Alliances, Preferential Trading Arrangements, and International Trade

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We analyze the effects of alliances and preferential trading arrangements on bilateral trade flows. Both factors are likely to promote trade among members, but we argue that the interaction between them is central to explaining patterns of commerce. The combination of an alliance, which creates political incentives for participants to engage in trade, and a commercial institution, which liberalizes trade among members, is expected to provide a considerable impetus to commerce among parties to both. The results of our quantitative analyses support these arguments. Both alliances and preferential trading arrangements strongly affected trade from 1960 to 1990, and allies that included a major power conducted considerably more trade than their nonmajor-power counterparts. Moreover, the interaction between alliances and preferential trading arrangements is fundamental to explaining patterns of bilateral commerce: Parties to a common preferential trading arrangement and a common alliance engage in markedly greater trade than do members of either type of institution but not both.

Concerns about the stability of the international trading system have become widespread in recent years. Many observers feel that the relatively liberal system forged after World War II is being undermined by the proliferation of preferential trading arrangements. These concerns have spawned a great deal of empirical research, much of which has found that such arrangements exert a substantial effect on trade flows. Yet, these studies have neglected the role political-military alliances play in shaping patterns of commerce. This omission is important because there is ample reason to expect that alliances guide trade flows, and preferential trading arrangements often are comprised of allies. As a result, extant analyses risk confusing the effects of alliances and preferential trading arrangements on commerce and systematically overstating the effects of the latter.

In this study, we analyze the effects of alliances and preferential trading arrangements on bilateral trade flows. Both factors are likely to promote trade among members, but we argue that the interaction between them is central to explaining patterns of commerce. The combination of an alliance, which creates political incentives for participants to engage in trade, and a commercial institution, which liberalizes trade among members, is expected to provide a considerable impetus to commerce among parties to both.[1]

Our quantitative analysis supports these arguments. We find that both alliances and preferential trading arrangements strongly affected trade from 1960 to 1990, and that allies that included a major power conducted considerably more trade than their nonmajor-power counterparts. Moreover, the interaction between alliances and preferential trading arrangements is fundamental to explaining patterns of bilateral commerce: Parties to a common preferential trading arrangement and a common alliance engage in markedly greater trade than do members of either type of institution but not both.

ALLIANCES AND TRADE

The effects of alliances on commerce emanate from the incentives of both governments and firms. Governments have an incentive to liberalize trade with allies because the efficiency gains from trade yield increases in national income that can be used to augment states' military power. As a result, trade generates security externalities (Gowa 1994).[2] Since the anarchic nature of the international system places pressure on states to attend to the power of others (Waltz 1979), they cannot ignore these security externalities without bearing substantial risks.

Open trade is much more likely to evolve among allies than among adversaries. Trade among allies is likely to enhance the security of all the parties; the gains from trade accrue to states with common security goals and bolster the aggregate political-military power of the alliance. In contrast, open trade among adversaries produces negative security externalities. A state that trades with an adversary augments the national income of its trading partner, thereby threatening to undermine its own security.[3] Especially among states

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[1] By virtue of our focus on alliances and preferential trading arrangements, our analysis is cast at the systemic level. Although various studies emphasize the domestic determinants of trade (e.g., Cohen 1990, Frieden 1988, Rogowski 1989), it is beyond the scope of this paper to examine these factors.

[2] Security externalities are uncompensated benefits or costs that influence the security of one actor due to the actions of another actor. For a more extensive discussion of this issue, see Gowa 1994.

[3] A state may have an incentive to trade with an adversary if, for example, it anticipates realizing very large gains from trade or

with sufficient market power to influence their terms of trade, governments are expected to discriminate in their foreign economic policies between allies and adversaries (Gowa 1994).

Private traders and investors have incentives to behave in a manner consistent with these government policies. All other things being equal, trade barriers imposed on a product increase its local price, thereby reducing local demand for it by private traders and other consumers. Since governments are more likely to impose trade barriers on the goods of adversaries than on those of allies, local demand for adversaries' goods is likely to be less than that for allies' goods.

In addition, many investments by firms are relation specific, that is, they are made to support a particular transaction with a particular partner (Williamson 1985, 54; Yarbrough and Yarbrough 1992, 25). As Yarbrough and Yarbrough (1992, 28) have pointed out, investments in relation-specific assets "are common in international trade, because the process of specialization according to comparative advantage involves investment in increased productive capacity designed to service export markets." Many observers also argue that such investments have become increasingly pervasive.[4]

Among relation-specific investments related to international trade are those made in facilities designed to transport goods to a specific market, those made in dedicated assets to produce goods for a specific market, and those made to create vertically integrated production facilities across states. For example, a Japanese automobile manufacturer may invest in a plant or technology to meet the specific demands of U.S. consumers. Similarly, a firm located in one country that invests in raw materials may vertically integrate its production facilities by investing in a plant to process these materials that is located in a foreign country where the processing can be conducted most efficiently. In both cases, firms have undertaken investments to support a specific relationship. The costs of shifting the assets in which these firms have invested to their best alternative uses therefore are likely to be high, and their value depends in part on the continuity of the particular relationship for which they are designed (Williamson 1985, 55).

Particularly important for our purposes is the disproportionate susceptibility of relation-specific investments—and the trade flows they generate—to opportunistic behavior by foreign governments.[5] Investors face the risk that a foreign government will take actions, such as imposing new or raising existing trade barriers, which degrade the value of these investments.

Alliances can help regulate opportunism by foreign governments. Because open trade among allies promotes the security of members, governments have less incentive to behave opportunistically toward their allies' firms than toward firms of other states. Thus, private agents reduce the likelihood of opportunism—and enhance the expected profitability of investments—by investing in relation-specific assets to service allies' markets. Similarly, governments have incentives to engage in opportunistic behavior toward their adversaries' firms, since doing so helps to redress the security externalities arising from trade. Firms face heightened risks, including the possibility that a foreign government will raise its trade barriers or even expropriate dedicated assets located within its borders, if they make investments to service adversaries' markets.[6] Furthermore, as the experience of the Coordinating Committee for Multilateral Export Controls (COCOM) illustrates, firms' ability to conduct business abroad can be limited by government actions if they prefer to trade with an adversary (Mastanduno 1992). For these reasons, firms and private traders are expected to conduct more trade with agents located in states that are allies of their home government than with those located in states that are adversaries.

PREFERENTIAL TRADING ARRANGEMENTS, MAJOR POWERS, AND TRADE

Two factors are likely to influence the magnitude of the relationship between alliances and trade. The first concerns whether allies also are members of a common preferential trading arrangement; the second concerns whether at least one of them is a major power.

That preferential trading arrangements are likely to facilitate trade among members is hardly controversial. Such arrangements refer to agreements stipulating that states impose lower levels of protection on members' goods than on the goods of third parties. These agreements may take the form of free trade areas, customs unions, common markets, and economic unions. While differences exist among these commercial arrangements, common to all of them is "the reciprocal nature of the preferential treatment which the participants accord to one another" (Anderson and Blackhurst 1993, 5).

Yarbrough and Yarbrough (1992) argue that preferential trading arrangements provide an institutional means of governing opportunism. Like alliances, preferential trading arrangements are likely to promote relation-specific investments by private agents, which in

promoting the competitiveness of domestic industries that are central to its security. Unless both this state and its adversary expect trade to have no influence on the distribution of power between them, however, the party that expects to gain less from trade (and therefore to experience a deterioration in its relative power) will have an incentive to limit commerce.

[4] For example, it has been argued that intrafirm trade is a good measure of trade involving relation-specific investments, and there is considerable evidence that intrafirm trade constitutes a substantial portion of international commerce and has been growing (McKeown 1991, 165–8; Yarbrough and Yarbrough 1992, 32).

