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THE EFFECT OF ECONOMIC INTERDEPENDENCE ON FOREIGN RELATIONS: IMPLICATIONS FOR LINKAGE DIPLOMACY

Edward Carr Franks

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THE FORD FOUNDATION

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AUGUST 1980

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PREFACE

In late 1978, The Ford Foundation provided grants to The Rand Corporation and several university centers for research and training in international security and arms control. At Rand, the grant is supporting a diverse program. In the Rand Graduate Institute, which offers a doctorate in policy analysis, the grant is contributing to student fellowships for dissertation preparation, curriculum development, workshops and tutorials, and a series of visiting lecturers. In Rand's National Security Research Division, the Ford-sponsored projects are designed to extend beyond the immediate needs of government sponsors of research by investigating long-term or emerging problems and by developing and assessing new research methodologies. The grant also is being used to fund the publication of relevant sponsored research that would otherwise not be disseminated to the general public.

All research products are being made available to as wide an audience as possible through publication as unclassified Rand reports or notes, or in journals. The Rand documents may be obtained directly or may be found in the more than 330 libraries in the United States and 35 other countries that maintain collections of Rand publications.

The subject of the present Note--determining whether economic interdependence has a significant effect on foreign policy cooperation for a given pair of trading countries over time--should be of interest to government planners and foreign policy analysts and to specialists in international relations.

SUMMARY

Events of the late 1960s and early 1970s resulted in significant changes in the international system. According to numerous policy-makers, these changes were at least in part due to increased economic interdependence. As a result, there ensued a proliferation of strategies linking the international economic and political arenas. Such linkage strategies were a prevalent feature of diplomacy during the Nixon/Ford administration, especially with regard to the concept of detente. Kissinger envisioned that the interrelationship of issues, as expressed in the linkage concept, would develop a network of vested interests between the United States and the Soviet Union and make both sides conscious of what they would lose by reverting to policies of confrontation and crisis.

One important aspect of this linkage phenomenon is the economic component. This is reflected in the widespread belief that economic interdependence brings political and security benefits. Indeed during the cold war, when contact between the United States and the USSR was severely limited, many argued that improved economic relations might mitigate international tensions, as evidenced by several Congressional resolutions to that effect. The question, according to Kissinger, was, "How could trade and economic contact serve the purpose of peace?" Kissinger (1977, p. 158) concluded that:

> Over time, trade and investment may lessen the autocratic tendencies of the Soviet system, invite gradual association of the Soviet economy with the world economy, and foster a degree of interdependency that adds an element of stability to the political equation.

Given the apparent increased emphasis on linkage strategies to deal with the problems of the contemporary world and the importance of the economic component of this strategy, several policy questions result:

- o Can we expect, *ceteris paribus*, expanded economic interaction and, therefore, presumably expanded economic interdependence, to contribute to closer and more cooperative relations between countries?
- o If so, can economic levers be employed as policy instruments to increase economic interdependence and thus promote more conciliatory foreign policy?
- o If so, how might this effect vary according to whether the target is a developed or less developed country?

The objective of this investigation is to answer these policy questions by determining whether economic interdependence (EID) has a significant effect on foreign policy cooperation (FPC) for a given pair of trading countries (dyad) over time; and if so, whether this effect is positive and varies across dyads.

Two types of economic interaction were used in the analysis: exports and cumulative foreign liabilities. For each of these interactions, the economic interdependence can be characterized by the *distribution* and the *intensity* of the relative benefits which accrue to each member of a given trading pair.

The relative benefit $\beta_{AB}(\beta_{BA})$ is defined as the proportion of benefit which accrues to one country A(B) as a result of its economic interaction with country B(A) relative to the total benefit which accrues to country A(B) as a result of its economic interaction with the world. This is essentially a concentration measure. The distribution, δ, measures the absolute value of the difference between A's and B's relative benefits, or alternatively, the *relative* concentration. (The use of absolute value underscores the attempt to avoid the morass, so prevalent in the literature, of trying to determine who is dependent on whom. The only concern here is the extent to which relative benefits are asymmetric). Intensity, τ, measures the sum of A's and B's relative benefits, or the *absolute* concentration.

These two concepts thus allow a more complete characterization of the economic relationship between two countries. For example, a pair of trading countries may have very similar trade concentrations

(symmetric distribution) but the intensity may vary from high to low (U.S.-Canada vs. U.S.-South Africa, respectively). Alternatively, a pair of trading countries can have differing trade concentrations (asymmetric distribution), with the intensity also varying from high to low (U.S.-Liberia vs. U.S.-Iraq, respectively). Also, a given trading pair may vary over time with respect to the distribution and intensity.

The discussion then turns to the construction of an indicator of the relative benefits. For various reasons an indicator of only the change in the relative benefit attributable to interaction 'i' was employed, and is termed the *interaction elasticity*. It can be interpreted as the relative propensity of A(B) to change the level of interaction 'i' with B(A), thus presumably reflecting the change in benefits that A(B) perceives it is accruing from its interaction with B(A) relative to the world. It is shown that the sum of the interaction elasticities of each member of a dyad, η^i_{AB} and η^i_{BA}, or the *dyadic interaction elasticity*, η_i, is proportional to the change in intensity that is attributable to interaction 'i'. These η_i are then the explanatory variables.

Since foreign policy cooperation (FPC) lacks conventionally accepted concepts and measures, multiple measures and indicators for cooperation were used. These measures included U.S. Arms Transfers, U.S. Treaties in Force and World Bank Loans. Indicators of FPC based on these measures were then constructed according to whether FPC is assumed to be a stock or flow phenomenon. In using these dependent variables it is recognized that none of them is a truly reliable indicator of foreign relations. But by using them as cross-checks on one another, it is hoped a more valid assessment of the results can be obtained.

World Bank loans are used as a measure of cooperation between the United States and a given trading partner because, while the World Bank is officially multilateral in nature, its actions may be normally considered to reflect U.S. policy because of U.S. dominance of the organization. The extent of this dominance is clearly evidenced by an analysis of U.S. voting power based on the Shapley-Shubik

Index. On this basis one might expect, ex ante, that the United States could exert substantial influence, if not *de facto* control, over the World Bank. As a result, this organization may, to some extent, be viewed as an instrument of U.S. foreign policy. Thus, decisions regarding the disbursement of loans may be influenced by whether the United States perceives the recipients (mostly LDCs) to be cooperative or hostile.

A linear *model* and the ordinary least squares *method* were used to determine the significance, sign and size of the effect of the measures of economic interdependence on the measures of foreign policy cooperation. Serially, for most regressions, the data range from 1957 to 1977. Cross-sectionally, seven trading pairs, or dyads, are examined, all of which have the United States as one member. Three of the dyads reflect interactions between developed countries: U.S.-U.K., U.S.-Netherlands, and U.S.-Japan; these are termed OECD dyads. The remaining four dyads reflect interactions between developed and underdeveloped countries: U.S.-Philippines, U.S.-India, U.S.-Argentina, and U.S.-Brazil. These are termed the LDC dyads. Each of these dyads is examined over time.

The regressions, for the most part, were not significant at the .05 significance level. For those that were, the squared correlation coefficients were low, the significant coefficients were not uniformly positive, and no difference in the size of the effect between LDC and OECD dyads could be discerned. Thus, assuming the validity of the model and the indicators, the hypothesis that economic interdependence (EID) has a significant effect on foreign policy cooperation (FPC) is not supported. In turn, the null hypothesis, that EID has no effect on FPC, cannot be rejected.

In addition, it was shown that an important determinant of the cumulative levels of loans from the World Bank to any given country is the cumulative level of World Bank loans to the world. Thus World Bank Loan policy appears to be based mainly on some intrinsic mechanism that reflects only world aggregates rather than the particulars of a given potential recipient. That is, if World Bank lending is a plausible instrument of U.S. foreign policy, it is rarely used as such.

The implications of such a result for linkage diplomacy are as follows:

- First, any linkage strategy predicated on the expectation that, *ceteris paribus*, expanded economic interaction contributes to closer and more conciliatory relations between countries is at once suspect. Improved political relations do not seem more likely to result from increased economic interaction between, e.g., OECD countries of the North and the less-developed countries of the South, or between the United States and the Soviet Union.
- Second, it follows that economic levers cannot be employed as policy instruments as part of any general strategy to promote foreign policy cooperation. Levers, such as tariffs, quotas, subsidies, embargoes, capital controls, etc., while perhaps influencing the level of economic interdependence, cannot be expected to alter general foreign policy behavior. Thus any linkage strategy in which the use of such levers is advocated for influencing general foreign policy behavior is suspect.
- Third, the use of such levers to promote foreign policy cooperation will be no more effective whether the target country is developed or less developed.

Of course, numerous *caveats* apply to these implications. Most importantly:

- First, this analysis is only concerned with marginal effects. It does not preclude the validity of structural cross-sectional assertions concerning the effect of economic interdependence on foreign policy cooperation. For example, these results are not inconsistent with the observation that cooperation and economic interaction are higher among the EEC countries and among the COMECON countries than between EEC and COMECON countries.

- Second, this analysis was confined to only those countries which had economic interactions with the United States and were therefore economically interdependent with the United States. Thus, the concern here was with *expanded* economic interdependence. We did not consider countries that initially had no economic interaction with the United States. Thus, we did not test the hypothesis that *establishing* economic interdependence promotes foreign policy cooperation. Such a hypothesis is perhaps more appropriate for questions concerning a role of linkage diplomacy in, e.g., relations between the United States and the People's Republic of China.
- Third, the results for those few statistically significant regressions suggest that factors other than economic interdependence, such as mutual security, cultural, and other political considerations, may predominate in explaining foreign policy behavior. Thus, further work based on this linkage model should also include additional explanatory variables to capture the variance in foreign policy cooperation not attributable to economic interdependence alone. In addition, it is possible that these other factors may interact with economic interdependence, so that the latter may have some effect which is not evident when it is considered alone. In other words, we are testing a "strong" version of the hypothesis, with the result that there is a bias in favor of the null hypothesis.

Finally, these policy implications are pertinent to those linkage strategies that are predicated on the beneficial effect of increased economic interaction *in general* yielding increased foreign policy cooperation *in general*. These implications deny the efficacy of any diplomacy which asserts that "over time, trade and investment . . . may foster a degree of interdependency that adds an element of stability to the political equation." (Kissinger, 1977, p. 158) These results, however, do *not* deny the possible efficacy of linkages

among specific issue areas in order to achieve a *particular* foreign policy *outcome*. The utility of using linkages as a negotiating device in *quid pro quo* agreements is not considered. Examples of such linkages might include (1) the possible threat of U.S. troop withdrawals as a way to influence German international financial policies, (2) NATO alliance members' insistence that SALT II be ratified in exchange for the deployment in NATO of new weapon systems, and (3) OPEC attempts to link oil discussions to other international economic issues.

In conclusion, then, the contention that, *ceteris paribus*, expanded economic interaction between countries contributes to their closer and more cooperative relations is not supported by this analysis. This result brings into question the utility of general linkage strategies that rely heavily on an economic component to foster improved relations between interacting countries.

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I. INTRODUCTION

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1. THE POLICY ISSUES: LINKAGE DIPLOMACY

a. The Rise of Linkage Strategies

Events of the late 1960s and early 1970s resulted in significant changes in the structure of the international system. According to such policymakers as Richard N. Cooper (1973), Joseph Nye (1976), and Henry Kissinger (1977), these changes were at least in part due to increased economic interdependence.* Government policies became increasingly concerned with international economic relationships to the extent that, as Cooper (1972/73) observed, "Trade policy is foreign policy." This combination of motives seems appropriate given that trade had been growing at an annual average rate of 10 percent--much faster than world income--since the early 1960s (Bergsten, 1973). As a result, there ensued an increase in the use of strategies linking the international economic and political arenas.

Such linkage strategies were a prevalent feature of diplomacy during the Nixon-Ford Administration, especially with regard to U.S.-USSR relations and the concept of detente. According to Kissinger (1977, p. 148):

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*For example, it was partly in response to increased economic interdependence that the Bretton Woods' monetary system was scrapped. One effect of increased economic interdependence had been to decrease the ability of a given interacting country to achieve its domestic economic policy objectives. A blurring of the boundaries between the domestic and foreign economic policy arenas had occurred, and hence states could no longer pursue domestic economic objectives without impacting on interacting states (Nye, 1976). Scott (1977) suggested that states would find it increasingly difficult to control their domestic interests as their interdependence increased. In response to these admonitions, many advocated a change from a fixed to flexible exchange rate system as a way of preserving domestic economic autonomy in the face of increased economic interdependence (Franks, 1977). It was felt that such a system would provide greater autonomy for nations to pursue domestic policy objectives without being constrained by any foreign policy implications. Unfortunately, as Johnson (1977) concluded in contrast to his earlier views (1969), "Contrary to widespread belief, a floating rate system yields little, if any, extra freedom for the independent exercise of national economic policy...."

> . . . by the end of the 60's and the beginning of the 70's the time was propitious for a major attempt to improve U.S.-USSR relations . . . . For the U.S. the choice was clear: to provide as many incentives as possible for those actions by the Soviet Union most conducive to peace. . . . Our approach proceeds from the conviction that in moving forward across a wide spectrum of negotiations, progress in one area adds momentum to progress in other areas. If we succeed, then no agreement stands alone as an isolated accomplishment vulnerable to the next crisis. We did not invent the interrelationship between issues expressed in the linkage concept; it was a reality because of the range of problems and areas in which the interests of the U.S. and the Soviet Union impinge on each other . . . [and] by acquiring a stake in a network of relationships with the West, the Soviet Union may become more conscious of what it would lose by a return to confrontation. Indeed, it is our hope that it will develop a self-interest in fostering the entire process of relaxation of tension.

Thus Kissinger clearly states that linkage diplomacy is the necessary response to the changes in the international system that had occurred; changes that impact on both the United States and the Soviet Union. But more importantly, he asserts that such a diplomacy would foster increased cooperation. Kissinger (1977, p. 305) expands on this linkage concept in a later statement concerning Administration policy toward the Soviet Union:

> Our essential task is to recognize the need for a dual policy that simultaneously . . . resists expansionist drives and seeks to shape a more constructive relationship . . . [via] a network of cooperative agreements in a variety of functional areas--economic, scientific, medical, environmental, and others--which promise concrete benefits. . . . It is our belief that a pattern of restraint and a network of vested interests can develop which will give coexistence a more hopeful dimension and make both sides conscious of what they would stand to lose by reverting to politics of pressure, confrontation or crisis.

b. The Economic Component

From the above discussion it is clear that one of the more important aspects of this linkage phenomenon is the economic

component. This is reflected in the widespread belief that, in the words of Robert Solomon (1977, p. 12), ". . . economic interdependence brings political security benefits." This perspective draws heavily from the assertion of John Stuart Mill (1894, p. 135) that: ". . . increased international commerce would rapidly render war obsolete by strengthening and multiplying the personal interests which are in natural opposition to it." By way of corollary, cooperative foreign policy behavior between states can be viewed as being in exchange for benefits that they mutually derive from their economic interaction.

Relations between the United States and Saudi Arabia over the last few years provide perhaps the clearest contemporary example that increased economic interdependence may promote cooperative foreign policy behavior. As Saudi Arabian dependence on the United States for capital goods, technology, manufactures, and military hardware has increased, so too has U.S. dependence on Saudi Arabian oil. Over the same period, there has been a marked convergence in foreign policies, especially with regard to the Arab-Israeli conflict and Soviet expansionism. The recent favorable vote by the United States on a United Nations resolution concerning West Bank settlements and the Palestinian question is perhaps the most striking example of convergence in foreign policy on the Arab-Israeli conflict, the later retraction by President Carter notwithstanding. Such a convergence in policy is perhaps in large part the result of U.S. economic (oil) considerations.

On the other hand, relations between the United States and Japan prior to our involvement in WWII provide an example that decreased economic interdependence (read: sanctions) may promote a decrease in cooperative foreign policy behavior. By invoking a trade embargo with Japan that included Dutch Indonesia's oil, Japan was forced to invade Indonesia to acquire oil and strike at Pearl Harbor to protect its supply lines with Indonesia (Questor, 1975).

In a similar vein, during the Cold War, when economic contact between the United States and USSR was severely limited, many argued that increased economic interaction might mitigate international

tensions. Kissinger noted (1977) that there were several Congressional resolutions to that effect, but recurring crises prevented any sustained progress. Kissinger (1977, p. 156) asserts that this period of confrontation should have left little doubt that economic boycott would not "transform the Soviet system or impose on it a conciliatory foreign policy." The question then became: How could trade and economic contact serve the purposes of peace?

During Kissinger's tenure, a series of interlocking economic agreements with the USSR were negotiated as detente progressed (Kissinger, 1977, p. 308). But, as Kissinger notes, these few successes were soon reversed as a result of Congressional displeasure with Soviet domestic policies. As a case in point, he cites the restrictions that were imposed on Soviet trade and credit. This Congressional attempt to link human rights issues with economic relations both deprived us of economic *levers* and reduced Soviet emigration. And, he notes, other industrial countries quickly filled the trade and credit void.

This sudden *ex post facto* form of linkage diplomacy was cited by Kissinger (1977, p. 157) as the way not to employ the economic component since, in such an approach, "the hoped for results of policy became transformed into preconditions for any policy at all." Kissinger (1977, p. 157-8) points out that a sense of proportion must be maintained about the leverage our economic relations give us with the USSR: 1) Denial of economic relations by itself cannot achieve what it failed to do when it was part of a determined policy of political and military confrontation; 2) trade benefits are not a one-way street; the law of mutual advantage operates, or there will be no trade; 3) boycott denies us a means of influence and possible commercial gain; it does not deprive the USSR, which can turn to other noncommunist sources.

Thus, with regard to the role of the economic component of linkage diplomacy, Kissinger (1977, p. 158) concluded that:

> . . . over time, trade and investment may lessen autocratic tendencies of the Soviet system, invite gradual association of the Soviet economy with the world economy, and foster a degree of interdependency that adds an element of stability to the political equation.

c. The Research Objective

Given the apparent increased advocacy of linkage diplomacy to deal with problems of the contemporary world system, and the importance of the economic component of this linkage strategy, several policy questions result which bear critically on this approach to foreign policy:

- Can we expect, *ceteris paribus*, expanded economic interaction, and therefore presumably expanded economic interdependence, to contribute to closer and more cooperative political relations between countries?
- If so, are there economic levers that can be employed as policy instruments to affect the extent of economic interdependence and thus promote conciliatory foreign policy?
- If so, how might this effect vary according to whether the target country is a developed or less-developed country?

The objective of this research is to answer these questions by testing the hypothesis that economic interdependence (EID) has a significant and positive effect on foreign policy cooperation (FPC) for given pairs of trading countries (dyads) over time; and if so, whether this effect varies across dyads depending on whether the dyads reflect U.S. interactions with developed or less-developed countries.

2. THE RESEARCH OUTLINE

Chapter Two, "International Relations," gives a brief overview of the literature and focuses on its inadequacies with respect to testing the hypothesis proposed here. Chapter Three, "The Analytical

Framework," presents the indicators of economic interdependence--based on exports and cumulative foreign liabilities-- and indicators of foreign policy cooperation--based on U.S. treaties in force, U.S. military transfers and World Bank loan disbursements--and proposes a testable linkage hypothesis. Chapter Four, "The Analysis," presents and discusses the results. On the basis of these results, Chapter Five, "Implications for Linkage Diplomacy," addresses the policy questions raised above and discusses the limitations of this analysis.

