar system, trade between allies should be greater than trade between nonallies.*

The reader may be concerned that Hypothesis 1b is so similar to Hypothesis 3a and Hypothesis 3b as to be indistinguishable. Alliances generally do indicate similarity of relations, but this is not necessarily the case (Dingman 1979; Morrow 1991, 906). Nations with very close relations do not necessarily need alliances to coordinate their policies. Indeed, as we show below, our operational indicator of close relations within a dyad is not too highly correlated with an alliance in a dyad, although it is based on alliance data. There are, consequently, sound theoretical and empirical reasons for maintaining all three hypotheses.

Our test of all five hypotheses allows us to sort out possible confounding effects among the variables we use to test the three general arguments. Democratic dyads have less conflict than other pairs of states (Bremer 1992; Maoz and Abdolali 1989). Democracies tend to have close political relations and enter into alliances with one another (Gaubatz 1996; Siverson and Emmons 1991). Allies generally, but not always, have good relations. Given these possible relationships, it is conceivable that a separate test of any one of the five hypotheses could be confounded by the effects of variables from another of the arguments. Our test controls for such confounding effects by examining all the variables at once.

Furthermore, the results reported by Pollins as well as Dixon and Moon are based upon data from the Cold War, an unusual period of history. Two strong ideological blocs faced each other, and domestic systems, common interests, and alliances are all closely linked in the history of the Cold War. To separate the effects of the three arguments, we must analyze trade patterns from both the Cold War and some other period. If the arguments above are truly general, they will survive a

competitive test across different periods of international history.

DESCRIPTION OF THE DATA AND MEASUREMENT OF VARIABLES

To test our hypotheses we rely on a cross-sectional time series broader than any used to date. This design has two important advantages. First, the tests allow us to separate the effects of each variable while controlling for the other possible political effects on trade flows. Second, the longer historical period introduces greater variation than previously in all the independent variables.

We collected data for all the major powers at the beginning of the twentieth century—the United States, Great Britain, France, Germany, Russia, and Italy—matching the sample of Gowa and Mansfield (1993). Each directed dyad of these major powers forms one of our cases. For example, exports from France to Germany is one case, and exports from Germany to France is another. The seven major powers produce 42 cases. Our period is 1907 to 1990.[4] The years 1914–19 and 1939–47 are excluded, due to the lack of trade data during the wars and its low reliability in the years immediately afterward. Each observation records the trade flow from one major power to another during one year in this domain.[5] Each of the 42 cases has 71 yearly observations, giving a total of 2,982 possible observations, but missing data reduce our set to 2,631 cases.[6]

Controls for economic conditions must be introduced to discern the effects of political variables by themselves. Like Pollins (1989b), Dixon and Moon (1993), and Gowa and Mansfield (1993), we begin with a "gravity model" of international trade drawn from economics (Aitken 1973; Anderson 1979; Bergstrand 1985). The gravity model is purely an empirical framework that has had success in predicting trade flows; it lacks a theoretical basis within the economic literature because it is not derived from macroeconomic premises. It serves us as a useful control for economic determinants of aggregate trade flows. The gravity model assumes that the physical distance between trading partners, the size of their economy, and their level of development affect the trade between them. The farther apart two states, the less their trade will be, since transportation costs are higher. The greater each state's GNP, the greater will be the amount of trade between them, because the marginal propensity to import is positive. Finally, all else equal, the greater is each state's population, the less trade, because larger domestic economies typically engage in less international trade.

We use constant values in U.S. dollars to measure exports and GNP in order to minimize the effects of changing price levels and inflation over time.[7] We first convert nominal values in national currency to current U.S. dollars and then convert the current dollar values to constant 1947–48 dollar values. The current exchange rate controls for national currency inflation relative to the dollar, and the constant dollar conversion controls for inflation of the U.S. dollar.

Our control variables from the gravity model are the *GNP of the Exporter* (GNPI) and *GNP of the Importer* (GNPJ), in millions of constant U.S. dollars; the *Total Population* of each trading partner (POPI and POPJ), in millions of people; and the *Distance* between states (DISTANC).

Our dependent variable is the value of *Exports from State i to State j*, in millions of constant U.S. dollars (EXP).

To test our five hypotheses, we employ independent variables measuring conflict, interests, joint democracy, and the presence of an alliance under conditions of both bipolarity and multipolarity. We discuss each of these in turn. Other studies of the relationship between conflict and trade use event data to assess the level of conflict in a dyad. Instead, we use the presence of a *Militarized Dispute* for three reasons. First, event data include a variety of acts that directly reduce trade, such as retaliatory sanctions and trade embargoes. The first argument contends, however, that conflict leads states to adopt measures that directly reduce trade. Including measures that reduce trade as evidence of conflict biases the study in favor of a positive result. Second, if international conflict leads to national policies to reduce trade with the other side, then certainly militarized disputes—the most signal conflicts in which nations engage, short of war—should lead to a reduction in trade. If disputes do not reduce trade, then we must question the direct effect of political conflict on trade flows. Third, event data measuring conflict between states in the period before 1939 are not available. Our use of disputes as the measure of political conflict allows us to include years before World War II, increasing the variance in our independent variables.