[5] Of course, foreign firms also may engage in opportunistic behavior, an issue taken up by Williamson (1985) and Yarbrough and Yarbrough (1992, 34).

[6] This argument is consistent with the view that private traders are likely to "take account not only of price and quality of goods and services but of the place of origin of these products and the political relationship between them" (Pollins 1989a, 738). In addition, Pollins (1989a, 1989b) argues that private agents may prefer to reward actors in states that they perceive to be politically friendly and punish actors located in hostile states. This also suggests that trade will be greater between allies than adversaries.

turn spur commerce among participants. More generally, it seems clear that, all other things being equal, preferential treatment is likely to facilitate the flow of trade among members. Less clear, however, is the extent to which preferential arrangements foster trade and the relative importance of alliances and preferential trading arrangements in this regard.

In addition to the separate effects of alliances and preferential trading arrangements on commerce, there is reason to expect that trade will be especially open between states that are both allies and members of a preferential trading arrangement. To the extent that the latter facilitates the use of strategies of contingent cooperation, and since this type of arrangement often is explicitly designed to reduce trade barriers, the combination of an alliance and a preferential trading arrangement provides multiple and reinforcing incentives for states to liberalize commerce and for firms to make relation-specific investments to serve foreign markets, thereby generating greater trade among members than does either type of institution alone.

Besides preferential trading arrangements, the presence of a major power also is likely to influence the relationship between alliances and trade. As noted earlier, the effects of alliances on trade are expected to be heightened among states with the ability to impose an optimal tariff. States that can degrade the national income of an adversary have little incentive to liberalize trade with it, since doing so only serves to undermine their security. In contrast, such states do have an incentive to liberalize trade with an ally, since an optimal tariff redistributes the gains from trade to them but eliminates these gains altogether for their trading partner, thereby undermining the alliance's strength. Major powers are likely to possess some monopoly power in trade (Gowa 1994, Gowa and Mansfield 1993); hence, the effects on trade flows of alliances involving them are likely to be especially pronounced.

Alliances including major powers also are likely to enhance openness among members because these alliances tend to be more durable and stable than those comprised solely of weaker states. By virtue of major powers' disproportionate strength, alliances involving them often exhibit an especially skewed distribution of power, a characteristic that has been linked to heightened alliance durability and stability (e.g., Morrow 1990).

Consistent with this argument, Gaubatz (1996) found that alliances involving major powers were significantly more durable than other alliances from 1816 to 1965. The results of a preliminary test indicate that major-power alliances also have been more durable than other alliances during the period after World War II, the era on which we focus in this paper. The analyses of alliances and major powers conducted here are based on Small and Singer's (1969, 1982, 44–5) data and updates of them compiled by the Correlates of War (COW) Project. To assess the durability of major-power alliances after World War II, we code each alliance identified by Small and Singer that was formed during this era based on whether it includes at least one major power. We then compare the average duration of alliances that include a major power with the average duration of those that do not.[7] Our results indicate that major-power alliances tend to last about twice as long as other alliances and that this difference is statistically significant ($t = 4.33$, $p < .005$).

While all alliances are expected to promote trade among members, the disproportionate durability of major-power alliances is likely to bolster their effect on trade because members are likely to discount less heavily the future benefits arising from intraalliance trade than do members of other alliances. The relative longevity of major-power alliances and the dearth of such alliances among which members typically can relocate reduce the risk of exit by members. Consequently, these factors limit the likelihood that today's ally will become tomorrow's foe and turn its augmented power, derived from prior intraalliance trade, against its former confederates. These factors also limit the risks faced by investors that the governments of current allies will shift political alignments and threaten their relation-specific assets by engaging in opportunism in the near future. Alliances involving major powers therefore should be advantaged in their ability to promote trade among members.[8]

In sum, we expect that international trade is likely to be greater when trading partners are allies or members of a preferential trading arrangement than when neither of these conditions is met. We expect that commerce will be greater still when both of these conditions obtain and when trading partners are allies and include a major power. We expect that trade will be greatest among states that are allies, members of a preferential trading arrangement, and include a major power.

PREVIOUS EMPIRICAL STUDIES

The existing empirical research bearing on these topics centers primarily on the effects of preferential trading arrangements on bilateral trade flows. Studies of this sort usually conclude that preferential trading arrangements increase the flow of trade among members, although the strength of these effects varies among commercial arrangements (Aitken 1973, Brada and Mendez 1983, Eichengreen and Irwin 1995, Frankel 1993, Linnemann 1966, Pelzman 1977, Pollins 1989a, Tinbergen 1962, Winters and Wang 1994). Yet, these studies rarely emphasize other "noneconomic" determinants of trade, which leads them to ignore the effects of alliances and other political factors. Since preferential trading arrangements often are comprised of allies (Mansfield 1993), these analyses risk confusing the

[7] Because many alliances are still in effect, it is not possible to measure their duration. For the purpose of this rough test, alliances still in effect as of 1993 (the last year for which data are available) are coded as ending in this year. Like Morrow's (1990, 921) analysis of alliance durability, "each alliance is treated as a whole and is not decomposed into dyads of allies."

[8] In addition, like the United States after World War II, major powers often have the economic capacity to provide aid and investment that may promote trade with weaker states (Freeland 1985).

effects of alliances and preferential trading arrangements. In so doing, they are likely to yield biased estimates of preferential trading arrangements' effects on trade flows and, hence, to offer a distorted view of the political economy of international trade.

Many empirical studies of the international political influences on trade focus on diplomatic cooperation and conflict between states. Polachek (1980, Gasiorowski and Polachek 1982), for example, argues that utility-maximizing actors tend to engage in cooperative relations with trading partners because of the opportunity costs associated with forgoing trade in the event of conflict. In the only studies bearing directly on this topic, Pollins (1989a, 1989b) examined the effects of preferential trading arrangements and diplomatic cooperation and conflict on bilateral trade flows. He found that cooperation promotes trade, but he also observed that his model may not account for variations in trade patterns between allies and adversaries or between major powers and other states (Pollins 1989a, 757). Indeed, since there is evidence that allies frequently engage in political conflicts (e.g., Bueno de Mesquita 1981), it is important to isolate the effects of alliances on trade rather than infer them from studies focusing on the effects of political cooperation and conflict.

A few studies have examined the effects of alliances on bilateral trade flows (Gowa 1994, Gowa and Mansfield 1993, Mansfield and Bronson 1997, Summary 1989), but they focused on trade involving major powers. As we argued above, it is important to determine the extent to which the strength and magnitude of the relationship between alliances and trade depend on whether the commercial partners are major powers. Furthermore, these studies did not examine the interactions among alliances, preferential trading arrangements, and major powers, an issue that is central to our analysis.

THE MODEL

In order to test the hypotheses described earlier, we begin with a gravity model, which has become a standard framework for explaining patterns of bilateral trade (e.g., Aitken 1973; Anderson 1979; Deardorff 1984, 503–4; Frankel 1993; Gowa 1994; Gowa and Mansfield 1993; Leamer and Stern 1970, 145–70; Linnemann 1966; Pelzman 1977; Pollins 1989a; Tinbergen 1962; Winters and Wang 1994). The gravity model describes trade flows between a given pair of states in terms of factors that influence the supply of exports in one country, factors that affect the demand for imports in the other, and factors that impede or facilitate the flow of trade between them. This model usually takes on the following form:

$$X_{ij} = \beta_0 GDP_i^{\beta 1} GDP_j^{\beta 2} POP_i^{\beta 3} POP_j^{\beta 4} DIST_{ij}^{\beta 5} A_{ij}^{\beta 6} e_{ij}, \quad (1)$$

where X_{ij} is the flow of trade between countries i and j; GDP_i and GDP_j are the gross domestic product (GDP) of i and j; POP_i and POP_j are the population (or, equivalently, the per capita GDP) of i and j; $DIST_{ij}$ is the geographical distance between i and j; A_{ij} is a set of additional factors influencing trade between i and j, often including preferential trading arrangements; and e_{ij} is a lognormally distributed error term.