II. INTERNATIONAL RELATIONS: AN OVERVIEW

1. Economic Dependence
2. Economic Interdependence
3. Summary

A recurring focus of the study of international relations has been the investigation of the effect of international economic interaction on either the underdevelopment of the less-developed countries within the context of *dependency theory*, or the foreign policy behavior of the developed countries within the context of integration theory.*

The integration literature argues that increased economic interaction between states necessarily results in their improved relations, whereas the "dependencistas" argue that increased economic interaction results in a number of negative consequences, including noncooperative relations. (Hollist and Johnson, 1977).

The apparent contradiction between these two theoretical perspectives is due, at least in part, to the fact that each "theory" refers to interactions among different kinds of countries. Integration theory is based on the experience of the European Economic Community, as Puchala (1968) has argued. He asserts that only in this context might positive outcomes or amicable relations ensue from economic exchanges. In other words, he claims that only actors that are similar economically, politically, and demographically can enter into economic exchanges with necessarily cooperative results.

On the other hand, dependency theorists focus on relations between nations and actors that are economically and politically different, i.e., exchanges between developed and lesser developed countries. The more radical writers (Frank, 1969; Galtung, 1971) go so far as to

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*It should be made clear at the outset that this chapter is in no way an attempt at a comprehensive review of the international relations literature. Instead the intent is to focus on those aspects of the literature, namely dependency theory and integration theory, which come closest to dealing with the policy questions posed in the prior chapter. In addition, the discussion of these respective "theories" is complete only to the extent necessary to point out their inadequacies with respect to testing the proposed hypotheses. For a more complete presentation of dependency theory, such as it is, the reader is referred to Duvall (1978), Caporaso (1978), Bornschier et al. (1979), and Jackson and Russett, et al. (1979). Similarly, for integration theory, the reader is referred to Puchala (1968), Puchala (1972), Nye (1971), Zinnes (1975), Keohane and Nye (1975), Keohane and Nye (1977), Nye (1976), and Cooper (1968).

argue that economic exchanges between such small and large entities necessarily reap negative political outcomes for both. Beneficial outcomes of international exchanges, if there are any, are clearly submerged beneath the difficulties these processes bring upon weak states.

Two contrasting views of international economic interaction are reflected in the above discussion. One, that of *economic dependence*, is mercantilist in origin and maintains that an increase in wealth by one country is achieved only at the expense of other countries. The other view, that of *economic interdependence*, draws from classical trade theory and the associated concept of "gains from trade," and states that all countries engaged in trade are at least as well off as, if not better off than, they would have been otherwise (Solomon, 1977).

Given this framework of economic dependence versus economic interdependence, the following discussion will attempt to focus on the respective deficiencies of the dependency and integration paradigms with regard to testing the hypothesis that economic interdependence has a significant effect on foreign relations.

1. ECONOMIC DEPENDENCE

The literature on economic dependence reflects the predominant theme of dependence as the absence of country autonomy, or *dependency*, rather than dependence as simply the asymmetric form of interdependence. Asymmetric interdependence, which involves an imbalance in the relationship between two countries, can range from the case where A needs nothing from B and B depends on A to fulfill all its needs, to the opposite asymmetry where B needs nothing from A and A depends on B to fulfill all its needs. It is a *bilateral* concept measured by looking at the differential between A's reliance on B and B's reliance on A.*

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*A full specification of the structural conditions for the existence of dependence as asymmetric interdependence might include (1) the magnitude of A's *utility* for a given good, (X), (2) the extent of *control* of X by B, and (3) the ability of A to *substitute* for X or B (Caporaso, 1978). The first condition is meant to discriminate between necessities and luxuries. The second condition addresses the number

On the other hand, *dependency* entails (especially in the Latin American literature--Cardoso, 1977) the lack of "true" independence from foreign influences due to a series of related domestic and foreign characteristics. These features are often referred to as "structural distortions" in reference to the influence of the international capitalist system on the local economy and thus the distribution of goods, services, and wealth. Dependency describes certain characteristics (economic as well as social and political) of the economy as a whole, and is intended to trace certain processes which are causally linked to its underdevelopment (Lall, 1975).

Dependency is a complex concept, as evidenced by the number of interpretations offered by "dependencistas" themselves.* There is

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of supplier countries. The third condition is concerned with cost of goods which are substitutes for X. Then, given a similar measure for B's dependence on A, the difference between these two sets of structural conditions provides a measure of dependence.

*According to Dos Santos (1970, p. 231), "by dependence we mean a situation in which the economy of certain countries is conditioned by the development and expansion of another economy to which the former is subjected. The relation of interdependence between two or more economies, and between these and world trade, assumes the form of dependence when the dominant countries can do this only as a reflection of that expansion, which can have either a positive or negative effect on their immediate development." In this definition, dependency involves a causal relationship in which the result is unequal development and growth.

Brewster's (1973, p. 91) definition emphasizes the lack of integration of the various sectors of the dependent economy as the result of foreign influence. "[Dependency] we may define as a lack of capacity to manipulate the operative elements of an economic system. Such a situation is characterized by an absence of interdependence between the economic functions (read: sectors) of a system. This implies that the system has no internal dynamic which would enable it to function as an independent, autonomous entity."

Cardoso (1977, p. 163) is even more explicit regarding dependency as a structural distortion of the dependent's economy: ". . . capital accumulation in dependent economies does not complete its cycle. [Capitalism in dependent countries] is crippled because it lacks a fully developed capital goods sector. The accumulation and expansion of local capital requires and depends on a dynamic complement outside itself: it must insert itself into the circuit of international capitalism."

general agreement, though, that dependency involves a reliance that goes beyond the asymmetric interdependence of the foreign trade sector to the entire domestic economy.*

Estimates of the magnitude of dependency must therefore include, according to Caporaso (1978), three separate types of information: (1) the magnitude of external reliance, (2) the degree of choice, and (3) the integrity of the domestic economic system. The first measure indicates the extent to which capital and goods are supplied externally. The second measure indicates the degree of reliance on one supplier and the high cost of shifting this reliance to others. The third measure indicates the lack of integration across domestic economic sectors and the lack of responsiveness to internally and externally generated demand. These last two items, though, have proved so elusive to measurement that most of the *dependency* literature has concentrated on only the assessment of the magnitude of external reliance as reflected in measures of the impact of trade, investment and aid.†

The formulators of the dependency theory have an imperialist view of the international system. They take as given that (1) the distribution of goods in the world is inequitable and will not improve, given the current structure of the international political system; (2) the present system grew out of colonialism and capitalism; (3) the

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*Dependency analysis is further complicated, "in that the units of analysis are no longer interacting nation-states. Classes, socio-economic groups, and the distribution of wealth and political power all constitute potential sources of dependence and their activities, patterns of influence, and potential allies become transnational. Thus, we are required to think not only of internal and external, but also of transnational alliances between foreign and domestic groups. The external system is real enough but is only significant in that it has the greatest influence when the system of domination reappears as an internal force, through the social practices of local groups and classes which try to enforce foreign interests." (Caporaso, 1978, p. 24)

†Examples of such empirical research include Tyler and Wogart (1973), Walleri (1975), Chase-Dunn et al. (1975), Rubinson (1976), Delacroix (1977), Bornschier et al. (1978) and Dolan and Tomlin (1979). See Jackson et al. (1979) for a comprehensive assessment of empirical research on dependency theory from a dependencista's point of view.

centers of production (OECD countries) expropriated surplus capital from the peripheries (LDCs) and constructed the economies of the latter in such a manner as to preclude indigenous development; and (4) the present system perpetuates basic structures created centuries ago, and results in continued exploitation (Cohen, 1973). Dependency theory, as developed by Frank (1969) and Galtung (1971), seeks to explain how exchange relationships between the center and periphery result in an inequitable distribution of wealth. This income inequality constitutes the dependent variable in these studies and is mostly taken for granted. Inequality and therefore hierarchy result from the structure of the international economic (capitalist) system and are sustained, in their view, by implicit and formal alliances between multinational corporations based in the developed countries and the periphery areas. In addition, they claim that foreign aid programs, cultural exchanges, etc. are designed to perpetuate the essential linkages between dominant and dependent economic actors.

Dependency models are dynamic in that they focus on the manner in which economic and institutional mechanisms perpetuate inequality, but are static in that they fail to measure changes in the dependent variables over time (Holsti, 1978). They generally ignore the evidence, as documented, for example, by Moran (1974) in his study of multinational corporations in Chile, that periphery governments can eventually develop the skills and means necessary to manage their resources in such a way as to avoid exploitation. The dependence theorists also ignore examples of countries such as Taiwan and South Korea that have overcome neo-colonial economic relationships (Holsti, 1978). Nationalism, regional variations, problems posed by population growth, and lack of resources are not considered in theories of dependency. In contrast to the conventional wisdom of the 1950s and 1960s that most barriers to growth were internal, dependency theories have gone to the other extreme--only exogenous variables explain the persistence of underdevelopment. Thus to achieve independence they claim it is necessary to modify the economic links between the centers and the periphery.

Finally, one last objection, noted by Ray (1974), concerns the use of biased samples, representing only OECD-LDC interactions. This objection is applicable to most of the dependence literature to date--whether concerned with dependence as *dependency* or as *asymmetric interdependence*. Treatment of the concept of economic dependence, and the determination of who is dependent on whom, has been inadequate at best. In general, the dependence of certain countries (e.g., LDCs) on others (e.g., OECD countries) is presumed, such that any measures of economic interaction employed are assumed to reflect this alleged asymmetry. In addition, in many cases measures are assumed to be indicative of economic dependence only on the basis of their relevance to LDCs. Unilateral transfers such as government loans (subsidized or otherwise), and grants from the OECD countries are often used as the bases for such economic dependence indicators.*

The unilateral ("asymmetric") nature of foreign aid transfers is apparently sufficient grounds for inferring the dependence of the recipient; unquestionably so if the recipient is an LDC. Such a conclusion is, of course, predicted on the presumption that LDCs must be dependent on the OECD countries, otherwise they wouldn't be LDCs. No consideration is given to that time-honored axiom that "if you loan a man a hundred dollars, he's in your debt; if you loan him a million dollars, he's your partner." Panama might be cited as a good example of one of the United States' newer partners, or Zaire, or Peru, or Turkey, etc. And in the case of highly subsidized loans or grants, one might think of LDCs as simply facilitating the fulfillment of domestic Keynesian objectives of the donor.

Another measure of economic interaction that is often employed in the construction of indicators of economic dependence is trade flows.* The concern, though, is to determine who is more dependent on whom, which is not necessarily reflected in relative levels of trade flows. First, it is necessary to determine the relative gains from trade

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*See, for example, Richardson, 1976; Hollist and Johnson, 1977; Walleri, 1975; Chase-Dunn, 1975; Bornschier, 1978.

which accrue to each member of a trading dyad (see terms of trade discussion in next chapter). But such a determination requires knowledge of the responsiveness of trade flows to changes in prices and incomes, i.e., the price elasticity of demand and supply and the income elasticity, or the marginal propensity to import (Tollison, 1973).*

In spite of this, the two most common measures of trade dependence are based on trade flows (Cooper, 1972). One measure, the relative acceptance (RA) coefficient, is defined as the difference between actual trade flows between two countries and the flows which would be expected if each country's share of world exports and imports were distributed equally across all countries. That is, it supposedly indicates the degree of preference displayed by one country to transact with another. A variant of this is the export percentage model. This measures the ratio of the sum of transactions from A to B by the total transactions of B (Hughes, 1971). The other measure is based on Russett's "chooser-chosen" GNP model (Russett, 1967) and is simply the ratio of a given country's exports and imports to its GNP.

But, as Cooper observed (1972), there is no necessary connection between the magnitudes of trade flows as measured by the RA and GNP models and the concept of economic dependence. Neither model measures the price elasticities of supply and demand nor the marginal propensity to import.

But, even allowing for the validity of these measures, they are often misused. This is evidenced by, e.g., one concept of "relative dependence," defined as the difference between the trade to GNP ratios of a pair of trading nations (Caporaso, 1974; Russett, 1967); i.e.,

$TD_{yx} = T(1/_{Gy} - 1/_{Gx})$, where

TD_{yx} = relative trade dependence of nation Y on nation X

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*And even if this information were available, it would still be unclear whether the country with the greater gain or benefit from trade is more or less dependent (see Chapter III, Section 1a).

T = total dyadic trade, i.e., $M_{xy} + M_{yx}$, where

$M_{xy}(M_{yx})$ is X(Y) imports from Y(X).

Gy(Gx) = GNP of y(x).

This indicator implies that $T/_{Gx}$ and $T/_{Gy}$ are measures of x and y's dependence, respectively. Assuming the validity of these dependence measures, the indicator is nevertheless inconsistent. If they are equal then TD_{yx} is zero. Does this mean that y is no longer dependent on x? And what if Gx < Gy? It is no coincidence that if Gx > Gy, then $TD_{yx} > 0$ since this measure was proposed in a dominance-dependence context where country y was the "small" country and country x was the "large" country. If Gx < Gy then $TD_{yx} < 0$. Does that mean that the trade dependence of nation y on nation x is negative? Does such a thing as negative trade dependence exist? Perhaps it is meant to imply that, conversely,

$$TD_{xy} = (T/_{Gx}) - (T/_{Gy}), \text{ when } Gx > Gy.$$

To summarize, most of the dependence literature to date has been predicated on the assumption of a given dominance-dependence relationship between given nations, with the result that the measures of economic interaction employed are presumed, on the basis of little theory, to reflect economic dependence. This approach is mercantilist in origin both from an economic and political perspective. Such a neo-mercantilist perspective is based on the conviction that an increase in the wealth of one country can only be achieved at the expense of other countries (Solomon, 1977).

2. ECONOMIC INTERDEPENDENCE

A contrasting, but prevalent, view of international economic interaction draws from classical trade theory and the associated concept of "gains from trade." It states that all countries engaged in trade are at least as well off as, if not better off than, they would have been otherwise.

The gains from trade are most often explained in terms of the doctrine of comparative costs. This doctrine maintains that, if trade is free, each country in the long run tends to specialize in the production and export of those goods in whose production it enjoys a comparative advantage in terms of real costs. And each country imports those goods which could be produced at home only at a comparative disadvantage in terms of real costs. Specialization in this sense is to the mutual advantage of each country, where real cost is defined as the marginal productivity of a given factor of production. Such costs differ between countries as a result of different factor endowments among them. This concept of comparative advantage is usually attributed to Ricardo (Viner, 1960).

Given a two-country world, where each country produced two goods at differing comparative cost ratios, then the two goods will be exchanged at a ratio (the terms of trade) somewhere between the comparative cost ratios, depending on the relative magnitude of the two countries (i.e., the reciprocal demand). If one country were much larger in economic terms than the other in such a two-goods world, then the terms of trade would probably settle at the comparative costs of the larger country, i.e., the smaller country would get all the gain from trade (Nicholson, 1897; Ray, 1977).*

But, as Mill (1894) observed, the entrance of more goods and more countries into trade would tend to allow the terms of trade to establish themselves at a point at which the benefits are divided between the countries. A related conclusion by Ray (1977) states that the distribution of relative gains (i.e., normalized to account for country size) will generally be independent of the size of the country, given free trade in a multicountry framework.*

Given this perspective, while there may not be dependence in the imperialistic sense, there certainly is dependence in the sense that the partners are mutually dependent or interdependent. Such economic interdependence can be symmetric or asymmetric, i.e., the "loss" incurred by each state from any break in trade between them can be equal

*See Appendix A.

or unequal. In addition, the magnitude of economic interaction can vary from low to high levels, i.e., both trading partners can have a lot to lose or little to lose in the event of an interruption of trade, regardless of the degree of symmetry.

The literature which comes closest to reflecting this broader view of international economic relations examines the causes of increased political integration among the industrialized countries of the European Common Market within the context of integration theory. The predominant theme of these studies is a concern with the dependent variable of foreign policy behavior between states as a function of various independent variables which include measures of economic interaction between those states.* But before considering these independent variables, the measurement of foreign policy behavior merits some discussion.

One popular measure of foreign policy behavior is the frequency of agreement in international forums such as the United Nations, i.e., voting agreement scores (Wittkopf, 1973; Richardson, 1976). The premise underlying this measure is that the higher the frequency, the higher the level of cooperation for that pair of nations, particularly if considered in relationship to voting agreement with other nations.

General Assembly voting annually covers a very wide range of substantive issues. It would be most surprising to discover that any country attempts to exert influence over others across the issue spectrum. Rather, it seems likely that a member nation selects only a subset of issues to which it attaches importance. Accordingly, the intervening concept of *issue salience* is often introduced to distinguish those roll calls that are likely to prompt a country to search out voting allies (Coplin, et al., 1974). Political behavior can be part of a political-economic exchange only when that behavior is of value to its recipient. For the United States, only those roll calls that are salient to it should be used to test propositions regarding its political relations.

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*See, for example, Weede (1970), Choucri (1972), Rummell (1964), Rummell (1966), Rummell (1968), Haas (1965), Haas (1973), Morse (1971), Rosecrance and Stein (1973), and Keohane and Nye (1977).

In the post-World War II years, there has perhaps been no set of issues consistently more important to the United States than those bearing on its relations with the Soviet Union. Hardly a major U.S. foreign policy decision seems to be reached without considering its bipolar implications. Thus, because cold war issues relating to U.S.-Soviet relations are of great salience to the United States, Assembly votes on these issues should be occasions in which any and all influence by the respective powers would be employed. Such a rationale, though, necessarily restricts the analysis domain to only U.S. $\leftrightarrow$ X and USSR $\leftrightarrow$ X interactions, where X is given any country. Unfortunately, distinguishing cold war issues from all other issues is a subjective process.

In addition, the utility of UN voting patterns as a measure of foreign policy behavior is further limited because of the uncertain connection between how a country votes in the UN and what it does. For example, although Mozambique voted for an economic boycott of South Africa, it continues to derive most of its foreign exchange earnings from the labor it exports to South African mines. Since the UN has little, if any, power to implement policy as dictated by General Assembly voting, a dominant country gains little in exercising its prerogatives. It seems unlikely that the United States would exercise all its economic might for public relations. Accordingly, the lesser countries believe they have wide latitude. Thus, it may be unwarranted to make conclusions regarding the relationship between foreign policy behavior and economic interdependence on the basis of analysis using UN voting patterns.

In the early 1970s a new class of data was added to the international relations archive--events data--developed in the 1950s and expanded considerably through the 1960s to provide indicators of international behavior with the intent of promoting substantive studies of international interaction, foreign policy behavior, socio-political monitoring, and forecasting abilities (Burgess and Lawton, 1972).

Events data are seen as important indicators of international behavior in that they consist of measures of regulatory or control

behavior that are a consequence of political decisionmaking rather than of administrative routine, as is the case for the more traditional measures such as budgetary allocations, international transactions (tourism, trade, mail flows, etc.), participation measures (diplomatic outposts, transnational organizations, and alliance participation), and voting patterns in international organizations (Burgess and Lawton, 1972).

Most events data projects share a common intellectual heritage drawing on the work of McClelland (1966), whose principal contribution was in the distinction between an event or event-interaction, and a transaction. This distinction signaled a departure from the extensive use of transaction data, e.g., mail and trade flows, as measures of behavior for such international processes as integration (Deutsch, 1957) and from the early work on events data in comparative politics (Gurr, 1968).