We test the direct effects of conflict on trade flows by

[4] After 1949, data are for the Federal Republic of Germany only; prior to 1917, data for Russia are used.

[5] A referee was concerned that our use of directed dyads could result in observations that are not independent of one another. In particular, many of our measures of the independent variables are dyadic, and so we have two directed dyads with the same values of many of the independent variables. A conservative approach would be to eliminate one of each pair of directed dyads in our sample, which would reduce our sample size by one-half. An alternative adjustment would be to consider our effective sample size to be one-half the actual sample size. In that case, simply divide all the t-scores by $\sqrt{2}$. We discuss the consequences of such an adjustment for our results in a subsequent footnote.

[6] The missing data are limited to the economic components of the gravity model. The elements of the missing data have different consequences. There are 17 nation-years for which export data are lacking. Because we use directed dyads, this results in missing data for 102 cases. Ten nation-years have no population figures, which creates missing data for 120 cases, since the population of the exporting state in one directed dyad becomes the population of the importing state in the respective directed dyad for the importer. Similarly, GNP is missing for 21 nation-years, creating missing data for 252 cases. Of course, in some cases the missing data overlap. In total, because one element or another of the economic and demographic information is missing, the size of the data set is reduced by slightly more than 11%.

[7] Details on the sources of the data and measurement procedures for the economic variables are given in the Appendix.

examining whether the importing and exporting states were engaged in a militarized interstate dispute (MID) with each other in that year. A militarized interstate dispute occurs when at least one member of the dyad has made a threat to use force against the other (Gochman and Maoz 1984). We code dyad-years with a militarized interstate dispute as 2, those without as 1.[8] The hypothesized direct relationship between political conflict and trade (Hypothesis 1a) predicts that the sign on this coefficient should be negative and statistically significant.

Following Bueno de Mesquita (1975, 1981), we operationalize *Common Interests* in a dyad of states by the tau_b correlation of their alliance portfolios (TAU). This revealed-choice measure of interests assesses the complete array of alliances that the member states of the dyad hold in common and apart. To assess the tau_b measure for a dyad, a four-by-four table that compares both states' alliance commitments is constructed. The four rows and columns of the table correspond to the four levels of commitment, in descending order, given in the Correlates of War military alliance data: defense pact, nonaggression pact, entente, and no alliance. Each state in the system, including the members of the dyad, is placed in the cell corresponding to the commitments that each member of the dyad has with that state. When placing the dyad members with respect to each other, each is assumed to have a defense pact with itself. The tau_b measure of shared interests is the tau_b value of the resulting table of the alliance commitments of the states in the dyad with all states in the system. Although tau_b is correlated with the presence of an alliance in the dyad, the existence of an alliance accounts for only about half the variance in the tau_b values in our sample, so *there is significant variation in the* tau_b *values for which the presence of an alliance in the dyad does not account.*[9] Negative tau_b values should also weakly predict the presence of conflict in a dyad, in line with the argument that common interests are a signal of lower political risk. The theoretical range of tau_b values is -1 to 1. We add 1 to these to get the value of TAU in order to avoid the possibility of multiplying the value predicted by the other variables by a negative number.[10] For the relationship between common interests and trade flows (Hypothesis 1b), this coefficient should be positive and statistically significant.

Hypothesis 2 addresses whether *Democratic Dyads* have higher trade flows than other dyads. We consider as democratic those states that score 6 or above on Gurr's 11-point scale (0–10) of institutionalized democracy (Gurr, Jaggers, and Moore 1989, 1991). If both members of a dyad are democracies, the dyad is democratic. We code democratic dyads as 2 and nondemocratic dyads as 1 (DEMD). Hypothesis 2 about democratic dyads and trade predicts this coefficient should be positive and significant.

We draw our list of *Alliances* from the Correlates of War list of mutual formal alliances between the states.[11] We use this list both to calculate the tau_b values and as the indicator of when alliances existed for testing hypotheses 4 and 5. Testing this pair of hypotheses requires two independent variables in order to distinguish the hypothesized positive effects of alliances under *Bipolarity* and their lack of effect under *Multipolarity*. We code the existence of an alliance in a dyad-year as 2 and use 1 for the absence of an alliance (ALLIA). Following Waltz (1979), we classify the international system as multipolar before World War II and bipolar afterward. We construct the interactions of multipolarity and bipolarity with the presence of an alliance, calling the variables MULTIAL and BIAL, respectively. MULTIAL is 2 if an alliance exists in a dyad-year before 1947 and 1 otherwise. BIAL is 2 if an alliance exists in a dyad-year in or after 1947 and 1 otherwise. The combination of these two variables allows us to test hypotheses 3a and 3b. They predict that the coefficient for an alliance under multipolarity should not be statistically significant, but the coefficient for an alliance under bipolarity should be significant and positive.