Different variants of this model have been advanced, and various theoretical justifications for it have been offered (Anderson 1979; Bergstrand 1985, 1989; Deardorff 1995; Helpman and Krugman 1985, chapter 8; Leamer and Stern 1970; Linnemann 1966; Tinbergen 1962).[9] But it is widely recognized that a state's capacity to supply exports is directly related to its GDP; so, too, is a state's demand for imports. Population often is included in this model as a proxy for a country's market size. Assuming economies of scale in production, the larger a country's population, the more goods for which it is likely to achieve the minimum scale needed for efficient production without relying on export markets (Aitken 1973, 882; Linnemann 1966, 11–4; Winters and Wang 1994, 12). A more populous country, therefore, is expected to produce less for export relative to its total production than is a less populous country. Similarly, a more populous country is expected to have a greater capacity to satisfy domestic demand with domestically produced goods, and thus a lower demand for imports, than is a less populous country.

Distance usually is included in the gravity model as a proxy for transportation and transaction costs. These costs are expected to rise, and hence bilateral trade flows are expected to decrease, as the distance between trade partners increases. For these and other reasons, the gravity model predicts that bilateral trade flows will be directly related to the GDP of i and j and inversely related to both the population of i and j and the distance between them.

In addition to GDP, population, and distance, we include in the following model variables related to whether both trading partners are members of a common alliance and a common preferential trading arrangement, whether either state is a major power, and the interactions among these factors.

As noted above, we use data on alliances and major powers compiled by the COW Project (Small and Singer 1969, 1982, 44–5) in this study. Furthermore, our analysis centers on the period since World War II, when the major powers have been the United States, the Soviet Union, Great Britain, France, and China. Although this list omits states that are major economic but not military powers—particularly West Germany and Japan—it seems appropriate in light of our emphasis on the relationship between political-military relations and trade. In order to assess the implications of excluding states that are solely economic powers from this list, however, we will analyze the sensitivity of

[9] A number of studies have attempted to provide a theoretical justification for the gravity model's multiplicative functional form (e.g., Anderson 1979; Bergstrand 1985, 1989; Deardorff 1995; Helpman and Krugman 1985, chapter 8). One reason to use a multiplicative rather than a linear specification of this model is that as the economic size—measured in terms of GDP and population—of either i or j approaches zero, so, too, should trade flows between them (Deardorff 1995, 4).

our empirical results to whether West Germany and Japan are considered major powers.

Also included in the following model are variables that measure whether the trading partners (1) are at war with one another, (2) are parties to the General Agreement on Tariffs and Trade (GATT), (3) had a prior colonial relationship, and (4) have command economies. First, it is important to control for the effects of war because it may influence patterns of both alliances and trade. A wide variety of studies have drawn links between alliances and warfare (e.g., Levy 1989, 228–30, 235–6); and the available evidence indicates that wars tend to dampen trade flows (Gowa 1994; Gowa and Mansfield 1993; Mansfield 1994; Pollins 1989a, 1989b). Second, the effects of the GATT on trade are analyzed since the GATT is widely viewed as having provided the global institutional framework for international trade during the post–World War II era, and there is evidence that it has promoted trade flows among members (e.g., Pollins 1989a). Since distinctions often are drawn between the GATT and preferential trading arrangements in both theoretical and empirical studies of international trade (e.g., Eichengreen and Irwin 1995; Pollins 1989a; Yarbrough and Yarbrough 1992, 5), we consider their effects separately.

Third, prior colonial relations are likely to influence trade flows (Kleiman 1976; Pollins 1989a, 741; Srivastava and Green 1986). Furthermore, omitting this variable from the model risks generating biased estimates of preferential trading arrangements' effects on trade, since a number of such arrangements (including the Lomé Convention and other preferential arrangements involving the European Community/European Union) are comprised of states that had a previous colonial relationship.

Finally, we include a variable pertaining to whether both trading partners have a command economy. Many pairs of countries with command economies also have been allied during the post–World War II era. It is important to ensure that any observed effect of alliances on trade is not due to the unusual ability of states with a command economy to direct trade toward allies and away from other states.

Thus, the model we will estimate is:

$$\begin{aligned}\log X_{ij(t)} = {} & \log \beta_0 + \beta_1 \log GDP_{i(t-1)} + \beta_2 \log GDP_{j(t-1)} \\ & + \beta_3 \log POP_{i(t-1)} + \beta_4 \log POP_{j(t-1)} \\ & + \beta_5 \log DIST_{ij(t-1)} + \beta_6 \log ALLY_{ij(t-1)} \\ & + \beta_7 \log PTA_{ij(t-1)} + \beta_8 \log MP_{ij(t-1)} \\ & + \beta_9 (\log ALLY_{ij(t-1)} \times \log PTA_{ij(t-1)}) \\ & + \beta_{10} (\log ALLY_{ij(t-1)} \times \log MP_{ij(t-1)}) \\ & + \beta_{11} (\log PTA_{ij(t-1)} \times \log MP_{ij(t-1)}) \\ & + \beta_{12} \log GATT_{ij(t-1)} + \beta_{13} \log COL_{ij(t-1)} \\ & + \beta_{14} \log COM_{ij(t-1)} + \beta_{15} \log WAR_{ij(t-1)} + \log e_{ij(t)}. \end{aligned} \quad (2)$$

The dependent variable is the natural logarithm of the real value of exports from state i to state j in year t. The independent variables are defined as follows:

log $GDP_{i(t-1)}$ and log $GDP_{j(t-1)}$ are the natural logarithms of the real GDP of i and j, respectively, in year $t - 1$;

log $POP_{i(t-1)}$ and log $POP_{j(t-1)}$ are the natural logarithms of the national population of i and j, respectively, in year $t - 1$;

log $DIST_{ij(t-1)}$ is the natural logarithm of the geographical distance between i and j in year $t - 1$;

log $ALLY_{ij(t-1)}$ is a dummy variable that equals one if i and j are allied in year $t - 1$, zero otherwise;

log $PTA_{ij(t-1)}$ is a dummy variable that equals one if i and j are party to a common preferential trading arrangement in year $t - 1$, zero otherwise;

log $MP_{ij(t-1)}$ is a dummy variable that equals one if either i or j is a major power in year $t - 1$, zero otherwise;

log $GATT_{ij(t-1)}$ is a dummy variable that equals one if both i and j are party to the GATT in year $t - 1$, zero otherwise;

log $COL_{ij(t-1)}$ is a dummy variable that equals one if i and j had a colonial relationship ending in or before year $t - 1$ (provided that it concluded after the onset of World War II), zero otherwise;

log $COM_{ij(t-1)}$ is a dummy variable that equals one if both i and j have a command economy in year $t - 1$, zero otherwise;

log $WAR_{ij(t-1)}$ is a dummy variable that equals one if i and j are at war with each other in year $t - 1$, zero otherwise; and

log $e_{ij(t)}$ is a stochastic error term.

The remaining variables are included in order to analyze whether, as we argued earlier, the interactions among alliances, preferential trading arrangements, and major powers help to explain patterns of bilateral trade.[10] A description of the data and coding procedures used in this analysis is provided in the Appendix.

In the following analysis, we include all pairs of countries for which complete data are available in 1960, 1965, 1970, 1975, 1980, 1985, or 1990 (years $t - 1$). The data are pooled across these seven years. The parameters in equation 2 are estimated using ordinary least squares (OLS), after controlling for country-specific and year-specific fixed effects by including a dummy variable for each country and year in the sample (except the United States and 1990, which are the respective reference categories). Because White tests (Greene 1993, 392–3, 450; White 1980) yield evidence of heteroskedasticity in each cross-section, White heteroskedasticity-consistent standard errors are used in this analysis.