In order to characterize interactions among actors that make up the international system, McClelland (1966) has proposed an exchange theory of international relations in which behavior is viewed as the result of the flow of events among the nations making up the international system. These flows are subject to minor and major disturbances and are composed of transactions and event-interactions. Transactions are routine, aggregated, apolitical flows, such as mail, trade, foreign direct investment, travel patterns, etc. Event-interactions, or simply "events," are turbulent, public, political flows, such as threats, protests, demands, etc. Events are the "major disturbances" that find their way into the public press, and they are dealt with by, or in, the political rather than administrative sphere.

Although events data have been built around McClelland's distinction between an event and a transaction, such a distinction is often ambiguous. Operationally, reliance on public sources of information provides the crucial distinction between events and transactions, becoming both public and political. This basic point of agreement among the projects is not, however, without problems, especially with regard to the choice of source. One source may underreport one region relative to another source. Events reported in semipublic or

specialized journals would seem to be beyond the conceptual bounds of an event, in turn raising such questions as what "public" is, such that the distinction between an event and a transaction might become blurred. Source coverage, underreporting, and overreporting are a problem of error estimation, and functional estimates of error *cannot* be made in the absence of an explicit theory.

Measurement routines for coding an event, which vary considerably among the events data projects, constitute yet another deficiency. The projects may be divided between those that categorize and those that scale events. Categorization involves the placing of events into nominal categories such as threat, request, access, etc. Scaling, on the other hand, involves identifying the impact or intensity of an event and then measuring it along a given dimension by assigning a number to indicate its position on a given continuum. In both cases, the methodologies are highly dependent on value judgments and assumptions.

In addition to these concerns regarding the measurement of foreign policy behavior, the integration literature has faults analogous to those of the dependency literature with regard to the independent variables. The integration studies, rather than assuming a dominance-dependence relationship between countries, instead assume an equal relationship. But the very same measures of economic interaction employed in the dependency literature to indicate economic dependence are employed in the integration literature as indicators of economic interdependence (see references in footnote, p. 18). In other words, for both the dependency and integration literature, the emphasis has been on quantifying the magnitude of economic interactions between countries that are presumed to benefit either equally or unequally from those interactions. Little effort has been devoted to actually measuring the equality (symmetry) or inequality (asymmetry) of the benefits which accrue to countries from their economic interaction, and to consider the varying effect that such a measure (in addition to their measures of the magnitude of economic interaction) might have on their dependent variables.

3. SUMMARY

Rigorous empirical research concerning the nature of the linkage between international economic interaction and foreign policy behavior is lacking. The dependency literature is predicated on a dominance-dependence relationship. Elaborate paradigms of economic dependence have been created, but all suffer from ambiguities and internal inconsistency; most importantly, they leave quite unresolved who is dependent on whom. In addition, such a dominance-dependence approach has placed an unnecessary and inappropriate constraint upon these analyses in that they have often been restricted to interactions *between* the developed countries and the less-developed countries, on the presumption that their relationship fitted the dominance-dependence pattern. At the very least, this focus has obscured the interactions *among* the more "equal" countries--equal in the sense that their relationship is characterized by mutual dependence or "interdependence." Finally, this research focuses on a negative effect of international eonomic interaction, that of underdevelopment.

The integration literature, on the other hand, is similarly constrained in the sense that it considers interactions only among the developed countries and focuses instead on a positive effect of international economic interaction, that of increased foreign policy cooperation. And, as previously discussed, both paradigms are devoid of any theoretical precepts with regard to the nature of economic interdependence.

It would appear that integration theory overlooks some of the possible negative consequences of international economic interaction while dependency theory, in arguing that economic interaction between first and third world countries lead *only* to negative outcomes, overlooks many of the probable positive consequences. Either perspective is at least unduly narrow. Both need to be synthesized and broadened in attempting to move toward a more general theory of the political consequences of international economic interaction. This is, in part, the intent of this research.

III. THE ANALYTICAL FRAMEWORK

1. Economic Interdependence
   - a. Theory
     - -- the distribution
     - -- the intensity
   - b. Measurement
     - -- terms of trade
     - -- interaction elasticity
2. Foreign Policy Cooperation
   - a. Theory
     - -- U.S. Treaties in Force
     - -- U.S. Military Transfers
     - -- World Bank Loans
   - b. Measurement
3. A Linkage Model

1. ECONOMIC INTERDEPENDENCE

a. Theory

Use of the term "economic interdependence" underscores the assumption that all countries that choose to interact economically with each other are benefiting and are therefore dependent on each other. However, one member of a trading dyad can be more dependent on the interaction than the other member. But whether the country that benefits more is also the more dependent member of the dyad is unclear. Some would argue that the one that benefits more has more to lose and is thus more dependent. On the other hand, some contend that the more dependent countries are also benefiting the least from trade. "Dependencistas" cite the relationship between the United States and the less-developed countries as an example of such a situation.*

In the previous chapter consideration was given to some earlier efforts to operationalize the concepts of economic dependence and interdependence. Below, an alternative approach is proposed. The concern here is not with determining who is more dependent on whom. Instead two concepts are developed to characterize the relative benefits of *bilateral economic interaction:* 1) the *degree of symmetry*, or *distribution*, of the relative benefits, and 2) the *magnitude*, or *intensity*, of the relative benefits.

The relationship between the relative benefits (β) of two countries, A and B, can be characterized in the following way:

Case 1:	$\beta_{AB} = \beta_{BA} > 0$	interdependence
Case 2:	$\beta_{AB} > \beta_{BA} > 0$	
Case 3:	$\beta_{AB} > 0, \beta_{BA} < 0$	colonialism
Case 4:	$\beta_{AB} = \beta_{BA} = 0$	independence

*See Chapter II, Section 1.

where β = relative benefit to A(B) of its economic interaction with B(A), i.e., the benefit to A(B) of its economic interaction with B(A) relative to the benefit to A(B) of its economic interaction with the world.

Case 3 is unlikely, since it can only occur if the beneficiary is able to coerce the loser into continued interaction. This case may have been relevant for colonial relationships which, if still extant, are certainly the exception to the rule. (This may be the case for interactions between, e.g., the USSR and some of its satellites.) Thus, if the interactions are freely chosen, Case 3 does not apply.

Case 4 is representative of those country pairs which do not economically interact. This is essentially the case for many COMECON-OECD (East-West) dyads (especially since data on what interactions they do have is sparse at best). While relations between these countries are of great significance to the question of the determinants of foreign policy behavior, factors other than the relative benefits of economic interaction will necessarily dominate.

Thus, we are left with Cases 1 and 2, both of which constitute an important aspect of economic interdependence, namely the *distribution* of relative benefits, as described in the previous chapter (Chapter II.2). Case 2 might be considered a postcolonial, neo-mercantilist case in that mutual relative benefits are unequal, or *asymmetric*. This case is perhaps characteristic of economic interactions of less-developed countries (LDCs) with developed countries (see Chapter II.1). Case 1, where mutual relative benefits are equal or *symmetric*, is perhaps characteristic of interactions among the developed (OECD) countries (see Chapter II.2). In addition, for both cases, the magnitude of these relative benefits, or *intensity*, can vary from high to low. Finally, for a given dyad, both the distribution (δ), and the intensity (τ), can vary over time.

The Distribution

The degree of symmetry or distribution (δ) is a function of the relative benefits β_{AB} and β_{BA}, which accrue to each member of a trading dyad, i.e.,

$$\delta = f(\beta_{AB}, \beta_{BA}). \tag{3.1}$$

The determination of a functional form for the relation in Eq. 1 is based on the assumption that symmetry is complete when $\beta_{AB} = \beta_{BA}$. Graphically, this requires a line with intercept equal to zero and a slope of unity in the β_{AB}, β_{BA} space (see Fig. 1). Thus, for any point in this space where $\beta \neq \beta_{BA}$, the degree of asymmetry (or lack of symmetry) will be proportional to the shortest distance between that point and the symmetry line, $\beta_{AB} = \beta_{BA}$. This distance is equal to a constant times the absolute value of the difference between β_{AB} and β_{BA}. The derivation follows.

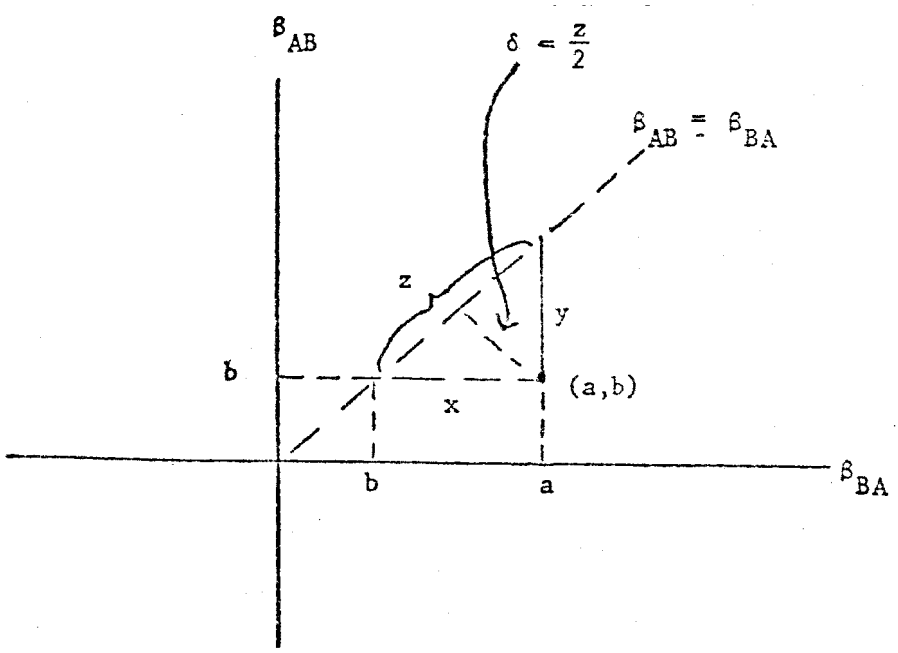

Fig. 1--Definition of distribution (δ)

For point (a,b), $x = a - b = y$. Since $x^2 + y^2 = z^2$, then $2x^2 = z^2$, and since $\frac{z}{2} = \delta$, then $2x^2 = 4\delta^2$, such that $\delta = \frac{1}{\sqrt{2}} |x|$, and therefore, $\delta = k\,|a - b|$. Thus,

$$\delta = k|\beta_{AB} - \beta_{BA}|. \tag{3.2}$$

The distribution (δ) is therefore at a minimum (zero) when there is symmetry, i.e., when the relative benefits are equal. If the relative benefits are not equal, or asymmetric, then $\delta > 0$. This definition does not provide for any "direction" to this asymmetry (i.e., dependence). Whether $\beta_{AB} > \beta_{BA}$ or $\beta_{BA} > \beta_{AB}$ is not the concern here, only the extent to which $\beta_{BA} \neq \beta_{AB}$, i.e., $\delta > 0$. This formulation avoids the morass, so characteristic of the dependence literature, of trying to determine which dyadic member is the more dependent one. The emphasis here is on the distribution of the relative benefits of *dyadic* interaction, not on who is more dependent on whom.

The Intensity

Another consideration important in characterizing the nature of economic interdependence is the total dyadic relative benefit of economic interaction or *intensity* (τ), where

$$\tau = \beta_{AB} + \beta_{BA} \tag{3.3}$$

i.e., τ is the magnitude of economic interaction, as measured by the dyadic relative benefits, and can vary from $0 < \tau \leq 2$. (It cannot be equal to or less than zero since the analysis is restricted to Cases 1 and 2 such that $\beta > 0$ always.) Regardless of the distribution of relative benefits, the intensity can vary, over time, between a large and a small magnitude. This measure would therefore capture the intensity of a *dyad's* economic interaction.

Since the relative benefit measure is basically a concentration measure (bilateral benefits as a proportion of world benefits), the distribution measure (δ) can be interpreted as the relative concentration of benefits, and the intensity measure (τ) as the absolute concentration of benefit.

These two concepts allow a more complete characterization of the economic relationship between two countries as demonstrated, for example, in Fig. 2.

DISTRIBUTION

INTENSITY	Symmetric ($\delta = 0$)	Asymmetric ($\delta \geq 0$)
high ($2 \geq \tau > 1$)	U.S. - Canada I	U.S. - Liberia II
low ($0 < \tau < 1$)	U.S. - S. Africa IV	U.S. - Iraq III

Fig. 2

In other words, a pair of trading countries (dyad) can have very similar trade concentrations (symmetric distribution) but the sum of their trade concentrations (intensity) may be high or low (U.S.-Canada vs. U.S.-S. Africa). Alternatively, a dyad can have differing trade concentrations (asymmetric distribution) with the intensity also high or low (U.S.-Liberia vs. U.S.-Iraq). In addition, a given dyad may move across cells over time (e.g., from Cell III to Cell II, etc.).

It is proposed then that 1) when the distribution is symmetric and the intensity is high (Cell I), the level of economic interdependence (EID) is unambiguously high; 2) when the distribution is asymmetric and the intensity is low (Cell III) EID is unambiguously low; and 3) that when the intensity is low and the distribution symmetric

(Cell IV), or when the intensity is high and the distribution is asymmetric (Cell II), EID is in the mid-range. Therefore, if the intensity increases while the distribution remains constant (Cell IV → Cell I or Cell III → Cell II), or if the distribution *decreases* (asymmetry → symmetry) while the intensity remains constant (Cell II → Cell I or Cell III → Cell IV), then there is an unambiguous increase in EID.

To summarize, it is proposed that bilateral economic interdependence (EID) is a function of both a quality variable, the distribution of relative benefits (δ), and a quantity variable, the intensity of relative benefits (τ), i.e.,

$$EID = f(\delta,\tau) \tag{3.4}$$

and that

$$\left(\frac{\partial EID}{\partial \delta}\right)_{\tau} < 0, \text{ and} \tag{3.5}$$

$$\left(\frac{\partial EID}{\partial \tau}\right)_{\delta} > 0. \tag{3.6}$$

That these measures are statistically independent is based on their both being linear combinations of β_{AB} and β_{BA}, both of which are independent random variables since the distribution of relative gains (β) is independent of country size (Ray, 1977).

b. Measurement

Given that $EID = f(\tau,\delta)$, where $\tau = (\beta_{AB} + \beta_{BA})$ and $\delta = k|\beta_{AB} - \beta_{BA}|$, it remains to be shown how to measure the relative benefits or gains (β) from economic interaction.

Terms of Trade

Implicit in the Ricardo-Mill concept of gains from trade is that the change in the terms of trade (TOT), i.e., the comparative real cost ratio at which goods are exchanged, is related to the change in the amount of gains or benefits from trade (β), i.e.,

$$\Delta\beta = f(\Delta TOT) \tag{3.7}$$

The exact nature of this relationship has been the subject of much controversy (Viner, 1960). In addition, there is considerable disagreement over what constitutes the best measure of the terms of trade, relative to the above definition. Before presenting the various definitions and their shortcomings, the determinants of variation in the terms of trade are discussed.

An improvement in the terms of the trade occurs when a country's purchasing power in international markets increases. With a given amount of exports, a country with improved terms of trade can import more. This provides, then, a greater capacity for development since resources are released from export- or import-competing production. An improvement in the terms of trade brought about by a rise in export prices is likely to stimulate an inflow of foreign capital. In contrast, a deterioration in the terms of trade due to a fall in export prices reduces a country's purchasing power on international markets, decreases the capacity for development in that more resources must now be absorbed in exports to gain the same amount of imports (unless the decline in export prices is due to increased productivity), and is likely to discourage the inflow of foreign investments.

Economic development also affects the terms of trade. The changes in consumption patterns, technology, factory supply, factory prices, and market structure, which accompany economic development, will affect commodity supply and demand and thus the terms of trade.

The concept of terms of trade has been defined in a variety of ways (Viner, 1960). The most common interpretation of the terms of trade is the commodity terms of trade (CTOT), or the net barter TOT, and is defined as the ratio between the prices of two commodities, or indexed prices of two groups of commodities, that may be exchanged against each other, i.e.,

$$CTOT = P_x/P_m \tag{3.8}$$

A closer approximation of the classical concept (a la Ricardo and Marshal) looks at the real quantity of factors exchanged for each other through the intermediation of commodities. This is called the double factoral terms of trade (DFTOT) and is equal to the CTOT times the reciprocal of changes in the indexed cost based on the marginal products of capital and labor for exports and imports.*

These two concepts amount to the same thing if there are constant proportions among factors used in each of the two exchanging countries, and constant returns to scale. But they diverge if there are changes in productivity and/or diminishing returns due to a limited supply of any factor. The classical concept, the DFTOT, thus indicates a limitation of the CTOT concept. A change in the latter could be offset by an inverse change in factor productivity. A further qualification concerns the effects on distribution of income, including the remission abroad of earnings of foreign investors and laborers, as an offset to export surpluses. A third qualification is that real prices received by primary producers may differ from border prices as a result of tariffs, quotas, exchange rate controls, and the cost of insurance and transportation (Myint, 1954/5).

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*Additional terms of trade concepts include: 1) the income terms of trade (ITOT), defined as the value of total exports divided by the price (indexed) of imports. In other words, ITOT = $P_x Q_x / P_y$. This has also been termed the "capacity to import" (i.e., purchasing power); 2) the gross barter terms of trade (GBTOT), where the real values of exports are divided by the real value of imports, to be used whenever a country's balance of payments contains unilateral payments; and 3) the single factoral terms of trade (SFTOT), which is a modification of the DFTOT. Here, the CTOT is corrected only for changes in productivity in producing exports such that it measures the quantity of imports bought by a unit of factors. Additional concepts have been put forward

Care must be taken when equating changes in the terms of trade with changes in the gains from trade, since changes in the terms of trade are not necessarily linearly proportional to changes in benefit (Haberler, 1937). It is necessary to determine *how* the changes in the terms of trade have occurred. The classical concept clearly recognized this problem, given its consideration of not only the price and/or quantity of exports, but the amounts of resources used in their production. For example, although the CTOT ($= P_x P_m$) would decrease when the production costs of exports fall, the classical concept (DFTOT) may nevertheless increase if the country received more imports than previously for the factors used in export production. In this case, then, a "gain" would occur in spite of a decrease in CTOT. Unfortunately, the DFTOT is hardly calculable, even given "much statistical coverage" (Viner, 1960).

Interaction Elasticity

Given the above conclusions it is clear that a measure of terms of trade is neither a feasible nor necessarily correct way of obtaining an index of change in the gains or benefits ($\Delta\beta$) of trade. In addition, the literature has apparently never even presumed that the *level* of gains or benefits (β) from trade could be measured. Thus, I propose a measure of $\Delta\beta$ that does not require measurement of β: the relative propensity of country A to change the extent of a *given* economic interaction (X^i, where $i = 1, \ldots, m$) with country B. For convenience this measure is referred to as the interaction elasticity (η^i_{AB}), and its derivation is discussed below.

First, a measure is proposed of the *change* in benefits that country A is receiving from country B: the annual rate of change of the level of funds in, or the flow of funds to, country A as a result of any given type of economic interaction (X^i) with country B, i.e.,

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but involve the determination of "disutility coefficients" and "average relative marginal utility" per unit of commodities produced (Morgan, 1963).

*In the case of trade, X^i_{AB} is therefore A's exports to B, i.e., money goes from B → A; for foreign direct investment, X^i_{AB} is the

$$RCX_{AB}^{i,t} = \left[\left(X_{AB}^{i,t} - X_{AB}^{i,t-1}\right) / X_{AB}^{i,t-1}\right] \qquad (3.9)$$

This then, is the propensity of A to change the extent of its economic interaction (X^i) with B in year "t."