Finally, the functional form of the gravity model is multiplicative, as follows, where ε_{ijt} is an error term, such that $\ln(\varepsilon_{ijt})$ is normally distributed with mean 0:

$$EXP_{ijt} = \alpha(GNP_{it}^{\beta_1})(GNP_{jt}^{\beta_2})(POP_{it}^{\beta_3})(POP_{jt}^{\beta_4})$$
$$(DISTANC_{ij}^{\beta_5})(TAU_{ijt}^{\beta_6})(DEMD_{ijt}^{\beta_7})(MID_{ijt}^{\beta_8})$$
$$(MULTIAL_{ijt}^{\beta_9})(BIAL_{ijt}^{\beta_{10}})\varepsilon_{ijt}$$

State i denotes the exporter, state j the importer, and t the current year. We transform this equation into a linear relationship by taking the natural logarithm of all the variables. We indicate this transformation by adding the letter L to the end of each variable name and estimate the following linear equation:

[8] We use values of 1 and 2, respectively, for the presence and absence of these variables in place of the conventional 0 and 1 values for dummy variables. Adding one to the conventional values for dummy variables ensures that the absence of the condition does not change the value predicted by all other variables in the gravity model, and the presence of the condition multiplies that value by a fixed amount determined by the coefficient of the dummy variable.

[9] For a discussion of the theoretical and empirical differences between tau_b and bilateral alliances as a measure of common interests, see Bueno de Mesquita (1981, 111–8 and especially Figure 4.1).

[10] The minimum value of the tau_b scores in the data set is $-.475$; adding 1 suffices to avoid infinite negative logarithms. A referee suggested manipulating the minimum value of the tau_b values to ensure that the minimum value of TAU equaled 1. Then the logarithm of the minimum value of TAU would be 0. This transformation could prevent any distortion introduced by taking the logarithms of values of TAU close to 0. We have replicated our analyses using this specification of TAU. The results produce the same pattern of coefficients presented and discussed in this paper but with some minor improvements in significance probabilities.

[11] The alliances we use are drawn exclusively from the COW listing (Small and Singer 1969). Gowa and Mansfield (1993) add a bilateral alliance between the United States and Japan to the COW listing for the bipolar era. It is the only bilateral alliance their data contain for this period. The Japanese-American Security Agreement, on which they base their coding, is widely regarded as a protectorate and not an alliance, since it does not carry reciprocal obligations.

$$EXPL_{ijt} = \alpha + \beta_1(GNPL_{it}) + \beta_2(GNPL_{jt}) + \beta_3(POPL_{it}) + \beta_4(POPL_{jt}) + \beta_5(DISTANCL_{ij}) + \beta_6(TAUL_{ijt}) + \beta_7(DEMDL_{ijt}) + \beta_8(MIDL_{ijt}) + \beta_9(MULTIALL_{ijt}) + \beta_{10}(BIALL_{ijt}) + \ln(\varepsilon_{ijt})$$

ESTIMATION STRATEGY

Time-series cross-sectional analysis presents a variety of statistical problems for estimation. Ordinary least squares (OLS) estimates of the coefficients are unbiased but may not make the most efficient use of the information in the data. The error terms cannot be expected to have the same variance across the cross-section and be independent over the time series and across the cross-section. That is, the error terms may be heteroskedastic, autocorrelated, and contemporaneously correlated. The primary effect of such an error term is that the estimates of the standard errors of the estimated coefficients are inaccurate.

The common response to this problem has been to use a variety of generalized least squares techniques (GLS) to render the error term spherical (Parks 1967; Stimson 1985). Such techniques use residuals of OLS to estimate the error structure and transform the data, using the estimated error structure to run GLS. Asymptotically, these procedures produce efficient, unbiased estimates of the coefficients and their standard errors.

Recent research shows, however, that the cure may be worse than the affliction (Beck and Katz 1995). GLS techniques are efficient only if we know the true error structure. Since we do not know that structure generally, it is usually estimated from the data. These estimates can rely on small effective sample sizes and so be inaccurate in small samples. For example, the effective sample size for estimates of the contemporaneous correlations is about $2T/N$, because $N(N-1)/2$ correlations are estimated using NT observations. When the length of the time series is close to the number of cross-sectional units, as is the case in our analysis, each individual correlation is highly dependent on the data. Because the effective sample size is small, one or a few individual cases may be highly influential. The estimated standard errors of the coefficients are likely to be smaller than the actual variance of the coefficients, and consequently statistical tests using these inaccurate standard errors are likely to lead to overconfidence in the statistical significance of our estimates.