Furthermore, because there is reason to expect the disturbances to exhibit autocorrelation, we estimate the parameters in equation 2 after including a lagged endogenous variable in the model. Doing so also is

[10] It should be noted that in antilogarithmic form, all the dummy variables in equation 2 take on values of e (the base of the natural logarithms) and one; as such, the logarithms of these variables take on values of one and zero.

useful since, if alliances, preferential trading arrangements, or other independent variables in equation 2 are influenced by prior trade flows, then omitting a lagged endogenous variable from the model will generate biased estimates of their effects (Eichengreen and Irwin 1995). The logarithm of the lagged value of exports, however, is likely to be correlated with the error term in equation 2, thereby generating inconsistent estimates. We therefore construct an instrument for the lagged endogenous variable, a well-known procedure for ameliorating this problem (Greene 1993, 435–6; Maddala 1988, 392–5).[11] Estimates of the parameters in equation 2 are shown in Table 1. The model estimated without the lagged endogenous variable is referred to as model 1; that estimated with the lagged endogenous variable is referred to as model 1A.

ESTIMATES OF THE PARAMETERS

The results in Table 1 indicate that the variables in models 1 and 1A explain 55% of the variation in bilateral trade flows. Also, as expected, GDP is directly related to the value of exports, and population and distance are inversely related to the value of exports. The estimates of log $GDP_{i(t-1)}$ and log $GDP_{j(t-1)}$ are positive; the estimates of log $POP_{i(t-1)}$, log $POP_{j(t-1)}$, and log $DIST_{ij(t-1)}$ are negative; and each of them is statistically significant.

In addition, the results based on model 1A demonstrate that the lagged value of log $X_{ij(t)}$ is strongly related to its current value. Surprisingly, however, the estimate of this parameter is negative. Further analysis revealed that this result is due to collinearity between lagged log $X_{ij(t)}$ and the values of both GDP and population in year $t - 1$. To reduce the collinearity among these variables, we replace log $GDP_{i(t-1)}$ and log $GDP_{j(t-1)}$ with log $(GDP_{i(t-1)} \times GDP_{j(t-1)})$ and log $POP_{i(t-1)}$ and log $POP_{j(t-1)}$ with log $(POP_{i(t-1)} \times POP_{j(t-1)})$. This specification is referred to as model 1B in Table 1 and is closely related to that used in a number of previous studies (e.g., Eichengreen and Irwin 1995, Frankel 1993).[12] As expected, the estimate of log $(GDP_{i(t-1)} \times GDP_{j(t-1)})$ is positive, the estimate of log $(POP_{i(t-1)} \times POP_{j(t-1)})$ is negative, and both are statistically significant. Moreover, the estimate of lagged log $X_{ij(t)}$ based on model 1B is positive and significant, which accords with the findings of those studies that have included a lagged endogenous variable in a gravity model (e.g., Eichengreen and Irwin 1995).

It also is important to recognize that, as shown in Table 1, regardless of which model is analyzed, very

TABLE 1. Regression of Exports on GDP, Population, Distance, Alliances, Preferential Trading Arrangements, Major-Power Status, GATT, Prior Colonial Ties, Command Economies, and War, 1960–90

	Model		
Variable	1	1A	1B
log β_0	7.783*	2.462	12.014**
	(3.156)	(3.381)	(3.373)
log GDP_i	.687**	.781**	—
	(.041)	(.047)	
log GDP_j	1.322**	1.608**	—
	(.040)	(.076)	
log POP_i	−.872**	−.808**	—
	(.079)	(.083)	
log POP_j	−.974**	−.959**	—
	(.078)	(.083)	
log $(GDP_i \times GDP_j)$	—	—	.527**
			(.044)
log $(POP_i \times POP_j)$	—	—	−.869**
			(.083)
log $DIST_{ij}$	−.787**	−.790**	−.792**
	(.014)	(.014)	(.014)
log $ALLY_{ij}$	.192**	.214**	.213**
	(.049)	(.050)	(.050)
log PTA_{ij}	.499**	.490**	.466**
	(.038)	(.039)	(.039)
log MP_{ij}	.631**	.652**	.642**
	(.133)	(.124)	(.124)
log $ALLY_{ij} \times$ log PTA_{ij}	.589**	.592**	.592**
	(.064)	(.065)	(.065)
log $ALLY_{ij} \times$ log MP_{ij}	.082	−.005	−.016
	(.066)	(.063)	(.067)
log $PTA_{ij} \times$ log MP_{ij}	−.546**	−.548**	−.527**
	(.065)	(.067)	(.067)
log $GATT_{ij}$	.071	.050	.042
	(.037)	(.040)	(.040)
log COL_{ij}	1.812**	1.800**	1.791**
	(.083)	(.089)	(.089)
log COM_{ij}	.791**	.760**	.841**
	(.102)	(.110)	(.113)
log WAR_{ij}	−6.423**	−6.247**	−6.496**
	(.108)	(.112)	(.109)
lagged log X_{ij}	—	−.293**	.913**
		(.066)	(.014)
$\bar{R}^2$	.55	.55	.54
N	32,156	30,418	30,418

Note: Entries are unstandardized regression coefficients. Two-tailed tests are conducted for each regression coefficient. Figures in parentheses are White heteroskedasticity-consistent standard errors. Regressions include dummy variables for country-specific and year-specific fixed effects.
*$p \leq .05$; **$p \leq .001$.

[11] This instrument is created by regressing the lagged value of log $X_{ij(t)}$ on the lagged values of log $GDP_{i(t-1)}$, log $GDP_{j(t-1)}$, log $POP_{i(t-1)}$, log $POP_{j(t-1)}$, and a dummy variable for each year (except 1990) included in the analysis. Data on exports for 1956 and data on GDP and population for 1955 are used to generate values of the instrumental variable for 1961. The dearth of these data accounts for the decline in N of 1,738 when the lagged endogenous variable is included in the model and (as noted in the Appendix) is one reason we restrict our analysis to the period beginning in 1960.

[12] Frankel (1993, 58; see also Helpman and Krugman 1985) points out that entering the GDP of the importer and exporter in product form is consistent with theories of international trade based on imperfect competition. One implication of this specification is that two states are expected to conduct more trade if both have a medium-sized economy than if one has a large economy and the other has a small economy.

little variation exists in the signs, sizes, or significance levels of the remaining variables in equation 2.

Turning to the remaining variables, there is considerable evidence that wars depress trade and that a former colonial relationship and the existence of a command economy on the part of both trade partners promote commerce. In every case, the estimate of log $WAR_{ij(t-1)}$ is negative, the estimates of log $COL_{ij(t-1)}$ and log $COM_{ij(t-1)}$ are positive, and all of them are statistically significant. In addition, there is some evidence that GATT membership facilitates trade. The coefficient of log $GATT_{ij(t-1)}$ is positive in each case, but it is never statistically significant.

The Effects of Alliances and Preferential Trading Arrangements on Trade

The results in Table 1 also provide strong support for the arguments advanced earlier. They indicate that alliances and preferential trading arrangements each promote trade, that the effects of alliances are heightened if the trade partners include a major power, and that the combination of an alliance and a preferential trading arrangement generates more commerce than does either type of institution alone. The estimates of log $ALLY_{ij(t-1)}$, log $PTA_{ij(t-1)}$, and log $MP_{ij(t-1)}$ are positive and statistically significant based on all three models. Equally important for the purposes of testing the hypotheses described above, the estimates of log $ALLY_{ij(t-1)} \times$ log $PTA_{ij(t-1)}$ and log $PTA_{ij(t-1)} \times$ log $MP_{ij(t-1)}$ are significant in each instance, although there is no evidence that log $ALLY_{ij(t-1)} \times$ log $MP_{ij(t-1)}$ has a statistically significant effect on trade. Moreover, the quantitative effects of alliances, preferential trading arrangements, and major powers on the predicted value of exports tend to be quite large.