If the numerator is positive ($\Delta X_{AB}^{i,t} > 0$), then the level (or flow) of funds to A from B has increased, such that A's benefit has increased. And, if $\Delta X_{AB}^{i,t} < 0$, then the level (or flow) of funds has decreased, such that A's benefit has decreased. Thus RCX_{AB}^{i} indicates the direction of the change in the level (or flow) of funds and presumably whether A's benefit is increasing or decreasing.*

The rate of change ($\Delta X/X$) is used to measure the change in benefits rather than the simple change (ΔX) because a given increase in interaction from a low magnitude is likely to reflect a greater increase in benefit than a similar increase in interaction from a higher magnitude. In other words, any measure of the change in benefits should consider not only the *change* in the magnitude of interaction, but also the magnitude.

Similarly, a measure of the *change* in benefits that A is receiving from the world is proposed: the annual rate of change in the level of funds in, or flow of funds to, country A is a result of any given type of economic interaction (X^i) with the world (W), i.e.,

$$RCX_{AW}^{i,t} = \left[\left(X_{AW}^{i,t} - X_{AW}^{i,t-1}\right) / X_{AW}^{i,t-1}\right] \qquad (3.10)$$

This then, is the propensity of A to change the extent of its economic interaction (X^i) with the world in year "t."

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investment of B in A, i.e., money goes from B → A. The distinction between the level or flow of funds is necessary because while trade is usually considered a flow variable, capital transfers, such as foreign direct investment, can be considered as stock or flow variables. (See Appendix B.)

*This measure does not indicate whether *dependence* is increasing or decreasing. As discussed earlier, the relationship between benefits and dependence is unclear, and for our purposes unnecessary (see Sec. III.1a).

Finally, the benefits which accrue to countries as the result of their mutual economic interaction ($RCX_{AB}^{i,t}$) should only be considered in relation to the benefits which accrue to each as the result of their economic interaction with the world ($RCX_{AW}^{i,t}$):

$$\eta_{AB}^{i,t} = \frac{RCX_{AB}^{i,t}}{RCX_{AW}^{i,t}} \tag{3.11}$$

This then, is the *relative propensity* of A to change the extent of a given economic interaction (X^i) with B, or the *interaction elasticity*. An analogous derivation obtains $\eta_{BA}^{i,t}$.

The interaction elasticity gives an indication of the *extent* to which A tends to increase its interaction with B relative to the world. In other words, the larger $\eta_{AB}^{i,t}\left(\eta_{BA}^{i,t}\right)$, the stronger the tendency, the greater the presumed or inferred increase in relative benefits. Thus it is proposed that the elasticity of interaction X^i is proportional to the annual change in relative benefits of interaction X^i i.e.,

$$\Delta\beta_{AB}^{i,t} \propto \eta_{AB}^{i,t}. \tag{3.12}$$

Unfortunately, the validity of this relationship is predicated on the rather strong assumption that all international economic interactions take place voluntarily (see Sec. III.1a). If so, then, given the the law of comparative advantage, no country would ever be inclined to reduce its *total* level of its economic interaction with the world since it presumably would not have attained that level if it was not beneficial to do so. Therefore, the above relationship only holds when $RCX_{AW}^{i,t} > 0$. But in the real world there are numerous exogenous events, such as war, embargoes/boycotts and recession/depression, which would cause the level of a given country's world trade to decrease. But, if $RCX_{AW}^{i,t} < 0$, then this leads to the counter-intuitive result that if $RCX_{AB}^{i,t} > 0$, then if $\eta_{AB}^{i,t} < 0$, and if $RCX_{AB}^{i,t} < 0$, then $\eta_{AB}^{i,t} > 0$. Thus, in order to accommodate a world in which $RCX_{AW}^{i,t}$ can be negative the following transformation is made: that

$$\text{if } RCX_{AW}^{i,t} > 0, \text{ then } \eta_{AB}^{*} = \eta_{AB}^{i,t}, \text{ but}$$

$$\text{if } RCX_{AW}^{i,t} < 0, \text{ then } \eta_{AB}^{**} = -\eta_{AB}^{i,t},$$

such that

$$\Delta\beta_{AB}^{i,t} = a_0 + a_1\eta_{AB}^{*} + a_2\ \eta_{AB}^{**}. \tag{3.13}$$

Fortunately, the world over the time frame considered in this analysis has been characterized by ever-increasing levels of interaction such that $RCX_{AW}^{i,t} > 0$ and the relation in Eq. 3.13 collapses to that in Eq. 3.12.

Now that we have a measure of $\Delta\beta_{AB}^{i,t}$, it is necessary to relate this to the intensity and distribution measures discussed earlier.

Given that the intensity (τ) is the sum of the relative benefits which accrue to each member of a dyad (Eq. 3.3), we can specify that

$$\Delta\tau_t = \Delta\beta_{AB}^{t} + \Delta\beta_{BA}^{t}. \tag{3.14}$$

Then given Eq. 3.12, that

$$\Delta\beta_{AB}^{i,t} \propto \eta_{AB}^{i,t}, \text{ and}$$

that, by definition,

$$\Delta\beta_{AB}^{t} = \sum_{i=1}^{m} \Delta\beta_{AB}^{i,t}, \text{ where} \tag{3.15}$$

m = the number of types of economic interaction, then

$$\Delta\beta_{AB}^{t} \propto \sum_{i=1}^{m} \eta_{AB}^{i,t}, \text{ and similarly,} \tag{3.16}$$

$$\Delta\beta_{BA}^{t} \propto \sum_{i=1}^{m} \eta_{BA}^{i,t}. \tag{3.17}$$

Then combining Eq. 3.14 with Eq. 3.16 and Eq. 3.17 gives

$$\Delta\tau_t \propto \Sigma\, \eta_{AB}^{i,t} + \Sigma\, \eta_{BA}^{i,t}, \text{ or} \tag{3.18}$$

$$\Delta\tau_t \propto \Sigma\, (\eta_{AB}^{i,t} + \eta_{BA}^{i,t}), \text{ or} \tag{3.19}$$

$$\Delta\tau_t \propto \Sigma\, \eta_{i,t}, \text{ where} \tag{3.20}$$

$$\eta_{i,t} = \eta_{AB}^{i,t} + \eta_{BA}^{i,t}. \tag{3.21}$$

$\eta_{i,t}$ is then the annual change in intensity that is attributable to any given economic interaction, or the *dyadic interaction elasticity*.

Unfortunately, an analogous operation is not applicable to the distribution varible (δ) since, given that $\delta = k|\beta_{AB} - \beta_{BA}|$ (Eq. 3.2),

$$\Delta\delta_t = k\left[|\beta_{AB}^{t+1} - \beta_{BA}^{t+1}| - |\beta_{AB}^{t} - \beta_{BA}^{t}|\right]. \tag{3.22}$$

Thus, in the absence of any acceptable indicator of the *level* of β, neither δ nor $\Delta\delta$ can be measured.

Three variables of economic interaction were considered for this analysis: exports (X^1), cumulative foreign direct investment (X^2), and cumulative liabilities (X^3).* Then, given Eq. (3.16), this results in three independent variables, the *dyadic elasticities*, as follows:

$$\eta_{1,t} = \eta_{AB}^{1,t} + \eta_{BA}^{1,t},$$

$$\eta_{2,t} = \eta_{AB}^{2,t} + \eta_{BA}^{2,t}, \text{ and}$$

$$\eta_{3,t} = \eta_{AB}^{3,t} + \eta_{BA}^{3,t}$$

*See Appendix B for discussion of economic interaction data sources and the construction of the explanatory variables (the dyadic interaction elasticities) and a description of the data.

where $\eta_{1,t}$ = the annual change in the intensity of exports,

$\eta_{2,t}$ = the annual change in the intensity of cumulative foreign direct investment, and

$\eta_{3,t}$ = the annual change in the intensity of cumulative foreign liabilities.

Given Eq. 3.20, the summation of these variables, $\sum_{i=1}^{3} \eta_{i,t}$, is then proportional to the annual change in intensity ($\Delta\tau_t$) that is attributable to exports, foreign direct investment, and cumulative foreign liabilities.

Earlier it was proposed (Eq. 3.4) that economic interdependence (EID) is a function of that intensity (τ) and the distribution (δ) of relative benefits, i.e., that

$$EID = f(\tau,\delta).$$

Given that these variables are independent and given Eq. 3.20, that

$$\Delta\tau_t \propto \Sigma\eta_{i,t},$$

it is proposed that

$$EID_t = f(\Sigma\eta_{i,t})_{\bar{\delta}} \tag{3.23}$$

where $\bar{\delta}$ is the average distribution over time.

In other words, over time, for a given dyad with a given average distribution ($\bar{\delta}$), the level of economic interdependence (EID_t) is a function of the summation of each economic interaction's contribution to the change in intensity ($\eta_{i,t}$).

While the average distribution ($\bar{\delta}$) cannot be measured, it is likely that each trading pair has its own characteristic average distribution. More specifically, current theories of economic interdependence contend (as discussed in Chapter II) that the relative benefits which

accrue from economic interactions between OECD countries and LDCs are, as a rule, distributed unequally, whereas the relative benefits which accrue from economic interactions among OECD countries, are, as a rule, distributed far more evenly (Snyder, 1979). Thus, for OECD-LDC dyads, it is reasonable to expect that their average distribution ($\bar{\delta}$) would be greater (i.e., more asymmetric) than the average distribution for the OECD-OECD dyads. In other words, as we move from OECD-LDC dyads to OECD-OECD dyads, we expect that the average distribution of relative benefits decreases (i.e., becomes more symmetric).*

2. FOREIGN POLICY COOPERATION

a. Theory

In order to understand foreign policy cooperation (FPC), it is necessary first to be able to distinguish between its existence and its absence. *Unfortunately, international cooperation lacks a conventionally accepted concept and measure. As such, the measurement of international cooperation has become a "conceptual and empirical problem of considerable magnitude"* (Rosenau et al., 1973).

By definition, *international* cooperation is not an attribute of a single actor, but occurs only as global actors *interact*. As previously discussed, numerous international interactions have been used to measure international cooperation, but the utility of any given one of these measures is subject to serious reservations.

These conceptual considerations suggest that the use of multiple indicators of foreign policy cooperation is preferable to relying on any single measure. The proxy variables to be used for constructing indicators of foreign policy cooperation are: (a) U.S. treaties in force, (b) U.S. military transfers, and (c) World Bank loans. In using these indicators it is recognized that none of them

*This contention will be used subsequently as the basis for a test of an interaction hypothesis concerning the effect of the distribution, and intensity, of relative benefits on foreign policy cooperation. See p. 45f.

is a truly reliable indicator of foreign policy behavior. But, by using them as cross-checks on one another, a more valid assessment of the results is possible.

U.S. Treaties in Force (USTF)

Clearly, a treaty event can be viewed as indicative of cooperative relations between the principals. As such, it seems reasonable that an indicator based on the cumulative level of treaties between the United States and a given country might suggest the extent of foreign policy cooperation between them. Such an approach, though, has problems. Treaties are not homogeneous. There are various types of treaties--defense, economic, cultural--and, clearly, some are more important than others. In addition, distribution of perceived benefits from a given treaty may be uneven.

Thus it is necessary to assume that for the set of treaty events in any given year, the benefit distribution and relative importance of a given treaty event are sufficiently random such that, on average, they are constant over time. This is a strong assumption in light of the fairly small number of treaty events which occur in any given year.*

U.S. Military Transfers (USMT)

These transfers occur under a variety of program headings. Most transfers to OECD countries occur under the foreign military *sales* (FMS) program while transfers to most LDCs occur under the Military *Assistance* Program (MAP). Thus this variable is at once suspect with regard to comparability across the two types of dyads (US-OECD, US-LDC). In addition, some countries have progressed from being mainly MAP recipients to being mainly FMS recipients (Japan). Further, FMS sales are made on a cash *or* credit basis. If the United States transfers, under the FMS program, $X amount to one country all on credit, and the same amount to another on a

*See Appendix D.2.

cash-only basis, is this indicative of the same amount of cooperation? For that matter, MAP transfers are outright grants by definition. Is the transfer of $X amount in this case the result of the same amount of cooperation as above? And there is always potential discrepancy between the dollar valuation of a given transfer and its military significance to the recipient. For example, the arms might be sold at a discount such that the extent of cooperation would in fact be greater than that estimated on the basis of the dollar value.

Thus, it is necessary to assume that differences in the terms of the military transfer--whether cash, credit, or grant--are a function only of a recipient's financial status, such that the size of a transfer is only a function of mutual security considerations and the extent of cooperation. In other words, arms transfers are made on the basis of the perceived extent of cooperation and mutual security interests, while the form of the transfer depends on a recipient's ability to pay.

The discrepancy between dollar valuation and military significance is assumed to be random, i.e., there is no bias over time, such that on average, the dollar valuation is proportional to the military significance. Finally, since some countries have varied from mainly MAP to mainly FMS transfers, the sum is used.

World Bank Loans (WBL)

The last item may require some elaboration. While the World Bank is officially multilateral in nature, it is considered to reflect a high degree of U.S. influence because of American dominance of the organization. The extent of this dominance is evidenced by an analysis of U.S. voting power.

The voting power of a country (as defined by its proportion of total votes) in the IMF and the World Bank is determined by the size of its subscription, which in turn is proportional to its gross national product.

Loan decisions by the World Bank and IMF are made by a Board of 20 members, or "Governors." For the World Bank the decision-making process is a simple majority "game," i.e., 50 percent majority

required, in which the United States has 23 percent of the total votes. The United Kingdom has the next largest share--9 percent--with the remaining 68 percent of the vote distributed among the remaining 18 governors. Given this skewed distribution of votes, the "real" voting power, based on the Shapley-Shubik (S-S) Index* is different from a voting power defined simply in terms of the proportion of total votes allocated to a given country. For the IMF, the "game" is essentially identical except that a special majority of 85 percent is required for most major decisions. Thus, in the IMF, the United States, with 23 percent of the vote, is the only member with veto power.

As a result, it might be anticipated that the United States has greater influence in the IMF than in the World Bank, since the United States is the only player that can exercise a veto in the IMF whereas no blocking by any individual country can occur in the World Bank. In fact, the contrary is true. This is because many *coalitions* of countries can be formed in the IMF which can *also* block action. The United States has greater S-S voting power in the World Bank (28.5 percent) than in the IMF (21.6 percent). In fact, the S-S voting power of the United States in the IMF is even less than its voting power based on its proportion of the total votes--23 percent. Thus, based on the S-S Index, the United States has more power in the World Bank (28.5 percent) than is indicated by its vote proportion (23.0 percent).*

This result suggests that the United States could exert substantial influence, if not *de facto* control, over the World Bank. As a result, this organization may, to some extent, be viewed as an instrument of U.S. foreign policy. Thus, decisions regarding the disbursement of loans may be influenced by whether the United States perceives the recipients (mostly LDCs) to be cooperative or hostile (e.g., Vietnam).

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*See Appendix C.

b. Measurement

All three of these measures are considered to be variables of international *political interaction*. While this is clear for U.S. treaties in Force (USTF), it also holds for the unilateral transfers, U.S. Military Transfers (USMT), and World Bank Loans (WBL). This is based on the notion that any assistance must involve the cooperation of both the donor and the recipient. In other words, the United States would not confer assistance to someone it perceives to be uncooperative, as in the case, e.g., of the recent cutoff in aid to Afghanistan as the result of the death of our ambassador. On the other hand, a potential recipient might refuse increased assistance if too many strings are attached, as in the case of Brazil's response to Carter's human rights initiative. Thus, in this sense, the unilateral transfers are interactions.

All of these interactions can be considered in terms of cumulative levels, flows, or rates of change. It is not clear, though, whether foreign policy cooperation is a *stock* or a *flow* variable. If it is a stock variable, then the cumulative level of a given interaction would be an appropriate indicator, but if it is a flow variable, the change or rate of change would be appropriate.

A perusal of these interactions showed that each is essentially a linear function of time as shown in Fig. 3.*

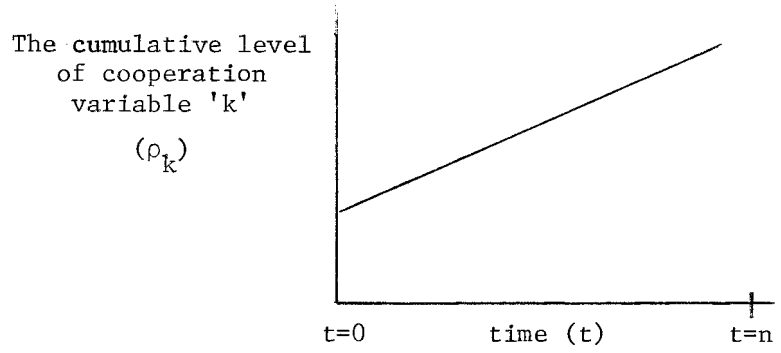

Fig. 3

such that $\rho_k = \alpha t + \beta$.

*See Appendix D.2.

Thus, if foreign policy cooperation (FPC) is linearly proportional to the cumulative level of a given political interaction (ρ_i),

$$FPC \propto \rho_k,$$

then cooperation increases over time in Fig. 3. But, if foreign policy cooperation is linearly proportional to the change in the level of interaction, then cooperation is constant from year to year since

$$(\partial\rho/\partial t) = \alpha, \quad \text{or } \partial\rho = \alpha\partial t, \quad \text{and } \partial t = 1.$$

On the other hand, if foreign policy cooperation is proportional to the rate of change in the level of interaction,

$$FPC \propto \frac{\partial\rho_k}{\rho_k},$$

then cooperation decreases over this period, since $\partial\rho_k$ is constant and ρ_k is increasing.

Given that there is no a priori reason for presuming the relevance of any of these models, all three must be considered. Of course, for the purposes of the ensuing analysis, a model in which foreign policy cooperation is constant is a trivial case since the explanatory variables will necessarily be unable to explain a phenomenon that is unchanging. This leaves us then with two models: one based on the cumulative level and the other based on rate of change of the cumulative level, for indicating foreign policy cooperation in year t, i.e.,

$$FPC_t \propto [\phi_j(\rho_k)]_t \tag{3.24}$$

given j = (1,2), where $\phi_1 = \rho_k$ and $\phi_2 = \partial\rho_k/\rho_k$, and k = (1,2,3) where ρ_1 = U.S. Treaties in Force (USTF), ρ_2 = U.S. Military Transfers (USMT), and ρ_3 = World Bank Loans (WBL).*

3. A LINKAGE MODEL

In the first chapter, it was established that the objective of this research was to investigate whether economic interdependence (EID) has a significant effect on foreign policy cooperation (FPC), i.e., whether

$$FPC = f(EID), \tag{3.25}$$

for a given dyad over time, and if so, whether the effect is positive and varies across dyads.