Beck and Katz (1995) suggest a solution to this problem: Use OLS to estimate the coefficients but correct the estimated standard errors using contemporaneous correlations estimated from the residuals. They call these estimated standard errors panel-corrected standard errors (PCSEs). Their Monte Carlo analysis demonstrates that PCSEs are more accurate estimates of the standard errors of the coefficients than those recommended by Parks (1967). They also recommend that any correction for serial correlation be common across the cross-sections, rather than estimating a separate serial correlation for each cross-section. We implement Beck and Katz's technique by estimating and removing a common serial correlation, estimating the coefficients using OLS on the transformed data, and using the residuals of this analysis to estimate the PCSEs.[12]

This technique is an improvement over the estimation procedures used by earlier studies. Both Pollins (1989a, 1989b) and Dixon and Moon (1993) estimate different autocorrelations for each cross-section. Such procedures create the possibility of incorrect standard errors and misleading statistical tests. Of course, Beck and Katz's research had not been done when Pollins and Dixon and Moon did their estimations. In addition, Gowa and Mansfield's (1993) cross-sectional design does not take advantage of the time-series nature of the data. Furthermore, it is difficult to interpret the range of time-specific coefficients Gowa and Mansfield report.

Our data suffer from two problems. First, as noted earlier, we are missing economic or demographic data for some states in a few years, and we delete these observations. Second, the two world wars create two interruptions in our time series, one from 1914–19 and the other from 1939–46. Both the missing data and the wars create interruptions in the time series. We deal with these interruptions when we remove the serial correlation. We use the Prais-Winston transformation, which treats the first term of a time series differently from the following observations (Prais and Winston 1954). We consider each observation that does not have an observation from the prior year as the beginning of a new time series. For example, all observations for 1920 receive the Prais-Winston treatment as the first term in a time series.[13]

STATISTICAL RESULTS

Our primary specification tests the three arguments about the effects of international politics on trade flows. All the hypotheses are tested in this specification. It includes the following exogenous variables, labeled by the corresponding hypothesis: (1a) whether a dispute occurred between the members of the dyad in that year, (1b) the tau_b measure of alliance similarity between the two members of the dyad, (2) whether the dyad was a pair of democracies, (3a) whether an alliance existed between the members of that dyad, and (3b) the interaction of whether an alliance existed with whether the system was bipolar. The coefficient for the tau_b value tests the hypotheses that the similarity of international political relations increases trade. A pos-

[12] PCSEs and all statistical estimations were calculated by a GAUSS program written by James Morrow. The program, which is designed to analyze this data set rather than be a general implementation of the Beck-Katz procedure, can be obtained from Morrow.

[13] The first observation after an interruption in the series is transformed to $y_t = x_t(1-\rho^2)^{1/2}$, where x is the original variable, y the transformed variable, and ρ the estimated serial correlation. The following observations are transformed to $y_t = x_t - \rho x_{t-1}$.

TABLE 1. Effects of Political Variables on Trade Flows

	Estimated Coefficient (Standard Error)
Independent Variables	
Militarized interstate dispute (MIDL)	.016 (.090)
Similarity of relations (TAUL)	1.448*** (.365)
Democratic dyad (DEMDL)	1.221*** (.131)
Alliance under multipolarity (MULTIALL)	−.180 (.157)
Alliance under bipolarity (BIALL)	−.497[a] (.160)
Control Variables	
GNP of the exporter (GNPIL)	.557*** (.076)
Population of the exporter (POPIL)	−.184 (.176)
GNP of the importer (GNPJL)	.308*** (.044)
Population of the importer (POPJL)	−.693*** (.058)
Distance between nations (DISTANCL)	−.277*** (.025)
R^2 = .78.	

Note: ρ = .89 (used in correction for serially correlated errors). ***p < .001.
[a]Indicates significant but incorrectly signed.

itive coefficient supports this hypothesis. A negative coefficient for the occurrence of a dispute supports the hypothesis that conflict lowers trade. The coefficient on whether the dyad is democratic tests the hypotheses that within a pair of democracies trade should be higher than within other pairs of nations. A positive coefficient supports this hypothesis. The pair of alliance variables interacted with the polarity of the system test the hypotheses that alliances under bipolarity increase trade, while alliances under multipolarity have no effect. This argument is supported if the coefficient for alliance is not significant, and the coefficient for the interaction of bipolarity and alliance is positive.

Table 1 presents the results of our primary specification. These results support part of the first argument, all of the second, but the third not at all. Since the coefficient reporting the estimated effect of a militarized interstate dispute on trade is not statistically significant, Hypothesis 1a is not supported. Both democratic dyads and similarity of political relations (i.e., high tau_b) increase trade flows, as hypotheses 1b and 2 assert. An alliance, however, increases trade under multipolarity and decreases it under bipolarity, the exact opposite of hypotheses 3a and 3b. Furthermore, all the control variables of the gravity model have the expected signs, and all but the population of the exporting state are statistically significant.