In antilogarithmic form and for a given pair of states, i and j, in a given year, t, equation 2 can be expressed as:

$$X_{ij(t)} = C \times [ALLY_{ij(t-1)} \exp(\beta_6 + \beta_9 \log PTA_{ij(t-1)} + \beta_{10} \log MP_{ij(t-1)})] \times [PTA_{ij(t-1)} \exp(\beta_7 + \beta_{11} \log MP_{ij(t-1)})] \times [MP_{ij(t-1)} \exp(\beta_8)], \quad (3)$$

where

$$C = \beta_0 GDP_{i(t-1)}^{\beta 1} GDP_{j(t-1)}^{\beta 2} POP_{i(t-1)}^{\beta 3} \cdot POP_{j(t-1)}^{\beta 4} DIST_{ij(t-1)}^{\beta 5} GATT_{ij(t-1)}^{\beta 12} \cdot COL_{ij(t-1)}^{\beta 13} COM_{ij(t-1)}^{\beta 14} WAR_{ij(t-1)}^{\beta 15} e_{ij(t)}.$$

As noted earlier, $ALLY_{ij(t-1)}$, $PTA_{ij(t-1)}$, $MP_{ij(t-1)}$, $GATT_{ij(t-1)}$, $COL_{ij(t-1)}$, $COM_{ij(t-1)}$, and $WAR_{ij(t-1)}$ are dummy variables that take on values of e and one; their natural logarithms therefore take on values of one and zero. For the purposes of analyzing the effects of alliances, preferential trading arrangements, and major powers on the predicted value of trade between a given pair of states in a given year, C can be treated as a constant. The entries in Table 2 are derived by arbitrarily setting C equal to 100. The estimates of $\beta_6 - \beta_{11}$ in Table 1 based on models 1, 1A, and 1B then are used to generate predicted values of $X_{ij(t)}$.[13] For each model, comparing the entries in Table 2 allows us to assess the proportional change in the predicted value of trade between a given pair of states in a given year if these states are allied rather than nonallied, are party to a common preferential trading arrangement rather than

TABLE 2. Effects of Alliances, Preferential Trading Arrangements, and Major-Power Status on the Predicted Value of Exports, Based on Estimates in Table 1

Relationship between Countries i and j	Model 1	Model 1A	Model 1B
A. Countries i and j include a major power			
Members of a preferential trading arrangement			
Allies	425	403	394
Not Allies	179	181	179
Not members of a preferential trading arrangement			
Allies	247	237	231
Not Allies	188	192	190
B. Countries i and j are not major powers			
Members of a preferential trading arrangement			
Allies	360	365	356
Not Allies	165	163	159
Not members of a preferential trading arrangement			
Allies	121	124	124
Not Allies	100	100	100

Note: Entries are the predicted value of exports from country i to country j, based on equation 3, where C is set equal to 100.

[13] Rather than setting C equal to 100, we could use the observed values of the variables in equation 3, the dummy variables pertaining to each country and year, and the estimates of their regression coefficients to obtain the predicted dollar value of trade for a given pair of countries in a given year. Note, however, that for this given pair of countries and year, doing so would yield the same proportional increases in trade as those derived using the entries in Table 2. Furthermore, doing so often generates predicted values of trade that deviate noticeably from their corresponding observed values. This problem is common in models estimated in double-log form. There is substantial variation about the regression lines estimated using models 1, 1A, and 1B, and this variation is magnified when the value of trade, rather than the logarithm of this value, is analyzed. Consider, for example, the twenty pairs of countries for which the logarithm of exports is closest to the sample mean. On average, the predicted log of exports based on model 1 deviates from the observed log of exports only by about 5%. This figure is only slightly higher for the twenty pairs of countries that conducted the most trade, but it is much higher for those pairs that conducted the least trade. Since the absolute values of these residuals often are relatively large, however, the differences between the predicted and observed values of exports based on this model are much more pronounced than those between the predicted and observed values of the logarithm of exports.

not, and include a major power rather than being composed solely of nonmajor powers, as well as the extent to which the quantitative effects of each factor are influenced by the other two factors.

The findings in Table 2 are consistent with the argument that alliances promote trade among members. A change from the absence to the existence of an alliance that does not include a major power increases the predicted value of trade between nonmajor powers by about 20% to 25% if these states are not members of a common preferential trading arrangement. If the trading partners include a major power and are not members of a preferential arrangement, a change from the absence to the existence of an alliance generates about a 20% to 30% increase in the predicted flow of exports. Furthermore, the predicted value of trade between allies that include a major power (and are not members of a common preferential trading arrangement) is roughly twice as large as the corresponding value between nonmajor-power allies.

That the effects of alliances are heightened if the trading partners are members of a common preferential trading arrangement also accords with our argument. Under these conditions, a change from the absence to the existence of an alliance yields an increase in the predicted value of trade of roughly 120% between nonmajor powers and of about 120% to 140% between states that include a major power.

Like alliances, preferential commercial arrangements exert a considerable influence on trade, but our results indicate they have a larger effect than alliances on trade flows between nonmajor powers, whereas the opposite holds for trade flows involving major powers. Instituting a preferential trading arrangement yields an increase of about 60% to 65% in the predicted value of exports between nonmajor powers that are not allied. Surprisingly, however, instituting such an arrangement decreases by about 5% the predicted value of trade between states that include a major power and are not allied.

As expected, the effects of a preferential trading arrangement are heightened if the members are allied. If allies establish a preferential commercial agreement, then the predicted value of exports increases by almost 200% between nonmajor powers and by roughly 70% between countries that include a major power.

These results provide strong support for our argument that the combination of an alliance and a preferential trading agreement generates a greater impetus to trade than does either of these institutions alone. As shown in Table 2, members of an alliance and a preferential trading arrangement conduct considerably more trade than do parties to either one or the other but not both. Moreover, allied preferential trading arrangement partners that include a major power engage in about 10% to 20% more trade than do their nonmajor-power counterparts. Indeed, the predicted value of trade for pairs of states that are allied, belong to a common preferential trading arrangement, and include a major power is the highest in Table 2 based on each model estimated, followed by that for nonmajor powers that are both allies and party to a common preferential trading arrangement, and that for major-power allies that are not members of a common preferential trading arrangement.

Definition of a Major Power

It was noted earlier that our analysis of major powers is based on a definition that emphasizes political-military strength. Economic powers lacking sufficient military capabilities to meet this criterion, however, also may influence the commercial effects of alliances and preferential arrangements on trade. Japan and West Germany are obvious examples of such states, and we therefore estimate the parameters in models 1, 1A, and 1B after including them among the major powers.

The results of this analysis tend to be very similar to those in Table 1, with two notable differences. First, the estimate of log $MP_{ij(t-1)}$ is, on average, about 40% larger when Japan and West Germany are considered major powers than when they are not. This result is hardly surprising, since both countries have been especially active participants in the international trading system during the period examined here.

Second, the estimates of both log $ALLY_{ij(t-1)} \times$ log $MP_{ij(t-1)}$ and log $PTA_{ij(t-1)} \times$ log $MP_{ij(t-1)}$ are much smaller than their corresponding estimates in Table 1. Thus, for example, instituting an alliance between states that include a major power generates roughly a 15% smaller increase in the predicted value of trade when Japan and West Germany are considered major powers than when they are not. This suggests that political-military major powers augment the openness of alliances and preferential trading arrangements to a greater extent than do other economic powers, which is consistent with the argument advanced above.