Given the measurement considerations delineated in the prior two sections, as reflected in Eq. 3.23, that

$$EID_t = f(\Sigma\eta_{i,t})_{\bar{\delta}}$$

and Eq. 3.24, that

$$FPC_t \propto [\phi_j(\rho_k)]_t,$$

a testable linkage hypothesis is proposed: that, over time, for a given dyad with a given average distribution ($\bar{\delta}$), the change in intensity of interaction, as reflected in the summation of the dyadic interaction elasticities ($\Sigma\eta_{i,t}$), has a significant effect on an indicator of foreign policy cooperation, $[\phi_j(\rho_k)]_t$, i.e.,

$$[\phi_j(\rho_k)]_t = f\left(\sum_{i=1}^{m} \eta_{i,t}\right)_{\bar{\delta}}, \text{ and} \tag{3.26}$$

*Data sources discussed in Appendix D.1.

if so, that this effect is positive, i.e.,

$$E_{\ell} = \left(\frac{\partial [\phi_j (\rho_k)]_t}{\partial \eta_{\ell,t}} \right) \sum_{i \neq \ell}^{m} \eta_{i,t} > 0 \qquad (3.27)$$

where E_{ℓ} is the effect that a change in each explanatory variable has on the dependent variable, m is the number of types of economic interaction, j = (1,2) where $\phi_1 \equiv$ cumulative level and $\phi_2 \equiv$ rate of change, and k = (1,2,3) where $\rho_1 \equiv$ USTF, $\rho_2 \equiv$ USMT, and $\rho_3 \equiv$ WBL.

A plausible causal mechanism for justifying the above linkage hypothesis is based on the words of Mill (1894, p. 135) as expressed earlier: "that increased international commerce would rapidly render war obsolete by strengthening and multiplying the personal interests which are in natural opposition to it." Thus, regardless of the level of the distribution (δ), as the intensity (τ) of interaction increases, so will the total dyadic desire to maintain peace. On the other hand, regardless of the intensity of interaction, as the level of the distribution decreases (moves from symmetry to asymmetry), it is likely that the proportions of the population in each country directly benefiting from their interaction would diverge. Thus, their resistances to war, or incentives to cooperate, might similarly diverge. As such, one country might become more predisposed to conflict than the other since it would have less to lose and correspondingly relatively more people unconcerned with an interruption in trade.

Given such a causal mechanism, it is reasonable to hypothesize an interaction effect. For example, for a given $\Delta\tau$, the effect on FPC may vary according to the distribution (δ). In other words, the effect on FPC of a given increase in intensity ($\Delta\tau > 0$) may be larger the more symmetric (the smaller) the distribution. Conversely, for a given change in the distribution ($\Delta\delta$), the effect on FPC may vary according to the intensity. In other words, a given increase in the distribution, i.e., *increased asymmetry* ($\Delta\delta > 0$) at high levels of intensity (τ) may have less of a negative impact on FPC than a similar increase in the distribution at low levels of intensity.

While the distribution (δ) cannot be measured, it is likely that each trading pair has its own characteristic average distribution over time ($\bar{\delta}$), as previously discussed. If so, then, given the above interaction assertion that the "effect on FPC of a given increase in intensity ($\tau > 0$) may be larger the more symmetric (the smaller) the distribution (δ)," one might expect the size of the effect (E_ℓ) of each η_ℓ on $\phi_j(\rho_k)$ to vary inversely with $\bar{\delta}$, the average distribution. In other words, given Eq. 3.26 and Eq. 3.27, is proposed that

$$\left(\frac{\partial E_\ell}{\partial \bar{\delta}}\right) < 0. \tag{3.28}$$

This interaction hypothesis would be tested indirectly by ranking the dyads examined according to the observed differential effect of each η_ℓ on $\phi_j(\rho_k)$ across dyads. This ranking would then be compared with the ranking based on preconceived notions common in the literature concerning the LDC, OECD relationship. In other words, given (see discussion on pp. 37-38) that, as we move from OECD-LDC dyads to OECD-OECD dyads, the average distribution decreases ($\Delta\bar{\delta} < 0$), then one would predict on the basis of Eq. 3.28 that, as we move from OECD-LDC dyads to OECD-OECD dyads, the size of the effect of the explantory variables should increase ($\Delta E_\ell > 0$). Such a result would then support the interaction hypothesis.

It is presumed that a model based on the relationship hypothesized in Eq. 3.26 is a suitable surrogate for one based on the relationship in Eq. 3.2, FPC = f(EID), and that analysis of such a model will provide answers to the policy questions raised initially.

Numerous models of the functional relation between foreign policy cooperation and economic interdependence for a given dyad over time can be constructed, as, e.g., in Fig. 4.

All of these models assumed (1) a threshold (d), which represents, essentially, the point at which foreign policies converge; (2) a nonzero intercept, implying that in the absence of economic

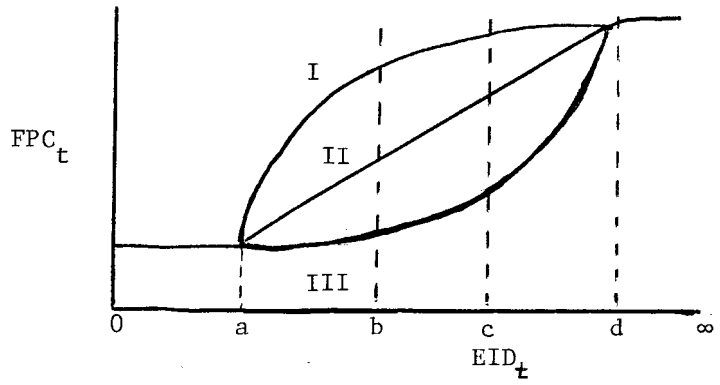

Fig. 4

interdependence, cooperation can still occur as the result of other factors such as military and cultural considerations, and (3) that at very low levels of EID (EID < a) there is no effect on FPC.

These models differ only in the mid-range of EID (a < EID < d) with regard to whether the second derivative is positive (III), i.e., increasing returns; negative (I), i.e., diminishing returns; or zero (II). For example, if, for a given dyad, the time period examined only covers a range in EID from 'a' to 'b' or from 'c' to 'd' (as, for example, in U.S.-PRC and U.S.-Canadian interaction, respectively, over the last few years) then, in the former case, Model III, and in the latter case, Model I, would show little or no effect of EID on FPC. Regardless, though, of which model is correct, it is assumed that the range in economic interdependence over time for the dyads examined in this analysis is in the mid-range and small enough (as, e.g., from a to b) such that a linear model is a useful approximation.

Thus, given the postulated linkage relationship in Eq. 3.26, the significance, sign, and size of the effect of each η_i on each $\phi_j(\rho_k)$ will be tested via an ordinary least squares regression analysis of the following model:

$$\left[\phi_j(\rho_k)\right]_t = \sum_{i=0}^{m} b_i \eta_{i,t} + \varepsilon_t. \qquad (3.29)$$

where 't' is a given year and $\eta_{o,t}$ is defined as unity.

IV. THE ANALYSIS

1. The Regression Model
2. Scope
3. Results
    a. U.S. Treaties in Force
    b. U.S. Military Transfers
    c. World Bank Loans
4. Discussion

1. THE REGRESSION MODEL

The linkage model specified in the previous chapter can incorporate any number of economic interactions as explanatory variables:

$$[\phi_j(\rho_k)]_t = \sum_{i=1}^{m} b_i \eta_{i,t} + \varepsilon_t \qquad (3.29)$$

where i = (1,...,m) and m = the number of interactions, and (to recapitulate) where $\eta_{i,t}$ (the change in intensity due to interaction x^i) is equal to the sum of the i^{th} interaction elasticities of A with B ($\eta_{AB}^{i,t}$) and B with A ($\eta_{BA}^{i,t}$), i.e.,

$$\eta_{i,t} = \eta_{AB}^{i,t} + \eta_{BA}^{i,t} \qquad (3.21)$$

It was anticipated, as previously discussed, that three types of economic interactions would be used for this analysis, but only two (exports and foreign liabilities) were employed because of the unavailability of complete data on annual world foreign direct investment in U.S. trading partners (see Appendix B). Thus m = 2, and

$$[\phi_j(\rho_k)]_t = b_0 + b_1\eta_{1,t} + b_2\eta_{2,t} + \varepsilon_t \qquad (4.1)$$

where $\eta_{0,t} \equiv$ unity,

$\eta_{1,t} \equiv$ change in intensity of exports, and

$\eta_{2,t} \equiv$ change in intensity of cumulative foreign liabilities.

In addition, j = (1 or 2) and k = (1, 2, or 3) where

$\phi_1(\rho_1) \equiv$ cumulative level of U.S. Treaties in Force $\equiv \phi_1$(USTF),

$\phi_2(\rho_1) \equiv$ rate of change of U.S. Treaties in Force $\equiv \phi_2$(USTF),

$\phi_1(\rho_2) \equiv$ cumulative level of U.S. Military Transfers $\equiv \phi_1$(USMT),

$\emptyset_2(\rho_2) \equiv$ rate of change of U.S. Military Transfers $\equiv \emptyset_2$(USMT),

$\emptyset_1(\rho_3) \equiv$ cumulative level of World Bank Loans $\equiv \emptyset_1$(WBL), and

$\emptyset_2(\rho_3) \equiv$ rate of change of World Bank Loans $\equiv \emptyset_2$(WBL).

This gives, then, six dependent variables: two indicators ($\emptyset_1$ and $\emptyset_2$) representing the level and rate of change for each variable of foreign policy cooperation (ρ_1, ρ_2, and ρ_3).

Finally, since this analysis is over time for a given dyad, lags of one or two years in the effect of the explanatory variables were considered. Greater lags were not considered due to data limitations. This gives, then,

$$[\emptyset_j(\rho_k)]_t = b_0 + b_1\eta_{1,t-n} + b_2\eta_{2,t-n} + \varepsilon_{t-n} \qquad (4.2)$$

where t is a given year and n = (0, 1, or 2). Consideration of possible lag effects is necessary for two reasons: (1) to account for the variance across dependent variables with regard to whether the data *compiled* represented agreements or actual disbursements (or ratifications in the case of treaties),* and (2) to account for possible variance across dyads with respect to the mechanism and/or efficiency of translating changes in the explanatory variables into changes in the dependent variables.

2. SCOPE

The extent of both serial (over time) and cross-sectional (across dyads) aspects of this analysis was constrained by data limitations. While the necessary data were available on exports back to 1948 for most U.S. $\leftrightarrow$ X dyads, where X is any given country, data on cumulative liabilities were rarely available before the mid-1950s, and then only for a few U.S. $\leftrightarrow$ dyads. In addition, data for the dependent variables--U.S. Arms Transfers, World Bank Loan disbursements, and Treaties in Force--were similarly constrained. Thus, (except for

*See Appendix D.

minor deviations) this analysis covers the period from 1957 to 1977, yielding 21 data points initially. But, given the rate-of-change nature of explanatory variables, the number of data points is reduced to 20. This number is further reduced according to whether the analysis incorporated a lag of zero, one or two years in the effect of the explanatory variables on the dependent variable; and according to the frequency of occasional missing data points.

Despite the constraints on serial data available, the set of dyads (of which the United States was one member) remaining amenable to analysis was of considerable size (approximately 20, most of which were OECD members). Since practical considerations prevented looking at all of them, three OECD countries and four LDCs were arbitrarily selected for this analysis. The OECD countries are the United Kingdom, The Netherlands, and Japan. The LDCs are India, Philippines, Argentina, and Brazil. This gives, then, seven dyads for the analysis: U.S.-United Kingdom (UK), U.S.-Netherlands (NETH), and U.S.-Japan (JPN), the OECD dyads; and U.S.-Argentina (ARG), U.S.-Brazil (BRAZ), U.S.-India (IND), and U.S.-Philippines (PHIL), the LDC dyads.

The scope of this analysis is summarized in Table 1. For each of the seven dyads, the lagged effect of the two explanatory variables on each of the six dependent variables, over time, is determined. Since the World Bank Loan indicators are not applicable to the OECD trading pairs, this yields 36 regressions for each lag of zero, one or two years. The results of this analysis are discussed in the next section.

3. THE RESULTS

The aptness of the proposed model, whether based on the cumulative level, $\emptyset_1$, or the rate of change of the cumulative level, $\emptyset_2$, was evaluated according to the following criteria:

1. Homoscedasticity of residuals,
2. Noncorrelation of residuals,
3. Normality of residuals, and
4. Multicollinearity.

Table 1

THE SCOPE OF THE ANALYSIS

TRADING PAIRS		DEPENDENT VARIABLE					
		CUMULATIVE LEVEL			RATE OF CHANGE		
		USTF	USMT	WBL	USTF	USMT	WBL
OECD TRADING PAIRS	US-UK						
	US-NETH						
	US-JPN						
LDC TRADING PAIRS	US-ARG						
	US-BRAZ						
	US-PHIL						
	US-IND						

Regressions

Not Applicable

USTF = U.S. Treaties in Force
USMT = U.S. Military Transfers
WBL = World Bank Loans

Aptness according to the first, second, and third criteria is necessary for assuming the validity of any significance tests based on the F and t statistics.

That homoscedasticity prevailed for both the $\emptyset_1$ and $\emptyset_2$ regressions was confirmed by the test of Goldfield and Quandt (Theil, 1971).* This test showed that the ratio of the sum of the later (1968-1977) squared residuals to the sum of the *earlier* (1958-1967) squared residuals (or vice versa), which is an F-statistic, was not significant at the 5 percent level. Thus, we cannot *reject* the hypothesis that the sum of the later square residuals is the same as the sum of the earlier squared residuals, i.e., we cannot reject the hypothesis that the residual variance is constant, or homoscedastic.

Given the nature of the variables used in this analysis, it is not surprising that the $\emptyset_1$ regressions (where $\emptyset_1$ is the cumulative level) gave residuals that are highly positively correlated based on the Durbin-Watson test (Theil, 1971), i.e., adjacent error terms e_t and e_{t-1} tend to be of the same magnitude, or autocorrelated.*

A major cause of positively autocorrelated errors in time series data is the omission of one or several key variables from the model. One likely explanatory variable missing from the $\emptyset_1$ regressions is the cumulative level for all countries; e.g., it is likely that the level of World Bank loans to all countries in a given year is highly correlated to the level of loans disbursed to a single country in that year. Inclusion of this explanatory variable into the $\emptyset_1$ (WBL) regressions confirmed this (Table 4d). For all four dyads tested, the coefficient of this explanatory variable was highly significant and the residuals were uncorrelated.

For the $\emptyset_2$ regressions, the autocorrelation should be reduced since $\emptyset_2$ is the rate of change such that it controls for the cumulative level. This was observed since the Durbin-Watson statistics tended to be above the upper bound at a level of significance of 5 percent. Hence the hypothesis that the residuals are positively autocorrelated could be rejected for the $\emptyset_2$ regressions.

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*See Appendix E.

The main problem with autocorrelation is that the variance of the residuals may be seriously underestimated. As a result, the t-statistics and F-statistics may be *overestimates*. But the results of the $\emptyset_1$ regressions given in Tables 2, 3, and 4 are, for the most part, insignificant even assuming the validity of the regression statistics. Allowing for autocorrelation merely suggests that these results are even more insignificant than already indicated. As a result, conclusions based on these regression results are unaffected.

That the $\emptyset_1$ and $\emptyset_2$ regression residuals are normally distributed was tested by plotting the residuals on normal paper. These plots were, in general, linear, thus indicating normality.*

Finally, any *problem* with multicollinearity was ruled out by examination of the correlation matrix, which showed that the absolute value of $4(\eta_1, \eta_2)$ was never greater than .60.*

The following results are presented according to the variables of foreign policy cooperation (ρ_k), whether treaties (USTF), military transfers (USMT), or World Bank Loans (WBL); and according to the indicator ($\emptyset_i$), whether the cumulative level ($\emptyset_1$) or the rate of change ($\emptyset_2$).

For each of these six dependent variables, $\emptyset_j(\rho_k)$, the best result across the lags of zero, one, or two years is given in Tables 2-4 for each of the seven dyads. Choice among the three different lags is based on the F-statistic, indicating each regression's significance, i.e., the probability that the squared correlation coefficient is not zero, or, alternatively, the probability that the explanatory coefficients are *not* simultaneously zero. For a given number of observations and degrees of freedom, the higher the F-statistic, the greater the significance.

Consideration of results is then confined to only those regressions which yield F-statistics that are significant at the 5 percent level. Similarly, given this set of *significant* regressions, consideration of the coefficients b_1 and b_2 is confined to only those

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*See Appendix E.

Table 2

EFFECT OF EXPLANATORY VARIABLES ON
U.S. TREATIES IN FORCE[‡]

Table 2a: $\emptyset_1$ (USTF)

	Lag	b_1	(t_1)	b_2	(t_2)	n	R^2	F
UK	2	1.50	(.91)	3.00	(1.50)	17	.33	3.50
Neth	2	.47	(1.10)	.0005	(.002)	17	.12	.91
Jpn	1	-1.50	(-3.20)*	.66	(1.20)	20	.38	5.10*
Arg	0	- .21	(- .45)	.55	(2.50)	17	.32	3.20
Braz	0	- .48	(- .56)	1.80	(1.10)	19	.12	1.10
Ind	1	.25	(.88)	-.37	(-.64)	15	.08	.54
Phil	0	.44	(.31)	1.40	(1.30)	19	.10	.90

Table 2b: $\emptyset_2$ (USTF)

UK	2	-.0009	(-.70)	-.0008	(.47)	17	.10	.80
Neth	0	-.0002	(-.25)	-.0006	(-1.50)	19	.18	1.80
Jpn	2	.005	(5.10)*	.0002	(.31)	19	.64	14.10*
Arg	1	.003	(.94)	-.004	(-2.60)	16	.34	3.40
Braz	2	.003	(2.10)	-.0005	(-.17)	18	.24	2.30
Ind	1	.001	(-1.20)	-.0003	(-.15)	15	.11	.72
Phil	2	.002	(.84)	.002	(1.40)	18	.14	1.30

Table 2c: Summary:
By Indicator, Across Dyads

	No. Regressions	Significant R^2	Significant b_1	$b_1>0$	Significant b_2	$b_2>0$
$\emptyset_1$(USTF)	7	1	1	0	0	0
$\emptyset_2$(USTF)	7	1	1	1	0	0
USTF	14	2	2	1	0	0

[‡] b_1 = coefficient of change in export intensity; b_2 = coefficient of change in cumulative liabilities intensity; t_1, t_2 are respective t-statistics; F is F-statistic; R^2 is the correlation coefficient; n is the number of data points.

*Significant F-statistics at 5 percent level; and *for those regressions*, significant t-statistics at 5 percent level.

Table 3

EFFECT OF EXPLANATORY VARIABLES ON
U.S. MILITARY TRANSFERS‡

Table 3a: $\emptyset_1$ (USMT)

	Lag	b_1	$(t_1)^{\ddagger}$	b_2	$(t_2)^{\ddagger}$	n	R^2	$F^{\ddagger}$
UK	0	493	(.99)	764	(1.50)	20	.30	3.60*
Neth	2	-186	(- .49)	150	(.79)	18	.04	.32
Jpn	0	-151	(-2.70)*	134	(2.20)*	21	.35	4.90*
Arg	2	- 4.7	(- .15)	32	(2.20)	16	.28	2.50
Braz	0	- 41	(- .79)	69	(.68)	20	.09	.80
Ind	0	2.6	(.42)	7.5	(.81)	17	.06	.41
Phil	0	17	(.27)	86	(1.80)	20	.16	1.60

Table 3b: $\emptyset_2$ (USMT)

UK	2	.007	(1.10)	-.007	(-1.00)	18	.09	.76
Neth	0	-.01	(-1.70)	.003	(1.00)	20	.15	1.50
Jpn	1	.001	(1.00)	-.003	(-2.60)	20	.29	3.50
Arg	1	.005	(1.10)	-.005	(-2.40)	17	.30	2.90
Braz	1	.005	(2.10)	.002	(.40)	19	.22	2.30
Ind	2	-.002	(-.89)	-.0005	(.15)	15	.06	.40
Phil	2	.0004	(.24)	-.002	(-1.80)	19	.17	1.60

Table 3c: Summary:
By Indicator, Across Dyads

	No. Regressions	Significant R^2	Significant b_1	$b_1>0$	Significant b_2	$b_2>0$
$\emptyset_1$(USMT)	7	2	1	0	1	1
$\emptyset_2$(USMT)	7	0	0	0	0	0
USMT	14	2	1	0	1	1

‡See footnote to Table 2.