Because our exogenous variables are correlated and colinearity might lead us to confuse the effect of one variable with another,[14] we have run a variety of specifications to test the robustness of the results beyond those given in Table 1. These analyses are presented in Table 2. In each alternative model, we drop one or more of the independent variables to check the stability of the estimated coefficients. In several runs, we investigate the effect of alliances without respect to the polarity of the system; this variable is listed as ALLIAL in Table 2. Our results are robust to these checks. The same clear pattern of coefficients holds across all models: Similarity of relations and democratic dyads always have higher trade flows, while alliances sometimes increase trade and at other times decrease it. Alliances under multipolarity are more favorable to trade than alliances under bipolarity (except for model 10).[15] The pattern of the control variables is also stable to these variations. Multicolinearity, then, does not threaten the inferences about the hypotheses that we draw from our data.[16]

There are two additional threats to the validity of these results: (1) nonspherical errors even after the correction for a common serial correlation and (2) endogeneity in the independent variables. We checked the residuals of our main analysis for evidence of nonspherical errors that might be caused by, for example, heteroskedasticity. The first ten partial autocorrelations of the residuals are all less than .3, and all but one are less than .1. We also calculated the mean residual of each cross-section. A substantial number of these means differing from 0 implies that the cross-sections exhibit heteroskedasticity. Only four of the 42 cross-sectional means of the residuals were statistically discernible from 0 at the .05 level. Because of the clarity of these patterns, we have confidence that

[14] The correlations between these variables are:

	MIDL	TAUL	DEMDL
MIDL			
TAUL	−0.14		
DEMDL	−0.14	0.45	
ALLIAL	−0.06	0.72	0.26

[15] The reader may wonder why we find such different results on the effects of alliances and polarity from those of Gowa and Mansfield (1993). OLS analyses of our data before correcting for serial correlation produce similar results to Gowa and Mansfield's analysis. The dependent variable, logged imports, and the three main independent variables, similarity of political relations, joint democracy, and the presence of an alliance, all have substantial persistent autocorrelation. For instance, the tenth-order autocorrelation between values of flows of imports in a directed dyad in a given year and ten years later—the approximate separation of the individual cross-sections in Gowa and Mansfield (1993)—is .536.

[16] If we adopt the conservative step of treating our effective sample size as one-half of our number of observations, as discussed in footnote 5, we divide all the t-scores by $\sqrt{2}$. Then alliances under multipolarity are significant at the .05 level instead of the .01 in models 4 and 9. Alliances under bipolarity are significant at the .05 level instead of the .01 level in the main model and model 1. Alliances in general are significant at the .01 level instead of the .001 level in models 6 and 8. The statistical significance of all other coefficients does not change. In short, treating our effective sample size as one-half of our number of observations weakens the results only for alliances. All of our inferences about the three arguments remain the same after this conservative procedure.

TABLE 2. Estimates of Alternative Specifications of the Model

	Model 1: Disputes Omitted	Model 2: Disputes, Polarity Omitted	Model 3: Disputes, Democracy Omitted	Model 4: Disputes, Relations Omitted	Model 5: Disputes, Alliances Omitted
Independent Variables					
Militarized interstate dispute (MIDL)					
Similarity of relations (TAUL)	1.398***	1.410***	1.478***		1.126***
	(.379)	(.373)	(.404)		(.211)
Democratic dyad (DEMDL)	1.213***	1.167***		1.251***	1.179***
	(.129)	(.111)		(.123)	(.115)
Alliance under multipolarity (MULTIALL)	−.163		−.346	.457**	
	(.161)		(.201)	(.157)	
Alliance under bipolarity (BIALL)	−.509**		−.290	.029	
	(.163)		(.151)	(.017)	
Alliance (ALLIAL)		−.274			
		(.153)			
Control Variables					
GNP of the exporter (GNPIL)	.567***	.558***	.675***	.565***	.554***
	(.077)	(.074)	(.071)	(.072)	(.074)
Population of the exporter (POPIL)	−.153	−.138	−.401***	−.102	−.123
	(.123)	(.116)	(.115)	(.123)	(.118)
GNP of the importer (GNPJL)	.298***	.290***	.399***	.297***	.286***
	(.046)	(.042)	(.035)	(.048)	(.041)
Population of the importer (POPJL)	−.680***	−.668***	−.909***	−.614***	−.652***
	(.067)	(.065)	(.056)	(.071)	(.058)
Distance between nations (DISTANCL)	−.272***	−.265***	−.258***	−.276***	−.262***
	(.027)	(.021)	(.010)	(.028)	(.022)
N = 2,631					
R^2	.78	.78	.77	.78	.78
ρ	.92	.92	.92	.92	.92

Note: Estimated coefficients are given with standard errors in parentheses underneath. **$p < .01$, ***$p < .001$.

further adjustment of the data is unnecessary to render the errors spherical.