THE EFFECTS OF ALLIANCE FORMATION ON CHANGES IN TRADE

Thus far, we have examined the effects of preexisting alliances and preferential trading arrangements, on the level of trade among states. But it is important to ensure that our results are not undermined by simultaneity bias caused by any influence of trade on alliances or preferential arrangements. Various studies have suggested that high levels of trade can generate incentives for states to forge formal institutions, like preferential trading arrangements, that minimize future disruptions of commercial relations (e.g., Eichengreen and Irwin 1995, Yarbrough and Yarbrough 1992). We addressed this issue earlier by lagging the effects of the independent variables one year and by including the lagged value of exports in models 1A and 1B. We now examine whether the formation of alliances (and preferential trading arrangements) increases bilateral trade flows. We then examine the effects of trade flows and changes in them on the formation of alliances. Initially, we estimate the parameters in the following model:

$$\Delta X_{ij(t)} = \alpha_0 + \alpha_1 \Delta GDP_{i(t-1)} + \alpha_2 \Delta GDP_{j(t-1)}$$

TABLE 3. Regression of Change in Exports on Changes in GDP, Population, Alliances, Preferential Trading Arrangements, GATT, Command Economies, and War, 1960–90

	Model	
Variable	2	2A
α_0[a]	917.833*** (72.440)	780.164*** (81.574)
ΔGDP_i	−.000521* (.000208)	−.000361 (.000271)
ΔGDP_j	.000735 (.000431)	.001613*** (.000459)
ΔPOP_i	−2.403* (1.080)	−1.683 (1.173)
ΔPOP_j	−4.207*** (1.044)	−3.767*** (1.046)
$\Delta ALLY_{ij}$[a]	106.607 (56.109)	172.183 (125.577)
ΔPTA_{ij}[a]	−63.376** (20.849)	−87.851** (26.895)
$\Delta(ALLY_{ij} \times PTA_{ij})$[a]	236.174*** (67.700)	430.848*** (101.215)
$\Delta(ALLY_{ij} \times MP_{ij})$[a]	99.819 (115.261)	104.358 (227.728)
$\Delta(PTA_{ij} \times MP_{ij})$[a]	174.900* (89.235)	−96.825 (71.187)
$\Delta GATT_{ij}$[a]	−16.237 (12.309)	−27.620 (15.662)
ΔCOM_{ij}[a]	622.404*** (184.746)	301.254*** (64.213)
ΔWAR_{ij}[a]	−130.052 (76.238)	67.431*** (17.161)
$\bar{R}^2$	.06	.06
N	23,940	20,892

Note: Entries are unstandardized regression coefficients. Two-tailed tests are conducted for each regression coefficient. Figures in parentheses are White heteroskedasticity-consistent standard errors. Regressions include dummy variables for country-specific and year-specific fixed effects.
[a]Parameter estimate and standard error are divided by 1,000,000.
*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

$$+ \alpha_3\Delta POP_{i(t-1)} + \alpha_4\Delta POP_{j(t-1)} + \alpha_5\Delta ALLY_{ij(t-1)} + \alpha_6\Delta PTA_{ij(t-1)} + \alpha_7\Delta(ALLY_{ij(t-1)} \times PTA_{ij(t-1)}) + \alpha_8\Delta(ALLY_{ij(t-1)} \times MP_{ij(t-1)}) + \alpha_9\Delta(PTA_{ij(t-1)} \times MP_{ij(t-1)}) + \alpha_{10}\Delta GATT_{ij(t-1)} + \alpha_{11}\Delta COM_{ij(t-1)} + \alpha_{12}\Delta WAR_{ij(t-1)} + \Delta z_{ij(t)}. \quad (4)$$

In this model, referred to as model 2 in Table 3, the change in exports between states i and j is measured from year $t - 5$ to year t, the change in each independent variable is measured from year $t - 6$ to year $t - 1$, and $\Delta z_{ij(t)}$ is an error term. It is clear, however, that this specification may not completely alleviate any simultaneity between trade and the exogenous variables in the model. Changes in trade from year $t - 5$ to year $t - 1$ could, for example, lead to the formation of alliances or preferential trading arrangements during that time. We therefore estimate a second model, referred to as model 2A in Table 3, in which each independent variable is measured from year $t - 11$ to year $t - 6$. In this model, the effects of the independent variables are completely lagged, thereby further reducing any possibility of simultaneity bias.[14]

It should be noted that based on our sample of states and the period considered here, no changes occurred in the distance between states, the states that were major powers, and states that had a prior colonial relationship. These variables, therefore, are not included in equation 4.

As in our earlier analysis, OLS is used to derive estimates of the parameters in models 2 and 2A after pooling the observations over time and including dummy variables for each country and year in the sample (except the United States and 1960, which are the respective reference categories). Since evidence of heteroskedasticity exists in each cross-section, we continue to use White heteroskedasticity-consistent standard errors in our tests of statistical significance.

The results of this analysis are presented in Table 3. Particularly important is the fact that $\Delta ALLY_{ij(t-1)}$, $\Delta(ALLY_{ij(t-1)} \times MP_{ij(t-1)})$, and $\Delta(ALLY_{ij(t-1)} \times PTA_{ij(t-1)})$ are positive in each case.[15] These findings indicate that the formation of an alliance tends to increase trade among members. That this relationship is relatively weak, however, also is clear, since only the estimate of $\Delta(ALLY_{ij(t-1)} \times PTA_{ij(t-1)})$ is statistically significant based on either model.[16] In addition, the results in Table 3 indicate that the effects of alliance formation on trade tend to be larger in the five years after the alliance is formed than in the period during which it is formed. The estimate of $\Delta ALLY_{ij(t-1)}$ is

[14] It should be noted that the functional form of models 2 and 2A is linear rather than multiplicative, like models 1, 1A, and 1B. While a simpler linear model often has obvious advantages, under the present circumstances it could be argued that a multiplicative model is more appropriate. Hence, we also estimated the parameters in models 2 and 2A based on a multiplicative specification, whereby each variable was defined as the change in its natural logarithm. In only three cases—$\Delta GDP_{i(t-1)}$ and $\Delta(PTA_{ij(t-1)} \times MP_{ij(t-1)})$ based on model 2 and $\Delta WAR_{ij(t-1)}$ based on model 2A—did statistically significant estimates based on the linear specification (reported in Table 3) change signs but remain significant based on the multiplicative specification.

In addition, we included in equation 4 the level of exports from i to j in year t. The estimate of this variable was negative but insignificant based both on models 2 and 2A. Moreover, the signs, sizes, and significance levels of the remaining variables in equation 4 were not at all sensitive to the inclusion of this variable.

[15] One limitation of this analysis is that, based on the sample of states for which we have complete data, few pairs of countries changed from nonallies to allies during any of the five-year periods ($t - 6$ to $t - 1$ for model 2 and $t - 11$ to $t - 6$ for model 2A) in which the independent variables are measured. Indeed, most alliances and various preferential trading arrangements that existed during the era we examine were formed prior to its outset. As such, this and the following analysis only can be considered a preliminary first cut at the issues of whether the formation of alliances or preferential trading arrangements gives rise to changes in trade flows and whether trade flows contribute to their formation.

[16] The p-value of the estimate of $\Delta ALLY_{ij(t-1)}$ is .06 based on model 2 and .17 based on model 2A. Thus, the estimate based on model 2 would have been significant at the .05 level had we conducted a one-tailed rather than a two-tailed test.

about two-thirds larger and that of $\Delta(ALLY_{ij(t-1)} \times PTA_{ij(t-1)})$ is roughly three-quarters larger based on model 2A than model 2. The estimate of $\Delta(ALLY_{ij(t-1)} \times MP_{ij(t-1)})$, however, is virtually the same size regardless of whether the effects of alliance formation on changes in trade are fully lagged.