Table 4

EFFECT OF EXPLANATORY VARIABLES ON WORLD BANK LOANS‡

Table 4a: $\emptyset_1$ (WBL)

$\emptyset_1$	Lag	b_1	(t_1)	b_2	(t_2)	n	R^2	F
Arg	2	1.6	(.13)	11.4	2.00	16	.26	2.30
Braz	2	-9.6	(-.23)	67	(.89)	19	.06	.52
Ind	2	25	(1.60)	-86	(-2.70)*	16	.42	4.70*
Phil	0	2.8	(.18)	13.6	(1.10)	20	.07	.63

Table 4b: $\emptyset_2$ (WBL)

Arg	2	.002	(.13)	-.02	(-2.00)	16	.25	2.20
Braz	0	.004	(.96)	.02	(2.40)	20	.25	2.80
Ind	1	.0009	(1.00)	-.0004	(- .33)	16	.08	.57
Phil	1	.009	(.96)	-.03	(-3.70)*	19	.49	7.60*

Table 4c: SUMMARY: By Indicator, Across Dyads

	No. Regressions	Significant R^2	Significant b_1	$b_1>0$	Significant b_2	$b_2>0$
$\emptyset_1$(WBL)	4	1	0	0	1	0
$\emptyset_2$(WBL)	4	1	0	0	1	0
WBL	8	2	0	0	2	0

Table 4d: $\emptyset_1$ (WBL), Controlling for Total Loans to World (b_3)

	Lag	b_1	(t_1)	b_2	(t_2)	b_3†	(t_3)	R^2	F
Arg	0	-3.50	(- .73)	.46	(.17)	.02	(9.7)*	.87	36*
Braz	1	9.90	(2.40)*	-2.00	(-.63)	.08	(41.0)*	.99	608*
Ind	2	.61	(.30)	5.70	(1.30)	.16	(46.0)*	.99	818*
Phil	1	1.40	(.34)	-2.30	(-.72)	.03	(16.0)*	.94	88*

‡See footnote to Table 2.

†Coefficient of total World Bank Loans to the world.

that are, on the basis of their t-statistics, significantly different from zero at the 5 percent level.

a. U.S. Treaties in Force

Table 2a gives the results obtained using the cumulative level of U.S. Treaties in Force, $\emptyset_1$ (USTF), as the dependent variable. Only one dyad, JPN, showed a significant relation between the level of treaties and the set of explanatory variables; and of the explanatory variables, only the change in export intensity (η_1) had a significant coefficient, and it was negative. Thus, for the remaining six dyads no significant relation between the level of treaties and the set of explanatory variables was observed.

In Table 2b, the results obtained using $\emptyset_2$ (USTF), the rate of change in the level of treaties, as the dependent variable are presented. Again, the same dyad (JPN) was the only one showing a significant relation; and of the explanatory variables, again the change in export intensity (η_1) is the only one with a significant effect, and it was positive. Thus, for the remaining six dyads (UK, NETH, PHIL, IND, ARG, BRAZ), no significant relation between the rate of change in the level of treaties and the set of explanatory variables was observed.

These results for U.S. Treaties in Force are summarized by indicator across dyads in Table 2c.

b. U.S. Military Transfers

Table 3a gives the results obtained using the cumulative of military transfers, $\emptyset_1$ (USMT), as the dependent variable. In this case two dyads showed a significant relation between the level of transfers and the set of explanatory variables: UK and JPN. But, for UK, neither of the explanatory variables had a significant effect, and for JPN only the change in export intensity (η_1) had a significant effect, which was negative (contrary to what the linkage hypothesis would suggest). Thus, for the remaining five dyads, no significant relation was observed between the level of military transfers and the set of explanatory variables.

In Table 3b the results obtained using the rate of change, $\emptyset_2$ (USMT), as the dependent variable are presented. In this case, none of the seven dyads showed a significant relation between the rate of change of USMT and the set of explanatory variables.

These results for U.S. Military Transfers are summarized for both cumulative and rate of change indicator, across dyads in Table 3c.

c. World Bank Loans

Table 4a gives the results obtained using the cumulative level of World Bank Loans, $\emptyset_1$ (WBL), as the dependent variable. Only one dyad, IND, showed a significant relation between $\emptyset_1$ (WBL) and the set of explanatory variables; and only the change in cumulative liabilities intensity (η_2) had a significant effect, which was negative. For the remaining three dyads, ARG, BRAZ, and PHIL, no significant relation between the level of World Bank Loans, $\emptyset_1$ (WBL), and the set of explanatory variables was observed.

In Table 4b, the results obtained using the rate of change, $\emptyset_2$ (WBL), are presented. In this case one dyad, PHIL, showed a significant relation between $\emptyset_2$ (WBL) and the set of explanatory variables; and of the explanatory variables only the change in cumulative liabilities intensity (η_2) had a significant effect, and it was negative. Thus, for the remaining three dyads--ARG, BRAZ, and IND--no significant relation was observed between the $\emptyset_2$ (WBL) and the set of explanatory variables.

These results for World Bank Loans are summarized by indicator across dyads in Table 4c.

Table 4d was discussed earlier in relation to the consideration of autocorrelation. These results show that most if not all of the unexplained variance in the regressions in Table 4a is accounted for by inclusion of the cumulative level of World Bank Loans to the World.

4. DISCUSSION

These results are now considered in reference to the linkage hypothesis proposed in Chapter III, Section 3. There are three aspects to this hypothesis:

1. That the change in intensity, as reflected in the summation of the dyadic interaction elasticities, has a significant effect on an indicator of foreign policy cooperation, i.e., that

$$[\phi_j(\rho_k)]_t = f(\Sigma\eta_{i,t})_{\bar{\delta}} \tag{3.26}$$

2. That this effect is positive, i.e., that

$$E_\ell = \left(\frac{\partial[\phi_j(\rho_k)]_t}{\partial\eta_{\ell,t}} \right)_{\sum_{i\neq\ell}^{m} \eta_{i,t}} > 0, \text{ and} \tag{3.27}$$

3. That across dyads the size of this positive effect varies inversely with the average distribution of relative benefits over time ($\bar{\delta}$), i.e., that

$$\left(\frac{\partial E_\ell}{\partial \bar{\delta}} \right) < 0. \tag{3.28}$$

Given the linear model proposed in Eq. (4.2), and the method of ordinary least squares, the F-statistic provides a test of the first aspect of the linkage hypothesis (Eq. 3.26), i.e., whether the relation between the dependent variable and the set of explanatory variables is significant. Given regression significance, the second aspect (Eq. 3.27) is tested by examining the sign of only the explanatory variable coefficients that are determined to be significant on the basis of their respective t-statistics. Given these coefficients, the third aspect (Eq. 3.28) is tested by comparing them across dyads

and using a t-test to determine whether they are significantly different from each other.

Aggregation of the results presented in Tables 2, 3, and 4 across dyads, across indicators, and across the variables USTF, USMT, and WBL shows that of the 36 total regressions, only six were significant (Table 5). These significant regressions are listed in Table 6a. Of these, only one of the three significant η_1 coefficients (b_1) and one of the three significant η_2 coefficients (b_2) were positive. Thus, for these regressions, the sign of the effect of the explanatory variables varied in a manner inconsistent with the linkage hypothesis. And, given the paucity of significant coefficients across dyads for a given indicator ($\emptyset_1$ or $\emptyset_2$) and variable (USTF, USMT, or WBL) it was impossible to determine whether the size of the effect varied in a systematic way across dyads. Thus, no difference in the size of the effect across dyads was observed.

Similar results are obtained even when the significance criterion for the F- and t-statistics is relaxed to the 10 percent level. This yields only six additional significant regressions (Table 6b). Of these, none of the η_1 coefficients (b_1) are significant, whereas of the five significant η_2 coefficients, only two are positive (these coefficients were also significant at the 5 percent level).

For all but one of the regressions significant at the 10 percent level or better (Table 6), the correlation coefficients were quite low ($R^2 \leq .50$) indicating that other factors are more important in explaining the variance of the dependent variables tested. This was clearly demonstrated for World Bank Loans as is evident in comparing the results from Tables 4a and 4d.

Such results clearly indicate that an important determinant of the cumulative levels of loans from the World Bank to each of these countries is the cumulative level of World Bank loans to the world. Thus World Bank loan policy appears to be based mainly on some intrinsic mechanism that reflects only world aggregates rather than the particulars of a given potential recipient. i.e., if World Bank

Table 5

SUMMARY: BY VARIABLE,
BY INDICATOR, BY TYPE OF DYAD‡

Table 5a: Summary: by variable, across indicators, across dyads

	No. Regressions	Significant R^2	Significant b_1	$b_1>0$	Significant b_2	$b_2>0$
USTF	14	2	2	1	0	0
USMT	14	2	1	0	1	1
WBL	8	2	0	0	2	0
TOTAL	36	6	3	1	3	1

Table 5b: Summary: by indicator, across variables, across dyads

	No. Regressions	Significant R^2	Significant b_1	$b_1>0$	Significant b_2	$b_2>0$
$\emptyset_1$	18	4	2	0	2	1
$\emptyset_2$	18	2	1	1	1	0
TOTAL	36	6	3	1	3	1

Table 5c: Summary: by type of dyad, across indicators, across variables

	No. Regressions	Significant R^2	Significant b_1	$b_1>0$	Significant b_2	$b_2>0$
OECD	12	4	3	1	1	1
LDC	24	2	0	0	2	0
TOTAL	36	6	3	1	3	1

[1]U.S. Treaties in Force.

[2]U.S. Military Transfers.

[3]World Bank Loans.

‡See footnote on Table 2.

Table 6

THE SIGNIFICANT REGRESSIONS‡

Table 6a: At the five percent level

Variable	Indicator	Dyad	b_1	b_2	R^2
USTF	ϕ_1	JPN	-1.5*	.66	.38
USTF	ϕ_2	JPN	.005*	.0002	.64
USMT	ϕ_1	UK	493	764	.30
USMT	ϕ_1	JPN	-151*	134*	.35
WBL	ϕ_1	IND	25	-86*	.42
WBL	ϕ_2	PHIL	.009	-.03*	.49

Table 6b: At the ten percent level†

Variable	Indicator	Dyad	b_1	b_2	R^2
USTF	ϕ_1	UK	1.50	3.00	.33
USTF	ϕ_1	ARG	-.21	.55*	.32
USTF	ϕ_2	ARG	.003	-.004*	.34
USMT	ϕ_2	JPN	.001	-.003*	.29
USMT	ϕ_2	ARG	.005	-.005*	.30
WBL	ϕ_2	BRAZ	.004	+.02*	.25

*Denotes significant coefficients at five percent level (all coefficients significant at ten percent level were also significant at five percent level).

‡See footnote on Table 2.

†But not at five percent level.

lending is a plausible instrument of U.S. foreign policy, it is rarely used as such.

In general, the results do not support the hypothesis that the change in intensity, as reflected in the summation of the dyadic interaction elasticities (η_1 and η_2), has a significant effect on the dependent variable, $\phi_j(\rho_k)$. This conclusion is warranted whether the results are disaggregated by variable (Table 5a), by indicator (Table 5b), or by type (whether LDC or OEDC) of dyad (Table 5c).* In other words, we cannot reject the null hypothesis that there is no relationship between the indicators of foreign policy cooperation and the indicators of economic interdependence.

How do these results relate to the original question: whether economic interdependence has a significant effect on foreign policy cooperation for a given dyad over time, and if so whether this effect is positive and varies across dyads. If it is assumed: (1) the theoretical model (Eq. 3.29) is valid; (2) the change in intensity as reflected in the summation of the explanatory variables η_1 and η_2 is a valid indicator of economic interdependence, i.e., that

$$EID_t = f(\Sigma\eta_{i,t}); \tag{3.23}$$

and (3) ϕ_1 (USTF, USMT, or WBL) is a valid indicator of foreign policy cooperation if such cooperation is a stock variable and ϕ_2 (USTF, USMT, or WBL) is a valid indicator of foreign policy cooperation if such cooperation is a flow variable, i.e., that

$$FPC_t \propto [\phi_j(\rho_k)]_t \tag{3.24}$$

then, on the basis of these results, we cannot reject the null hypothesis that economic interdependence has no effect on foreign policy cooperation.

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*Table 5c, though, does show significant results for 33 percent (4/12) of OECD regressions whereas only 8 percent (2/24) of LDC regressions were significant.

To summarize, the results in general were not significant at the 5 percent level. For those regressions that were significant, the squared correlation coefficients were low, indicating the relative unimportance of these explanatory variables. Also, the significant coefficients were not uniformly positive, and no difference in the size of the effect across dyads (as between LDCs and OECDs) could be discerned. Thus, assuming the validity of our model and the indicators of foreign policy cooperation and economic interdependence that we have employed, we cannot reject the null hypothesis that economic interdependence has no effect on foreign policy cooperation.

V. IMPLICATIONS FOR LINKAGE DIPLOMACY

Given the prevalence of an economic component in linkage strategies and the arguments for increased reliance on linkage diplomacy to deal with the problems of the contemporary world system, several policy questions which bear critically on the efficacy of such an approach to foreign policy were raised initially:

- Can we expect, *ceteris paribus*, expanded economic interaction, and therefore presumably expanded economic interdependence, to contribute to closer and more cooperative relations between countries?
- If so, can economic levers be employed as policy instruments to affect economic interdependence and thus promote more cooperative foreign policy?
- If so, how might this effect vary according to whether the target is a developed or less-developed country?

To answer these questions, an investigation was undertaken to determine the nature of the relationship between indicators of economic interdependence and foreign policy cooperation. Assuming the validity of these indicators, it was concluded that the contention that economic interdependence has no significant effect on foreign policy cooperation could not be rejected. The implications of such a result for linkage diplomacy are many.

- First, any linkage strategy predicated on the expectation that, *ceteris paribus*, expanded economic interaction contributes to closer and more cooperative relations between countries is at once suspect. Improved political relations do not seem more likely to result from increased economic interactions between, e.g., OECD countries of the North and the less-developed countries of the South, or between the United States and the Soviet Union.
- Second, it follows that economic levers cannot be employed as policy instruments as part of any general

strategy to promote foreign policy cooperation directly. Levers such as tariffs, quotas, subsidies, embargoes, capital controls, etc., while perhaps influencing the level of economic interdependence, cannot be expected to alter general foreign policy behavior. Thus, any linkage strategy in which the use of such levers is advocated for influencing general foreign policy behavior is suspect.

- Third, the use of such levers to promote foreign policy cooperation will be no more effective whether the target country is developed or less developed.

Of course, numerous caveats apply to these implications. In the first place, this analysis is only concerned with marginal effects. It does not preclude the validity of structural cross-sectional assertions concerning the relation between economic interdependence and foreign policy cooperation. For example, these results are not inconsistent with the contention that both cooperation and economic interaction are higher among the EEC countries and among the COMECON countries than between the EEC and COMECON countries.

Second, the model's specification assumed that, for those trading pairs to be evaluated, the level of foreign policy cooperation changed with economic interdependence (i.e., that EID ranged somewhere between a and d in Fig. 4). For some pairs of countries, though, their economic interaction may already be at such a high level (EID > d) that increases from that level have no further effect on their foreign relations. Such may be the case for relations between the United States and some of the developed countries, such as the United Kingdom, Netherlands, and Japan. On the other hand, the level of economic interaction may be at such a low level that, again, the level of economic interdependence may have no effect on foreign policy behavior (EID < a). Such may be the case for the U.S.-LDC dyads considered in this analysis, as

well as for relations between the United States and other LDCs and centrally planned economies such as the USSR and People's Republic of China.

A related caveat is that this analysis was confined to only those countries which had economic interactions with the United States and were therefore economically interdependent with the United States. Thus, the concern here was with *expanded* economic interdependence. We did not consider countries that initially had no economic interaction with the United States.* Thus we did not test the hypothesis that *establishing* economic interdependence promotes foreign policy cooperation. Such a hypothesis is perhaps more appropriate for questions concerning the role of linkage diplomacy in, e.g., U.S.-PRC relations, than a hypothesis concerning the effect of *expanding* economic interdependence.

In addition, as this analysis was confined to only those trading pairs of which the United States was a member (due to data and time constraints), the policy implications are necessarily most pertinent to the foreign policy of the United States and the foreign policy of its trading partners toward the United States.

The above caveats indicate avenues for further work based on this linkage model:

1. Increased time frame to capture an increased range of economic interdependence and/or greater confidence with regard to the statistical significance or insignificance of the results;
2. The inclusion of countries with which the United States initially had no economic interaction, thereby allowing incorporation of any hypothesis concerning the establishment of economic relations into the analysis; and

---

*This is because the set of countries in this time frame (1957-1977) that initially had no interaction with the United States is essentially the same as the set which has, in general, very low levels of interaction with the United States today--the centrally planned economies; and data from these countries are sparse.

3. The inclusion of U.S.-COMECON and other OECD-COMECON dyads to test whether the wide oscillations in their foreign policy cooperation are attributable to their economic interdependence.
4. The inclusion of trading pairs of which the United States is not a member, such as LDC-LDC dyads and other OECD-LDC (UK-India) dyads and other OECD-OECD (UK-France) dyads, thereby improving the generalizability of these results.

The results for those few statistically significant regressions suggest that factors other than the extent of economic interdependence, such as mutual security and cultural considerations, may predominate in explaining foreign policy behavior. Thus, further work based on this linkage model should also include additional explanatory variables to capture the variance in foreign policy cooperation not attributable to the extent of economic interdependence alone. In addition, it is possible that these other factors may interact with economic interdependence such that the latter may then have some effect which is not evident when it is considered alone. In other words, we are testing a "strong" version of the hypothesis, with the result that there is a bias in favor of the null hypothesis.

Additional caveats center on the validity of the indicators of economic interdependence and foreign policy cooperation, especially with regard to the latter. It was intended that by using multiple indicators (U.S. Treaties in Force, U.S. Military Transfers, and World Bank Loans) as cross-checks of one another, their validity as indicators of foreign policy cooperation could be assessed. Unfortunately, this approach is feasible only given significant results. In the absence of significant results, it is not possible to ascertain the validity of these indicators as measures of foreign policy cooperation.

Even given a reliable measure of foreign policy cooperation and assuming that the effect of economic interdependence was as originally postulated, a significant relation would require still another caveat. Other factors may have had offsetting effects on foreign

policy behavior over the time frame considered such that the level of cooperation has remained unchanged. In this case, the level of foreign policy cooperation would necessarily go unexplained.

Finally, these policy implications are pertinent to those linkage strategies that are predicated on the beneficial effect of increased economic interaction *in general* yielding increased foreign policy cooperation *in general*. These implications deny the efficacy of any diplomacy which asserts that "over time, trade and investment may . . . foster a degree of interdependency that adds an element of stability to the political equation" (Kissinger, 1977, p. 158). These results, however, do *not* deny the possible efficacy of linkages among specific issue areas in order to achieve a *particular* foreign policy *outcome*. The utility of using linkages as a negotiating device in *quid pro quo* agreements is not considered (Tollison, 1979). Examples of such linkages might include (1) the possible threat of U.S. troop withdrawals as a way to influence German international financial policies, (2) NATO alliance members' insistence that SALT II be ratified in exchange for the deployment in NATO of new weapon systems, and (3) OPEC attempts to link oil discussions to other international economic issues.