Simultaneity bias would arise if trade causes one or more of our exogenous variables. In particular, trade is often believed to mitigate conflict. Several arguments have been advanced on behalf of this, but they all hinge on the presumed beneficial effects of trade between states. Under theories of interdependence (Keohane and Nye 1977; Nye 1971), trade creates a web of beneficial interdependence between states that dampens conflict by raising its costs. Similarly, Polachek (1980) argues that states will attempt to avoid conflicts with their trading partners in order to preserve the gains from trade. To test for the possibility that trade reduces conflict, we ran several different probit analyses that tried to predict the occurrence of conflict using trade flows, distance, and our other political variables. In our first analysis, we simply used militarized interstate disputes as the dependent variable and trade as the independent variable in a logit. In this bivariate analysis the coefficient for trade is −.002 and statistically significant ($p < .001$), indicating that trade did dampen conflict. Yet, when the political variables for similarity of political relations, joint democracy, and the presence of an alliance and distance are added to the logit, the coefficient for trade falls to −.0002 and is not significant, while the coefficients for similarity of political relations and joint democracy are −3.54 and −3.19, respectively, and both are significant ($p < .001$). The coefficient for the presence of an alliance is significant, but it is positively signed (1.02, $p < .01$). The coefficient for distance is negative and not significant. Similar results were obtained when we analyzed the same specifications and lagged the independent variables by one period. When controls for joint democracy, foreign policy similarity, alliance, and distance are included, trade does not have a statistically significant effect in predicting the occurrence of a militarized dispute in our data set, whether we tested for trade flows in the year of the dispute or the year prior to it. Consequently, we do not believe that simultaneity bias is a significant threat to our analyses.[17]

[17] For a further analysis of this, see Morrow, Siverson, and Tabares (1998). The empirical literature on this relationship is growing. In recent work, Oneal et al. (1996) and Barbieri (1996) have reported somewhat differing results. The former, drawing upon a broad data set of politically relevant states from the post–World War II era, report that conflict is less likely between states when their trade is significant or they are democratic. Barbieri (1996), using data on international trade and conflict between 1870 and 1938, reports results in which trade can both increase and decrease conflict, with peace being most likely when states have symmetrical trade with each other. In addition, using Granger techniques on a time series of trade and conflict for 16 dyads over the period between 1960 and 1992, Reuveny and Kang (1996) report results showing that increased trade can bring either more or less conflict. Plainly, this research question remains open, but insofar as our results are concerned,

TABLE 2. (continued)

Model 6: Democracy, Alliances Only	Model 7: Polarity, Alliances Only	Model 8: Alliances Only	Model 9: Relations Omitted	Model 10: Democracy Omitted	Model 11: Relations Only	Model 12: Democracy Only
			−.0002	.018		
			(.060)	(.070)		
				1.539***	1.124***	
				(.385)	(.224)	
1.195***			1.262***			1.181***
(.106)			(.126)			(.115)
	.305		.471**	−.370		
	(.173)		(.150)	(.193)		
	.286***		.093***	−.262		
	(.031)		(.019)	(.147)		
.326***		.293***				
(.077)		(.071)				
.555***	.678***	.674***	.578***	.691***	.670***	.566***
(.069)	(.066)	(.060)	(.071)	(.070)	(.067)	(.071)
−.084	−.355**	−.346**	−.134	−.448**	−.381***	−.093
(.115)	(.113)	(.096)	(.126)	(.119)	(.107)	(.121)
.289***	.402***	.399***	.310***	.415***	.394***	.296***
(.044)	(.038)	(.029)	(.046)	(.033)	(.023)	(.045)
−.599***	−.847***	−.814***	−.627***	−.936***	−.890***	−.603***
(.067)	(.046)	(.063)	(.059)	(.059)	(.077)	(.070)
−.268***	−.262***	−.261***	−.282***	−.260***	−.255***	−.275***
(.021)	(.010)	(.013)	(.025)	(.010)	(.014)	(.026)
.78	.77	.77	.77	.77	.77	.78
.92	.92	.92	.89	.89	.92	.92

DISCUSSION

Trade patterns between the major powers during the twentieth century broadly support the first two arguments but not the third. Common interests and mutual democratic institutions increase trade flows between states. The effect of alliances on trade flows is uncertain; they may increase or decrease trade. Trade flows are higher between allies in multipolar system than between allies in bipolar systems. These results are robust, even given the interrelated patterns of the variables. Although democracy, common interests, and alliances are often found together in this period, the results do not change when one or more of these variables is dropped from the analysis. Our sample also contains greater variation on these variables than earlier studies, making it easier to separate the effects of different variables.