Whereas the formation of alliances between states that include a major power does not significantly increase trade flows, the formation of preferential trading arrangements between such states does. This increase, however, is realized only in the immediate aftermath of their formation. The estimate of $\Delta(PTA_{ij(t-1)} \times MP_{ij(t-1)})$ is positive and significant based on model 2 but is negative and not significant based on model 2A. Furthermore, the estimate of $\Delta PTA_{ij(t-1)}$ is negative and significant based on both models. In combination with our earlier results, these findings suggest that the trade-promoting effects of preferential arrangements that do not include allies or a major power occur only some time after they are formed.

The effects of GATT membership on trade seem to follow a similar pattern. Whereas our earlier results indicated that pairs of states belonging to the GATT conduct somewhat more trade than do other pairs, changes leading both trade partners to become partners to the GATT actually generate a mild decrease in trade. Indeed, the estimate of $\Delta GATT_{ij(t-1)}$ is negative, but small and insignificant, based on both models. There also is evidence that the onset of war depresses trade but that these effects are short-lived. The estimate of $\Delta WAR_{ij(t-1)}$ is negative and insignificant based on model 2 but positive and significant based on model 2A. In addition, changes leading both trade partners to have a command economy yield increases in trade: Both estimates of $\Delta COM_{ij(t-1)}$ are positive and significant. Finally, increases in the importer's GDP and decreases in the exporter's GDP and in the population of both trade partners give rise to increases in commerce. The estimate of $\Delta GDP_{j(t-1)}$ is positive, those of $\Delta GDP_{i(t-1)}$, $\Delta POP_{i(t-1)}$, and $\Delta POP_{j(t-1)}$ are negative, and five of the eight estimates are significant.

THE EFFECTS OF TRADE ON ALLIANCE FORMATION

The preceding results indicate that allies conduct more trade than do nonallies and that the formation of alliances tends to generate increases in trade. To further ensure that our findings do not reflect the effects of trade flows or changes in trade on the formation of alliances, we conduct two additional analyses.

First, we define a variable that is equal to the log of the odds that states i and j form an alliance during the period from year $t + 1$ to year $t + 4$, where we observe one if an alliance is formed during this period and zero otherwise. Like our earlier analysis, trade flows between i and j are measured in year t (where t = 1956, 1961, 1966, 1971, 1976, 1981, and 1986). These data are pooled and a logistic regression is conducted to estimate the effects of trade flows on the probability of alliance formation. The results indicate that the maximum likelihood estimate of trade is positive but small (9.29×10^{-11}) and not statistically significant (t = .87).

Second, we analyze whether the change in trade between i and j during the period from year $t - 5$ to year t influences the probability that they form an alliance during the period from year $t + 1$ to year $t + 4$, using the same procedure described above. The maximum likelihood estimate of the change in trade also is positive but small (2.94×10^{-10}) and not statistically significant (t = 1.16).

In addition, we introduced into these models other variables included in our earlier analyses and continued to find no evidence that trade flows or changes in them influence the formation of alliances. We also estimated these models using a multiplicative functional form and found no evidence that trade or changes in trade affect alliance formation, controlling for other variables (such as distance) included in our earlier analyses. These findings, therefore, provide no indication that our earlier results are undermined by problems of endogeneity.

DISCUSSION AND CONCLUSION

The results of this study indicate that alliances and preferential trading arrangements both promote the flow of trade and that in combination they generate more commerce than does either alone. These findings are consistent with the argument that firms and private traders have incentives to reduce the risks of opportunism by foreign governments. Investing in relation-specific assets to service the market of an ally or a preferential trading arrangement partner reduces these risks. These risks are further reduced if such a partner is also an ally.

That alliances facilitate trade among members also accords with the argument that the security externalities fostered by commerce create incentives for states to trade more freely with allies than with adversaries. These incentives are especially pronounced for states with the ability to influence their terms of trade. Major powers are likely to have that ability, and this is consistent with our finding that pairs of allied states which include a major power conduct considerably more trade than allied pairs which do not. In addition, major-power alliances tend to be more durable and stable than those comprised solely of nonmajor powers. This tendency further reduces the risks of opportunism faced by investors in dedicated assets to service an ally's market. It also reduces the risk that a government's current allies will become adversaries in the near future and use the augmented political-military capacity derived from intraalliance trade to undermine its security.

Illustrative of the effects of major-power alliances is the case of the United States and South Korea. The United States has long sought to foster South Korean economic growth in order to bolster its security vis-à-vis North Korea and other potential adversaries. To this end, the United States pressured South Korea to adopt an export-led growth strategy and provided a

market for a large portion of these exports (Haggard and Moon 1983). Indeed, it is widely acknowledged that these two countries have enjoyed a " 'special' . . . economic and trade relationship based primarily on strategic and other noneconomic factors" (Yang 1986, 34). The United States (and its allies) also has severely limited trade with North Korea in an attempt to undermine its security.

The heightened tendency for major powers to promote trade with allies at the expense of political rivals is not limited to this one example. Cohen argues that:

> from the start of the Cold War, official Washington's chief objective was to reconstruct the war-ravaged economies of Western Europe and Japan, and maintain the vigor of the undamaged Canadian economy, so that these countries could serve as effective barriers to communist expansion. . . . Toward this end, . . . the United States later encouraged an outflow of private investment from the United States, particularly to Canada but also to Europe, and it promoted through GATT a broad program of worldwide liberalization of industrial trade that frequently benefited its allies directly at its own expense (1991, 102; see also Gowa 1994).

In fact, U.S. policymakers seem to have recognized the contribution that free trade can make to the security of participants and the need to discriminate between friends and foes in this regard. As Dean Acheson argued in the late 1940s, "the preservation and development of sound trading relationships with other countries of the free world [that is, U.S. allies] is an essential and important element in the task of trying to build unity and strength in the free world" (quoted in Freeland 1985, 325).

Equally important in this regard was the denial of commercial benefits to adversaries of the United States and its allies. Chief among the efforts to achieve this end was COCOM, which was explicitly designed to stem the flow of commerce that might enhance the security of the Soviet Union and its allies (Mastanduno 1992). Due to its effect, "by the early 1950s, American trade with the East was negligible, while trade between Eastern and Western Europe continued but at much reduced levels" (Pollard and Wells 1984, 355–6).

These illustrations and our statistical results are consistent with the findings of most previous research on the effects of alliances on trade, almost all of which has analyzed commerce between or involving major powers (Gowa 1994, Gowa and Mansfield 1993, Mansfield and Bronson 1997, Summary 1989). But our results indicate that alliances comprised of nonmajor powers also promote trade and that the combination of an alliance and a preferential trading arrangement provides a particularly potent impetus to trade, important issues that have not been addressed to date.

Moreover, our results do not reflect the influence of war, command economies, prior colonial relations, or GATT membership. We controlled for the effects of each of these factors, and, except for the GATT, each has a strong influence on trade flows. That wars depress trade is consistent with various studies which have found that conflict inhibits trade, while cooperation promotes it (Polachek 1980; Pollins 1989a, 1989b). As we mentioned earlier, however, these studies did not analyze the effects of alliances on trade, and Pollins (1989a, 757) noted that these results might not account for variations in trade due to alliance relations. Our findings indicate that, in addition to conflict, alliances are salient influences on commerce.

The observed effects of command economies, prior colonial relations, and GATT membership on bilateral trade flows also accord with the existing literature (Kleiman 1976, Mansfield and Bronson 1997, Pollins 1989a, Srivastava and Green 1986), although the GATT's effect is somewhat weaker than expected. But alliances and preferential trading arrangements have strong and large influences on trade even after controlling for these factors. Thus, our findings pertaining to alliances and preferential trading arrangements are not, for example, due to the tendency for the Soviet Union to direct trade flows within the Warsaw Pact and the Council for Mutual Economic Assistance. Nor are they outgrowths of the tendency for some preferential trading arrangements and alliances to be comprised of states with a former colonial relationship or membership in the GATT.