In conclusion, then, the contention that, *ceteris paribus*, expanded economic interaction between countries contributes to their closer and more cooperative relations is not supported in this analysis. This result brings into question the utility of general linkage strategies that rely heavily on an economic component to foster improved relations between interacting countries.

Appendix A

DISTRIBUTION OF GAINS FROM TRADE*

Who gains more from trade--the small country or the large country? The Ricardo-Mill answer to this question goes in favor of the small country inasmuch as it can trade at the prices prevailing in the rest of the world before trade was opened up. In this two-country model the small country reaps all the gains from trade and the large country (the rest of the world) gains nothing. In the present paper we take up this question of the distribution of gains from trade between the large country and the small country in terms of a multicountry framework. In this altered setting, as we shall see, the distribution of gains will generally be independent of the size of the country so long as there is universal free trade.

The question at hand involves intercountry welfare comparisons which lead to all the familiar problems of interpersonal utility comparisons. One possible way out will be to compare the per unit gains from trade as captured by the difference between the no-trade prices and the prices at which trade is taking place. This measure of gain will not involve any cardinality of utility. Moreover, unless somehow normalized by the size factor, any measure of the absolute or total gains from trade runs the risk of yielding a higher level of gains for the large country as against the small country simply because of the greater size of the large country. The unit measure which we adopt for our purposes will be free of this possible drawback.

The Standard Two-Country Model

As is well known, the offer curves under the Ricardian single-factor, constant returns to scale model would consist of a straight line through the origin (reflecting the no-trade price ratio) in the initial stretch combined with a regular shaped curve in the later stretch, as given in our Fig. 1.[1] There the rest of the world's offer curve is *OR*. The home country's offer curve is *OS* or *OL* depending upon whether the home country is small (in the sense of a price taker in international markets) or large--

*Excerpted from A. Ray, *J. of Int. Econ.*, Vol. 7, 1977.

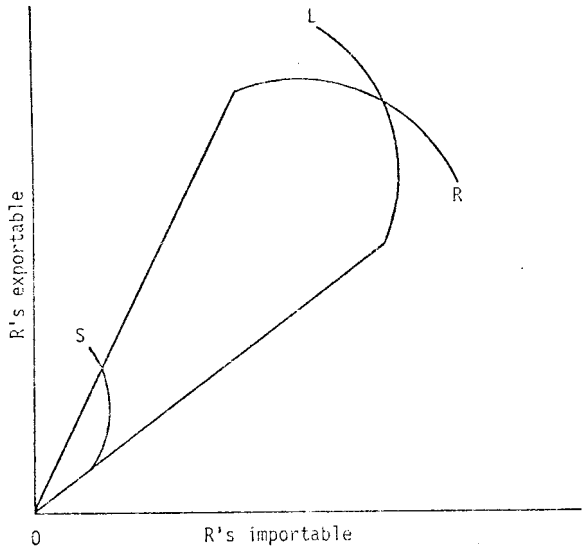

Fig. 1

OS if small, *OL* if large. Under free trade the home country, if small, trades at the prices prevaling under autarky in the rest of the world and hence obtains the maximum possible terms of trade gains. The home country, if large, obtains a terms of trade intermediate between the autarkic prices prevailing in the home country and in the rest of the world. Even if we depart from the free trade assumption and postulate that the home country exercises its monopoly or monopsony power in the world market through trade restriction, the terms of trade that it can at best secure is the one prevailing under autarky in the rest of the world. Thus the large country can at best approximate the terms of trade gains of a small country through deliberate trade intervention. A country, therefore, obtains a larger terms of trade gain if it is small than if it is large, irrespective of whether one retains the free trade assumption or not.

A Multicountry Framework

Let us now analyse the question of gains from trade in a multicountry framework. Here we have a small country *(S)*, a large country *(L)* and

the rest of the world *(R)*, all existing at the same time. This is in contrast with our earlier model, where we had either *S* and *R* or *L* and *R* but never the coexistence of *S*, *L*, and *R*. The question we now pose is: Does *S* gain more from trade with *R* than *L* does, when *both S* and *L* are trading *at the same time* with *R*? To make the gains comparable, we assume that there exists a common class of commodities which both *S* and *L* are importing from *R* and, similarly, there is another common class of commodities which both *S* and *L* are exporting to *R*. We then restrict our attention to a comparison of terms of trade gains of *S* and *L vis-à-vis R* with regard to only these two common classes of commodities.

With free trade, and abstracting from transport costs, the price of a commodity must be the same in all countries. So both *S* and *L* would buy at the same prices the common class of import goods from *R* and sell at the same prices the common class of export goods to *R*. Moreover, the no-trade prices prevailing in *S* and *L* need not have any systematic relationship to their respective sizes. Hence, under free trade the gains from trade, as measured by the gap between the no-trade prices and the prices at which trade actually takes place, is independent of the size of the country. To take a numerical example, suppose that the autarky price of a commodity is 10 in *L* and 20 in *R* whereas the free trade price is 16. The autarky price in *S* is as likely to be greater than 10 (*L*'s autarky price) as to be less than 10--in the former case *S* gains less from trade than *L*; in the latter case *S* gains more. Since both are equally likely, no *a priori* presumption of *S* gaining more (or less) than *L* is possible. It would, nonetheless, still be true that the eventual free trade prices would be influenced more by *L* than by *S* but this does not have any bearing on the distribution of gains from trade between *L* and *S* in the present context.

One may sum up the discussion in terms of the following two propositions:

> *Proposition 1.* Suppose the small country (*S*) and the large country (*L*) each have the same autarky prices. Now, consider the experiment of putting each of them *separately* in a trading context with a rest-of-the-world (*R*) whose autarky prices are different. In the *L*-*R* combination, the free trade prices will more closely resemble the *S* or *L* autarky prices than under the *S*-*R* (alone) combinations. In this sense a small country can gain more by trade than a large country. Even allowing for optimal trade intervention the small country continues to gain more than the large country.

Proposition 2. Suppose S and L are both trading with R *at the same time*. Since autarky prices in S are just as likely to be in R's direction compared with L's as in the opposite direction, there is no reason to expect S to gain more (or less).

It is proposition 1 or, more precisely, its Ricardo-Mill variant that has received exclusive attention in the literature. In the present paper we have emphasized proposition 2 not simply because it has been missing so far but because we feel that for answering a question like "Does the U.S. (a large country) gain more from international trade than, say, Nepal (a small country)?" the model underlying proposition 2 is more relevant than the model underlying proposition 1.

Appendix B

THE VARIABLES OF ECONOMIC INTERDEPENDENCE

B.1. THE CONSTRUCTION OF EXPLANATORY VARIABLES

The explanatory variables (η_i's, the dyadic interaction elasticities) are constructed from the following variables:

X^1_{AB} = exports from A to B (funds from B to A)
X^1_{BA} = exports from B to A (funds from A to B)
X^2_{AB} = cumulative direct investment of B in A
X^2_{BA} = cumulative direct investment of A in B
X^3_{AB} = A's cumulative liabilities to B (B's claims on A)
X^3_{BA} = B's cumulative liabilities to A (A's claims on B)
X^1_{AW} = A's total exports
X^1_{BW} = B's total exports
X^2_{AW} = total cumulative foreign direct investment in A
X^3_{BW} = total cumulative foreign direct investment in B
X^3_{AW} = A's total cumulative foreign liabilities
X^3_{BW} = B's total cumulative foreign liabilities

These twelve variables, then, give six interaction elasticities (or relative propensities) as follows (given Eq. 3.11):

$$\eta^1_{AB} = \%\Delta X^1_{AB}/\%\Delta X^1_{AW} \equiv \text{A's relative propensity to export to B,}$$

$$\eta^1_{BA} = \%\Delta X^1_{BA}/\%\Delta X^1_{BW} \equiv \text{B's relative propensity to export to A,}$$

$$\eta^2_{AB} = \%\Delta X^2_{AB}/\%\Delta X^2_{AW} \equiv \text{A's relative propensity to sell to B,}$$

$$\eta^2_{BA} = \%\Delta X^2_{BA}/\%\Delta X^2_{BW} \equiv \text{B's relative propensity to sell to A,}$$

$$\eta^3_{AB} = \%\Delta X^3_{AB}/\%\Delta X^3_{AW} \equiv \text{A's relative propensity to borrow from B,}$$

$$\eta^3_{BA} = \%\Delta X^3_{BA}/\%\Delta X^3_{BW} \equiv \text{B's relative propensity to borrow from A,}$$

where, given Eq. 3.21,

$$\eta_1 = \eta^1_{AB} + \eta^1_{BA} = \text{dyadic export elasticity,}$$

$$\eta_2 = \eta^2_{AB} + \eta^2_{BA} = \text{dyadic foreign direct investment elasticity,}$$

$$\eta_3 = \eta^3_{AB} + \eta^3_{BA} = \text{dyadic cumulative foreign liabilities elasticity.}$$

B.2. DATA SOURCES

η_1

Data on dyadic exports (X^1_{AB} and X^1_{BA}) of goods and services have been obtained from the International Monetary Fund in the form of a tape subscription (Direction of Trade--DOT), which contains annual data on exports and imports for all trading partners for 150 countries from 1948 to date.

The DOT tape is by far the most consistent and complete set of data available and is readily amenable to aggregation, temporally and cross-sectionally. However, the data are subject to various inaccuracies and inconsistencies. For example, the data are given in U.S. dollars on the basis of the *average* exchange rates for each reporting period. Export data are reported f.o.b. (free on board), but import data are reported f.o.b. *or* c.i.f. (cost of insurance and freight), according to each country's practice. When data on a country's distribution of imports are available, *estimates* derived from trading partners' reported data are used, adding 10 percent for c.i.f. To cover transactions between nonreporting countries, *extrapolations* from prior data are used, based on various criteria. The data are not adjusted to account for the time necessary for exports shipped from one partner to become imports to another partner. The data, temporally and cross-sectionally, also suffer from varying definitions

of those categories of goods and services that are not included in trade data. For example, South Africa does not include oil imports in its import data and, for the U.S., the definition of excluded shipments was changed in 1965.

Data for total exports (X^1_{AW} and X^1_{BW}) were obtained from the IMF's International Financial Statistics (IFS) tape, which is similar in format to the DOT tape but less extensive, especially with regard to time coverage. In the case of total export data (Item 70) the time coverage was complete. Data were usually given in national currency units, but because of the dimensionless nature of the interaction elasticity indicator, no conversion was necessary.

η_2

Data on bilateral cumulative foreign direct investment (X^2_{AB} and X^2_{BA}) were obtained from various issues of the monthly Survey of Current Business (SCB), published by the U.S. Department of Commerce's Bureau of Economic Analysis. Each year articles are published on 1) U.S. investments in foreign countries, covering both OECD and LDC countries (X^2_{BA}), and 2) foreign investments, exclusively OECD, in the U.S. (X^2_{AB}). This "asymmetry" in coverage presented an immediate problem since these interaction elasticity measures necessarily require interaction. Thus if X^2_{AB} is assumed to be zero over time for U.S.-LDC dyads (given the non-coverage of LDC investment in the U.S. by SCB), this would require that η^2_{AB} be undefined, i.e.,

$$\eta^2_{AB} = \frac{\Delta X_{AB}/X_{AB}}{\Delta X_{AW}/X_{AW}} = \frac{0/0}{\Delta X_{AW}/X_{AW}} \equiv \text{undefined}$$

such that

$$\eta_2 = (\text{undefined} + \eta^2_{BA}) \equiv \text{undefined}$$

where

$$\eta_2 = \text{change in cum. for dir. inv. intensity}$$

Thus in the absence of any interaction, the explanatory variable η_i is appropriately enough undefined. Of course X^2_{AB} is most likely non-zero for most LDCs, but owing to time and money limitations, the individual LDCs could not be queried on their U.S. investment activities. Thus the analysis can only include η_2 as an explanatory variable for the U.S.-OECD dyads.

The actual data provided by SCB were the U.S. dollar book value of foreign direct investments, which can vary considerably from market value or replacement cost less depreciation. In addition, the definition of a foreign direct investment has changed, for example, from 25% stock ownership down to 10% ownership. Also, book value adjustments are made in reference to a given "benchmark" year, in which a survey of all multinational actors is performed. Their performance is then followed via annual reports submitted to the BEA, but not the activities of any subsequent multinational actors. Thus these benchmarks are periodically revised (e.g., for U.S. abroad in 1950, 1957, 1966). This hampers data comparability over time.

The data on X^2_{AW}, i.e., total cumulative foreign direct investment (FDI) in the U.S., were also obtained from SCB articles on FDI in the U.S.

But data on X^2_{BW} were unavailable from SCB since the aggregate in the articles on dyadic U.S. FDI abroad was simply total U.S. FDI abroad. It was hoped that the IMF's Balance of Payments tape could be used, since it had for each country net annual foreign direct investment and total annual FDI abroad. Thus the difference would yield at least annual total FDI in that country. Then given at least one benchmark year, i.e., total cumulative FDI in that country, the necessary data could be derived. But the BOP tape only had data back to the mid-1960s, and thus provided too few data points for analysis (≤ 10). And, again, time and money limitations precluded obtaining the data from the respective countries. Thus, even for U.S.-OECD dyads, η_2 could not be constructed.

$\underline{\eta_3}$

Dyadic cumulative liabilities (X^3_{AB} and X^3_{BA}) were obtained from

the IMF's International Financial Statistics tape. For most countries, U.S. liabilities to a country (X^3_{AB}) and U.S. claims to that country, i.e., that country's liabilities to the U.S. (X^3_{BA}), were given for a sufficient number of years.

These data are aggregates of short- and long-term liabilities and are in U.S. dollars.

Data on total cumulative foreign liabilities (X^3_{AW} and X^3_{BW}) were obtained by summing Monetary Authorities foreign liabilities (16c) and Deposit Money Banks' foreign liabilities (26c).

Thus, to summarize, only two explanatory variables are included in the analysis: $\eta_1 \equiv$ the change in export intensity and $\eta_3 \equiv$ the change in the cumulative foreign liabilities intensity; where the sum $(\eta_1 + \eta_3)$ is equal to the change in the intensity ($\Delta\tau$) attributable to exports and liabilities interactions.

B.3. DATA DESCRIPTION

As an example, the following describes the variables used in the construction of these two explanatory variables, as well as the explanatory variables themselves, for the United States-Japan trading pair. For similar data on the other U.S. trading pairs (dyads) considered in this analysis, the reader is referred to the data sources given above.

In Tables 1 and 2 the necessary data are given for the construction, as described in Section B.1, of the dyadic export intensity, or the change in export intensity (η_1), and the dyadic cumulative foreign liabilities elasticity, or the change in the cumulative foreign liabilities intensity (η_3). In Figs. 1 and 2 the values of these explanatory variables are then plotted over time.

Table 1

EXPORTS (U.S. - JAPAN)

Year	Japan's Exports to the U.S. (X^1_{BA}) (mill $)	U.S. Exports to Japan (X^1_{AB}) (mill $)	Japan's Exports to the World (X^1_{BW}) (mill $)	U.S. Exports to the World (X^1_{AW}) (mill $)
57	606	1317	2858	20873
58	692	987	2876	17920
59	1051	1080	3456	17643
60	1107	1451	4054	20601
61	1073	1841	4235	21037
62	1410	1574	4916	21714
63	1522	1846	5452	23387
64	1866	2018	6673	26650
65	2517	2084	8452	27530
66	3009	2371	9776	30430
67	3048	2700	10441	31622
68	4132	2954	12971	34634
69	5017	3490	15990	38006
70	6015	4652	19317	43224
71	7616	4055	24087	44130
72	9115	4963	29095	49758
73	9573	8313	37081	71339
74	12929	10679	55554	98507
75	11242	9563	55817	107592
76	15923	10144	67305	114992
77	20077	10522	81126	121212

Table 2

CUMULATIVE FOREIGN LIABILITIES (U.S. - JAPAN)

Year	Japan's Liabilities to the U.S. (X^3_{BA}) (mill $)	U.S.'s Liabilities to Japan (X^3_{AB}) (mill $)	Japan's Total Foreign Liabilities (X^3_{BW}) (bill yen)	U.S.'s Total Foreign Liabilities (X^3_{AW}) (bill $)
57	155	586	72	7.19
58	111	936	78	8.19
59	339	1287	175	7.89
60	829	1890	429	9.29
61	1552	1674	689	10.59
62	1814	2198	779	11.09
63	2419	2489	972	12.59
64	3239	2773	1210	15.39
65	3213	3025	1242	16.09
66	2897	2877	1144	19.99
67	3334	3065	1487	22.29
68	3235	3986	1662	24.89
69	3520	4525	1630	34.99
70	4004	5591	1994	27.59
71	4526	16014	2307	23.39
72	4505	20223	2573	29.99
73	6649	11524	4148	35.69
74	12777	14429	7600	52.50
75	11072	13489	8136	53.39
76	11379	17074	8743	59.29
77	10096	22104	8274	71.99