If politics does influence trade flows, then how large are the effects? Table 3 gives the estimated effect of changes in trade flows for the specified change in the political variables. Because the gravity model is multiplicative, these effects are given as percentage changes.[18] Holding all other political and economic variables constant, a dyad composed of democratic states has more than double the trade of a nondemocratic dyad. Political relations also have large effects on trade flows, but alliances and disputes have only relatively small effects. For the sake of comparison, we have estimated the effects of all the political variables on trade, even those whose effects were not statistically significant in Table 1.

There is another way of looking at the size of these political effects on trade. We tested the statistical significance of our political variables as a set.[19] Com-

simultaneity does not appear to be a problem with respect to the conclusions we draw.

[18] The percentages in Table 3 are calculated from the estimated coefficients in Table 1 using the multiplicative functional form of the gravity model. As noted earlier, we added 1 to DEMD, ALLIA, MID, and TAU to ensure that their logarithms were positive. An example may clarify how the figures in Table 3 were calculated. A democratic dyad multiplies the effect of the other variables by $2^{1.221} = 2.331$, where 1.221 is the estimated coefficient of the effect of a democratic dyad in Table 1, and 2 is the coded value of a democratic dyad. A nondemocratic dyad multiplies the effect of the other variables by $1^{1.221} = 1$. Moving from a nondemocratic dyad to a democratic dyad increases trade by a factor of 1.331 (=2.331 − 1), or 133.1%, assuming all other variables are fixed.

[19] A joint hypothesis test compares a regression with all the political variables included to a regression without the political variables (Hanushek and Jackson 1977, 128). The test statistic is calculated as the difference in the sums of squares divided by the number of political variables over the sum of squares of the equation including the political variables, divided by the degrees of freedom in that equation. The test statistic has an F-distribution with degrees of freedom of the number of political variables and the degrees of freedom of the equation including the political variables.

TABLE 3. Estimated Effects of Political Variables on Trade Flows

Change in Political Variables	Effect of the Change on Trade Flows
From nondemocratic dyad to democratic dyad	Increases trade 133.1%
Occurrence of a militarized dispute	Increases trade 1.1%[a]
Formation of an alliance	
Under multipolarity	Reduces trade 11.7%[a]
Under bipolarity	Reduces trade 29.1%
Change in similarity of relations	
From negative to neutral (TAU from −.5 to 0)	Increases trade 172.8%
From neutral to positive (TAU from 0 to .5)	Increases trade 79.9%
From negative to positive (TAU from −.5 to .5)	Increases trade 390.1%

[a]These estimates are based on coefficients that were not statistically significant at the .05 level. We include the estimated effect to illustrate the estimated relative effect of these changes in the political variables compared to the changes that had statistically significant effects.

pared with a model of only the economic control variables, the complete set of political variables is significant at the .001 level. If we restrict our attention just to joint democracy and similarity of relations, the two most successful variables in our test, then the political variables add to the economic model at significance levels of .05 or less.[20] Our political variables do account for something the economic model alone misses.

Our evidence challenges neorealist arguments. When we do not control for joint democracy and relations between states, alliances have a positive effect on trade that is statistically discernible. Our evidence clearly shows, however, that domestic institutions and relations have a much larger effect on trade flows than do alliances. Furthermore, trade flows are higher between allies under multipolarity than under bipolarity. According to the neorealist position, the opposite should be true, because neorealists contend that the risk of exit from an alliance is less in bipolarity than multipolarity. The complete neorealist position on trade and alliances—namely, that alliances increase trade between the members and are more reliable under bipolarity than multipolarity—is incompatible with our evidence.[21]

Our evidence does not support the position that security concerns lead states to control their trade flows. Trade flows during the Cold War were primarily within, rather than across, the Eastern and Western blocs. But each of the three arguments—political relations, joint democracy, and security concerns—predict this pattern. Our evidence suggests that common interests and political institutions fostered trade within each bloc. To be sure, some goods were banned for trade between the blocs because of their strategic importance, such as computers (Morrow 1997), but the argument that security concerns affect trade flows conflates the need to monitor trade over *certain goods* into a belief that states must watch *all trade flows*.

Our evidence indicates that other factors are more important than alliances. Prime among these are joint democracy and the similarity of policy interests between the states. The positive effects of joint democracy are in accord with the theoretical position of Pollins. He argues that private economic agents (i.e., individuals and firms) are the central actors; for Gowa the state is the central actor. Liberal democratic states give private economic agents the greatest scope to act on their judgments about what business they should pursue. Those active in foreign commerce are likely to be particularly interested in the various risks attached to trade. One of these risks is that the other party may violate a contract. The risk posed by such violations is very different when the trading partner is a firm in a state with a legal system that recognizes contracts than when the trading partner is a government firm in a state that may not recognize the contract or interprets the contract in accord with the immediate interest of the state rather than a body of law. These are the risks we outlined above, and they seem to make a difference.