Much research on the determinants of bilateral trade flows has focused on the effects of preferential trading arrangements. Consistent with the findings of this research, our results indicate that these arrangements had a marked influence on trade after World War II. As we mentioned earlier, however, very few studies have compared the effects of preferential trading arrangements with those of alliances; and no research has examined the extent to which the effects of preferential trading arrangements depend on whether commercial institutions include a major power or are comprised of allies.

Yet, these issues are centrally important. Based on our results, preferential trading arrangements have a larger influence than alliances on trade flows between nonmajor powers, whereas the opposite holds for states that include a major power. Furthermore, absent an alliance, the effects of preferential commercial treatment on trade depend very little on whether the trading partners include a major power. The predicted value of trade conducted by nonallied members of a preferential trading arrangement is about 10% larger if one partner is a major power than if both are not major powers. But regardless of major-power status, the effects of a preferential trading arrangement depend fundamentally on whether its members also are allies. Indeed, allied members of a preferential trading arrangement conduct roughly 120% to 140% more trade than do their nonallied counterparts (refer to Table 2).

Moreover, most studies of preferential trading arrangements omit alliances from the analysis; had we done so, too, substantial bias would have been introduced into our estimates of preferential trading arrangements' effects. For example, estimates of log $PTA_{ij(t-1)}$ based on models 1, 1A, and 1B increase by an average of about 50% when log $ALLY_{ij(t-1)}$, log $ALLY_{ij(t-1)} \times$ log $MP_{ij(t-1)}$, and log $ALLY_{ij(t-1)} \times$ log $PTA_{ij(t-1)}$ are deleted from these models. Since preferential trading arrangements often are comprised

of political-military allies (Mansfield 1993), research that focuses solely on discriminatory commercial blocs therefore seems likely to confuse their effects with those of alliances and to systematically overstate the influence of preferential trading arrangements on commerce.

One central purpose of this paper was to analyze whether the combination of an alliance and a preferential trading arrangement provides a greater impetus to commerce than does either type of institution alone. Our results provide strong support for this argument. Nonmajor powers conduct roughly 120% to 200% more trade if they are party to both an alliance and a preferential trading arrangement than if they are either allies or members of such an arrangement (but not both). Allies that belong to a preferential trading arrangement and include a major power conduct about 70% more trade than do allies that include a major power but are not members of a preferential trading arrangement and roughly 125% more trade than nonallied members of such an arrangement that include a major power. Moreover, the predicted value of trade between states that are allies, members of a common preferential trading arrangement, and include a major power is greater than under any other set of conditions examined in this study, followed by the predicted value of trade between nonmajor powers that share both an alliance and a preferential trading arrangement (refer to Table 2).

These findings indicate that the interplay between alliances and preferential trading arrangements is fundamental to explaining patterns of international trade. It is clear that a wide variety of alliances and preferential trading arrangements exist and that different types of each may have different influences on trade. It is equally clear that our analysis is confined to the post–World War II period and that the effects of alliances and preferential commercial treatment during this era may not correspond to their effects during earlier periods. Our results strongly suggest, however, that the pursuit of power conditions the pursuit of plenty. In so doing, this paper provides considerable evidence that an understanding of international politics is central to the study of international trade.

APPENDIX: DATA SOURCES AND CODING

Described here are the data used in this article and some coding issues pertaining to our analyses.

Data on exports are taken from the International Monetary Fund (IMF), *Direction of Trade* (various years). The IMF presents these data in nominal U.S. dollars. Following Eichengreen and Irwin (1995), we use the U.S. wholesale price index and producer price index to create real values of exports. Furthermore, the IMF often does not distinguish between pairs of countries for which so little trade is conducted that the trade flow is reported as zero and pairs of countries for which data are not available. As such, neither type of pair is included in any of our analyses.

Data on GDP and population are taken from the Mark 5.6 version of the Penn World Table (Summers and Heston 1991). In order to maintain consistency with the procedure for deflating the data on exports described above, we generate nominal values of GDP using the data provided in the Penn World Table on per capita GDP expressed in current prices and population. We then deflate these values using the U.S. wholesale price index and producer price index. This data set does not include values of per capita GDP and population for a number of countries in 1990. Where it is possible to do so, we substitute values of these variables in 1989 for missing values in 1990.

Consistent with previous studies using gravity models, we measure distance based on the shortest distance in nautical miles between ports in states i and j. If at least one trading partner is land-locked, then we rely on land distances (either road or rail) to measure the distance between them. Data on geographical distances are taken from the Defense Mapping Agency, *Distances between Ports* (1985); Fitzpatrick and Modlin (1986); *The Times Atlas of the World* (1992); and *The Times Concise Atlas of the World* (1972).

Data on alliances are taken from Small and Singer (1969) and preliminary updates of these data provided by the COW Project, dated March 25, 1993. We consider all neutrality agreements, ententes, and defense pacts listed by Small and Singer to be alliances. Since they sought to explain wars, Small and Singer did not include wartime alliances in their compilation. They noted, however, that for other purposes it would be important to amend their list correspondingly, and previous studies of the relationship between alliances and trade have done so (Gowa 1994, Gowa and Mansfield 1993). We therefore include as allies all states fighting together in any interstate war listed by Small and Singer. In order to maintain consistency with the earlier studies of alliances and trade, we also include as allies the United States and Japan, even though this pair of countries is not included in Small and Singer's data set. This decision is made because the Japanese–United States Security Treaty (1951–60) and the Treaty of Mutual Cooperation and Security (1960–present) served much the same purpose as an alliance, including the stipulation that the United States come to Japan's assistance in the event it is attacked (Grenville 1974, 270, 286–7). However, the decision to code these states as allies has no bearing on any of our results.

Data on preferential trading arrangements are taken from Belous and Hartley (1990, 141–3), Schott (1989), and Hartland-Thunberg (1980). We also include the Council for Mutual Economic Assistance, the Southern African Development Coordination Conference, and the Eastern and Southern African Preferential Trade Area because various studies have identified them as preferential trading arrangements (Hanlon 1986, Kisanga 1991, Orimalade and Ubogu 1984, Pomfret 1988).

Data on major powers and wars are taken from Small and Singer (1982; Singer and Small 1994). It should be noted that only trade data between India and Pakistan are available for the pairs of states that were at war during the years $(t - 1)$ analyzed here.

Data on GATT membership are taken from various issues of GATT's *Basic Instruments and Selected Documents* (Geneva) and *International Trade* (Geneva). Data on prior colonial relations are taken from Kurian (1992). Data on command economies are taken from Kornai (1992, 6–7) for the period from 1960 to 1985 and from Staar et al. (1991) for 1990.

All the independent variables in equation 2 are measured at year $t - 1$. For each pair of states, i and j, it should be noted that alliances, preferential trading arrangements, GATT membership, prior colonial relations, command economies, and war are coded based on the end of this year.

All pairs of countries for which complete data are available in 1960, 1965, 1970, 1975, 1980, 1985, or 1990—and that Small and Singer (1969, 1982; Singer and Small 1994) list as

members of the interstate system—are included in our sample. Small and Singer only provide data on alliances and interstate wars for members of the interstate system; and, in some of the years mentioned above, their list of members excludes countries for which data on other variables analyzed here are available.

The number of dyads for which complete data exist ranges from 2,647 in 1960 to 5,667 in 1990. These differences arise because the number of members of the interstate system increased during this period, as did the availability of data on GDP and trade flows. Data on trade flows and GDP are quite limited for earlier years, especially for less developed countries and states with command economies. This is the primary reason we do not analyze periods prior to 1960, despite the obvious desirability of doing so if data on a wider range of countries were available.

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