Politics affects trade flows because economic actors care about political risks. International conflict disrupts trade, introducing risk. The institutions of limited government reassure actors, reducing risk. Democracy by itself is not a panacea for increasing trade. But modern democracies generally have been limited governments. Democracies are also less likely to engage in violent conflict with one another (Bremer 1992; Maoz and Abdolali 1989). Both of these effects raise trade between democracies. Furthermore, economic actors anticipate these political effects. The anticipation of conflict prevents trade from growing more than the realization of conflict leads to its disruption.

Finally, we end on a note of caution about our results. We have found evidence about the effect of politics on international trade at the level of overall trade flows. We use a broader sample of data with greater variation and more appropriate methods for that data than do existing studies. Further support for these arguments must be found at lower levels of analysis than aggregate trade flows. If limited government does encourage trade, then there should be direct evidence at lower levels, such as the individual trading concern. If economic agents fear the political disruption of trade, then that risk should be reflected in which international trading businesses are established. If security concerns lead governments to manage their aggregate trade flows, then the mechanisms of such management must exist.

[20] The F-scores for each comparison are $F^5_{2621} = 5.67$ for the complete model and $F^2_{2624} = 88.24$ for just similarity of relations and joint democracy.

[21] For further evidence on the lack of an alliance effect on trade in the post–World War II era, see Smith and Eyerman (1996) and Bliss and Russett (1998).

APPENDIX: MEASUREMENT

Exchange rates for 1907 to 1920 for France, Germany, Italy, Japan, and Great Britain were taken from Bidwell (1970) and Liesner (1989); for 1921 to 1929, rates used were from the U.S. Census Bureau (1928, 1931); and from 1930 to 1990, rates were taken from the United Nations (1955, 1966, 1994). Constant dollar values were obtained using the consumer price index (CPI) provided in the U.S. Census Bureau (1947, 1962, 1995) and derivations thereof.

Data on GNP from 1907 to 1965 were taken from Mitchell (1980, 1982, 1983, 1992) and Clarke and Matko (1983). For the period from 1907 to 1922, reliable data on Soviet GNP are difficult to obtain. In this case, estimates were made from data in Bairoch (1976). GNP from 1966 to 1990 were taken from the International Monetary Fund (1995) for all countries except the Soviet Union. Soviet GNP from 1966 to 1988 was taken from Mitchell (1992). Population data for 1907 to 1965 were taken primarily from Liesner (1989). Population figures for France for all years were taken from Maddison (1991), but these were also supplemented. Data for Italy from 1909 to 1950 were from Istituto Centrale di Statistica (1958); for the Soviet Union, from 1907 to 1913, data were from Mitchell (1992), from 1920 to 1939 from Eason (1963), and from 1950 to 1965 population was from Clarke and Matko (1983). Population from 1966 to 1990 was taken from the International Monetary Fund (1995) for all countries except the Soviet Union. Soviet population from 1966 to 1988 was taken from Mitchell (1992); Soviet population figures for 1989 and 1990 are from Karasik (1992). Geographical distance is the shortest distance between capital cities. Prior to 1949, Berlin is used as Germany's capital. Data on geographical distances are from Fitzpatrick and Modlin (1986).

The primary source of export data for 1907 to 1965 was Mitchell (1980, 1982, 1983). Exceptions to this follow. France's exports to Japan and the Soviet Union for all years were taken from Bureau de la Statistique Générale (1900–11, 1932, 1966). Germany's exports to Japan from 1907 to 1954 were calculated from reported Japanese imports from Germany; for 1955 to 1965 data were taken from the United Nations (1959, 1961, 1966). Italy's exports to Japan and the Soviet Union for all years were taken from Istituto Centrale di Statistica (1912, 1914, 1922–25, 1929, 1933, 1936, 1939, 1941, 1952, 1959, 1962, 1966). The Soviet Union's exports to France, Germany, Italy, Great Britain, and the United States from 1909 to 1913 were taken from Miller (1967); exports to Italy, Japan, and the United States from 1913 to 1965 were taken from Clarke and Matko (1983). Great Britain's exports to Italy and Japan for all years came from Great Britain Central Statistical Office (1914, 1928, 1938, 1953, 1961, 1967). U.S. exports to Italy and the Soviet Union for all years were taken from the U.S. Census Bureau (1912, 1919, 1921, 1928, 1931, 1933, 1938, 1940, 1941, 1947). Japan's exports to Italy and the Soviet Union for all years were taken from the Japanese Department of Finance (1916, 1936, 1940). Export data from 1966 to 1990 were taken from the International Monetary Fund (1971, 1978, 1985, 1992).

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