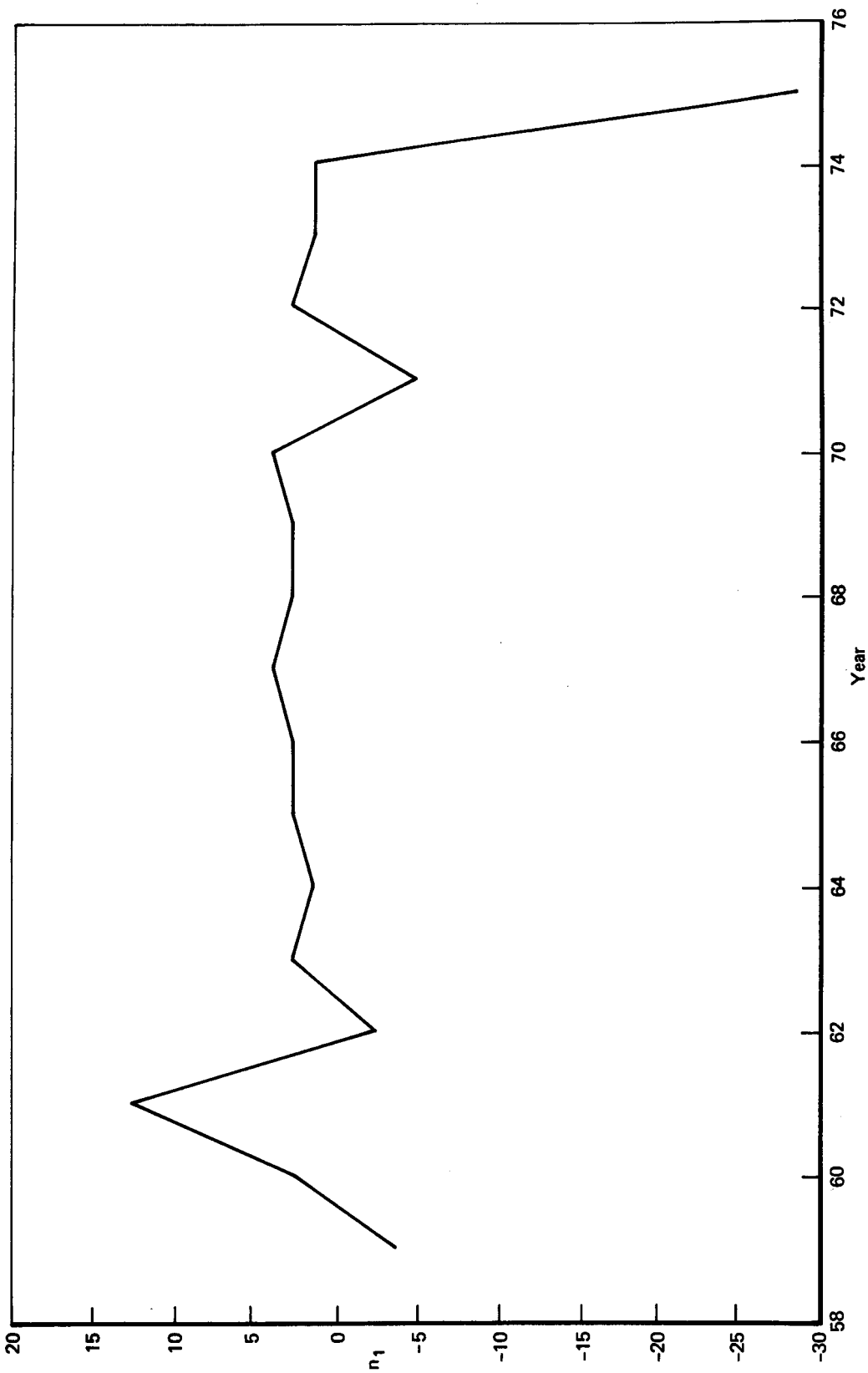

Fig. 1—U.S.-Japan

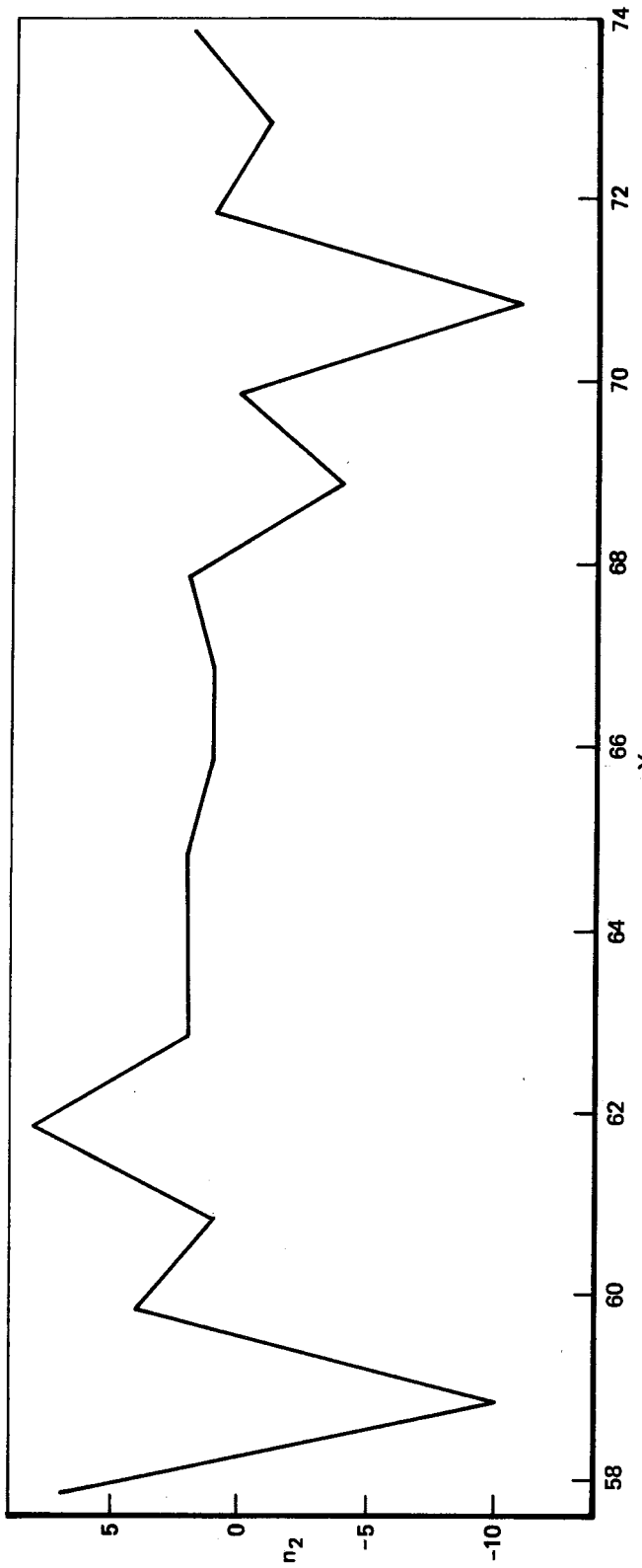

Fig. 2*—U.S.-Japan

*n_3 is given as n_2 in Chapter IV for expositional purposes.

Appendix C
U.S. INFLUENCE IN THE IMF AND WORLD BANK

During World War II the Allies realized that attention would have to be given not only to the immediate relief and reconstruction of economies disrupted by the war, but also to the expansion, by "appropriate" international and domestic measures, of production, employment and the exchange and consumption of goods. As a result, two complementary financial institutions emerged to help realize these goals (World Bank, 1974). The first--the International Monetary Fund (IMF)--was formed to promote international currency stability by (1) helping to finance "temporary" balance-of-payments deficits, (2) providing for the progressive elimination of exchange restrictions, and (3) promoting the observance of accepted rules of international financial conduct. And, additionally, this stability was to be pursued in the context of the maintenance of high levels of employment and real income. The second institution--the International Bank for Reconstruction and Development (World Bank)--was formed to promote reconstruction in Western Europe in the short term, and increase the living standards of the underdeveloped areas of the world over the longer term (Gold, 1976). Since then the World Bank has grown to include two additional lending facilities, the International Development Association (IDA)--established to provide loans on exceptionally favorable terms--and the International Finance Corporation (IFC)--established to promote private foreign investment.

THE ISSUE

Voting power is based on the size of the subscriptions of member countries to the capital stock of these institutions, which in turn is based on each member's quota in the IMF, the quota being designed to reflect the country's relative economic strength (World Bank, 1974). Thus voting power is essentially proportional to the member country's gross national product.

As a result, given the relatively huge GNP of the United States, it is likely that the United States exerts considerable influence over

policy direction in these institutions. If this influence approaches control, then decisions regarding the distribution of loans may be a function of whether the United States perceives the recipients to be cooperative in their foreign policy (in spite of any charter provisions regarding objectivity). As such, it may be plausible to consider these institutions, their internationality notwithstanding, to be simply instruments of U.S. foreign policy. Thus, given that foreign policy cooperation is a function of the extent of economic interaction, some "index" of the loan policy of these institutions should be a function of the degree of economic interaction of loan recipients with the United States.

THE METHOD

In determining whether U.S. influence in these institutions is sufficient to warrant any conclusion regarding effective control, it will be necessary to look at a measure of voting power other than that provided by these institutions. Their definition of voting power--the proportion of total votes--is a poor measure in that it fails to take into account the relative power of the other players and the effects of "special" majorities. That is, such an index does not measure the probability that a given player will be pivotal. A more appropriate index relevant to control is one in which the voting power of a given member depends on the chance he has of being critical to the success of a winning coalition. The Shapley-Shubik (S-S) index provides such a measure (Shapley, 1954). This measure, though, is only of a priori power, in that all voting orderings of members are assumed to occur equally often and it is assumed that votes are made independently (i.e., no log-rolling or coalitions). Thus the index is calculated by determining the proportion of voting orders (that are N! orders for N players) in which a given player casts a pivotal vote. (Henceforth voting power in this sense will be termed S-S voting power.)

More generally (Miller, 1973), the value of the K^{th} player (ϕ_K) is:

$$\phi_K = \sum_S [(n - S)!(S - 1)!/n!] \times [V(S) - V(S - K)]$$

where V(S) is the value of a coalition S and V(S - K) is the value of coalition S without player K. Given a voting game in which V(S) is either one or zero ('S' winning or 'S' losing), then a player is pivotal when V(S) - V(S - K) = 1. Thus in a voting game:

$$\phi_K = \sum_{S'} \frac{(n - S)!(S - 1)!}{n!}$$

where S' is all the coalitions in which the K^{th} player is pivotal.

While this analysis is most relevant to voting games in which votes are isolated events (e.g., Congressional elections), it will still provide a more accurate measure of intrinsic voting power than an index based solely on the proportion of total votes.

THE MODEL

1. Policy Formulation

All of these institutions--the IMF, World Bank, IDA, IFC--have essentially identical organizational structures for policy formulation and executive supervision (World Bank, 1974). Each country is represented by a Governor who is typically his country's Finance Minister or central bank Governor. All power in each institution is vested in a Board of Governors. But in each institution this Board has delegated most of its authority to the Council of Executive Directors. Currently there are 20 Executive Directors, 5 of whom are permanent, with the remaining 15 elected to two-year terms by the remaining members. Each of the permanent members votes according to his country's voting power, whereas the elected members have votes equal to the total of the members' votes he received (thus the voting power of this executive council is less than unity, since there were some hopeful governors who received votes but were not in the top 15). Inevitably, these elected Directors are regional representatives, with the Black Africans representing Black Africans, the Arabs representing the Mideast, and so on (World Bank Annual Reports, 1970, 1972, 1974, 1977).

2. Special Majorities

The major difference between the IMF and the other institutions is with regard to "special" majorities. As a result of the Second Amendment of the IMF's Articles of Agreement, 85 percent of the voting power is required for any decisions relating to the SDR and/or international liquidity (thus encompassing nearly all decisions of any significance) (Gold, 1977). In contrast, the World Bank (IDA, IFC) requires only a simple majority for the disbursement of a loan.

3. Voting Rights

Voting rights in each of these institutions are determined on a slightly different basis in that they have different weightings with regard to the underdeveloped countries (World Bank, 1974). In the World Bank, for example, each member is given 250 votes plus one additional vote for each share (analogy to stock game) of capital stock subscribed by it, which in this case is $100,000 of the weight and fineness (in terms of gold) in effect in 1944. But for the IDA, in the latest subscription of funds, each country got 3850 plus one for each additional $25.00! While this does substantially increase the voting power of the poorest countries (e.g., Afghanistan and Algeria have .19 and .37, respectively, in the World Bank and .29 and .54, respectively, in the IDA), it has little effect on the Big Five (France + Germany + Japan + UK + U.S.: .46 in World Bank, .48 in IDA).

Given these slight differences in the voting power of the largest subscribers (regardless of share cost) and that IMF quotas are used in determining subscription size, it will be assumed, for the sake of simplicity, that the voting power distribution in these institutions is identical to that given for the World Bank. In addition, it will be assumed that the breakdown in voting power of the elected Executive Directors is the same as that for the World Bank.

4. Coalition Forming

There can be large changes in the distribution of a priori power when coalition-forming takes place, i.e., when personalities and issues are considered. A formal way to approach this would be through

an asymmetric generalization of the S-S index in which 'n' issues are represented as, e.g., linear functions in an 'n' dimensional Euclidean space, R^n (Shapley, 1977). An easier approach might be to simply look at voting records in recent years to get an idea of how coalitions vary with the issues. Due to a lack of the necessary information, neither of these approaches will be pursued here.

THE DATA

The voting power for both the IMF and World Bank is assumed to be distributed as follows (World Bank, 1974): 1) For the Board of Governors: U.S. = .230, UK = .093, Germany = .049, France = .046, Japan = .037, with the remaining .54 split among the remaining 117 countries, giving an average of ~.005/country; 2) for the Executive Directors: the breakdown for the "Big Five" is the same, with the remaining 15 Directors having an average of .036, median of .036 and varying from .025 to .047 in 1976. Substantially the same statistics are observed for the elected Executive Directors in 1974 with an average = .035, median = .037 and varying from .026 to .044. Thus it appears that this distribution is to be expected, although there have been only two elections since the establishment of a twenty-member council. It is presumed that the use of the average values for the voting power of the non-Big Five Countries will not significantly alter the calculation of the S-S value for the United States.

THE VOTING GAMES

The S-S voting power of the United States will be calculated (with the aid of a computer) for the following two weighted majority voting games for each institution:

I) The Board of Governors,

II) The Council of Executive Directors.

For the World Bank (IDA, IFC) each game needs only a simple majority, whereas for the IMF each game needs the special majority. In addition, relevant to Game I, total membership in the World Bank (IDA, IFC) and IMF differs slightly.

RESULTS*

IMF N = 129

		n_1	n_2	n_3	n_4	n_5	n_6, ..., n_{129}
I)	[.85;	.230,	.093,	.049,	.046,	.037,	.005, ..., .005]
	S-S Index:						
		n_1	n_2	n_3	n_4	n_5	n_6, ..., n_{20}
II)	[.85;	.230,	.093,	.049,	.046,	.037,	.036, ..., .036]
	S-S Index:	.216,	.110,	.064,	.064,	.034,	.034, ..., .034

WORLD BANK (IDA, IFC) N = 123**

		n_1	n_2	n_3	n_4	n_5	n_6 ; ....., n_{123}
I)	[.501;	.230,	.093,	.049,	.046,	.037,	.005, ..., .005]
	S-S Index:						
		n_1	n_2	n_3	n_4	n_5	n_6 , ..., n_{20}
II)	[.501;	.230,	.093,	.049,	.046,	.037,	.036, ..., .036]
	S-S Index:	.285,	.099,	.051,	.038,	.033,	.033, ..., .033

DISCUSSION

It is clear, for both the IMF and World Bank, that Game II (the game which represents the real distribution of voting power in these institutions given the role of the Council of Executive Directors) involves a decrease in the S-S voting power of the United States relative to Game I (in spite of the United States having identical vote proportions in both games). This is because, given the increased voting weight of the merged players, their probability of being pivotal has increased; e.g., in the limiting case of the simple majority game, where $W_1 = .23$ and $1 - W_1$ of the voting power is equally distributed among an infinite number of players, the S-S voting power for n_1 (U.S.) would be equal to $W_1/1 - W_1 = .299$. The S-S voting power for the

*Results not available for Game I; calculations for Game II based on one thousand total votes, whereas there are actually 288,000.

**Calculations for IDA and IFC would be slightly different, as membership is 112 and 98, respectively; but all include Big Five.

United States in Game I must therefore lie between that of the limiting case and Game II. Thus, for both the IMF and World Bank, the vesting of authority to the Council of Executive Directors (Game II) represents a concession (albeit small) in S-S voting power by the United States.

The results of Game II are shown in Fig. 1. For the IMF, this game is essentially identical to that for the World Bank except that a special majority of 85 percent is required for most major decisions. Thus, in the IMF, the United States is the only member with veto power. As a result, it might be anticipated that the United States has greater influence in the IMF than in the World Bank, since the United States is the only player that can veto in the IMF's special majority games whereas no blocking by any individual country can occur in the World Bank's simple majority game. In fact, the contrary is true. The United States has greater S-S voting power in the World Bank (28.5 percent) than in the IMF (21.6 percent). (Surprisingly, the S-S voting power of the United States in the IMF is even less than its voting power based on its proportion of the total votes--23 percent.) This can be attributed to the fact that as the size of the required majority increases, so does the number of coalitions that can block; i.e., the United States only needs a special majority of 77.1 percent to be able to block, given its 23 percent share of votes. Requiring 85 percent only makes it possible for smaller and therefore more numerous coalitions to block. For the United Kingdom, on the other hand, S-S value rises from 8.5 percent in the World Bank to 11 percent in the IMF, relative to its voting share of 9 percent. A similar sharp rise is observed for Germany and France, although Japan and the 15 Elected Directors have essentially unchanged S-S values. Thus the three major European players appear to benefit from the 85 percent special majority requirement. This seems reasonable given that it was the European countries that pushed hardest for the 85 percent majority requirement in the 2d Amendment to the Articles of the IMF. Previously, the special majority requirement had been 80 percent, just enough such that the coalition of the United Kingdom, Germany, and France could not block,

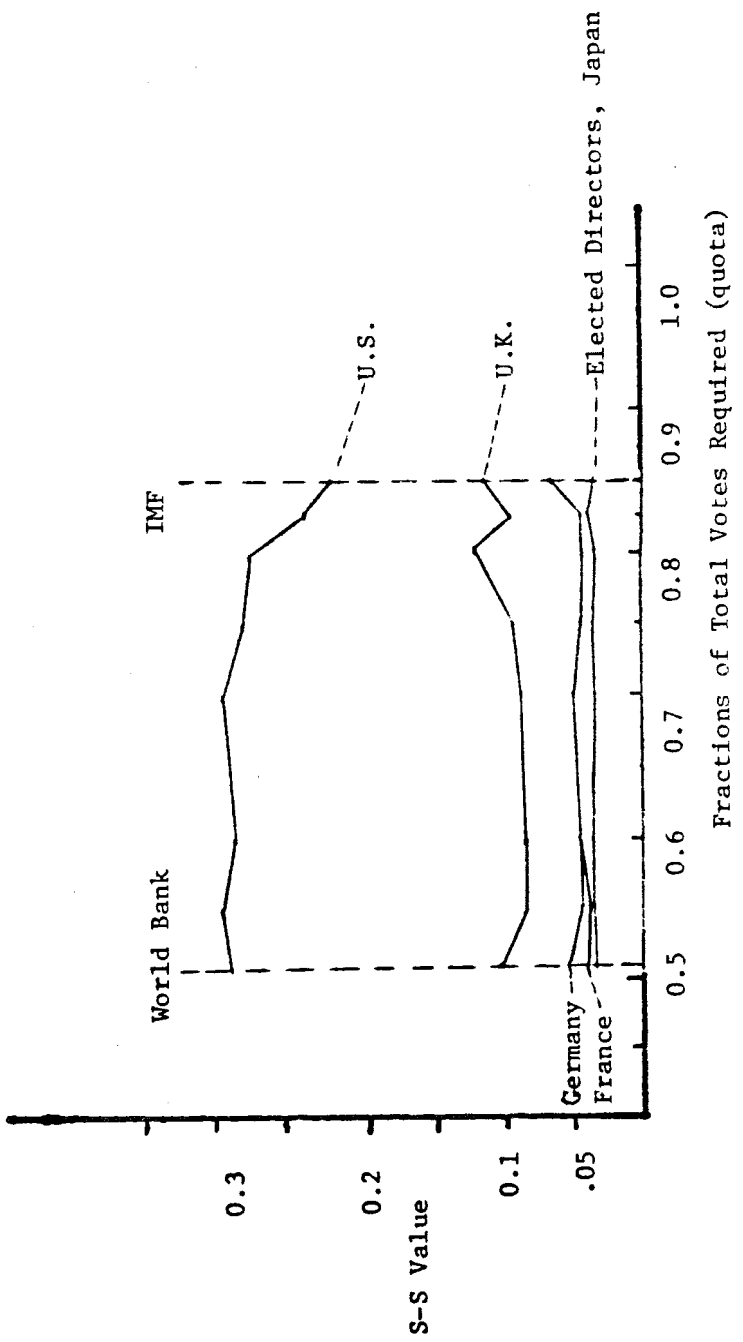

Fig. 1--S-S values for Game II

but the United States could. Accordingly, with a quota of 80 percent the S-S value for the United States was 27.4 percent. But with an 85 percent quota, the value dropped to 21.6 percent. Thus the Europeans have succeeded in reducing the U.S. S-S voting power in the IMF by 21 percent.

Thus, it appears that, on the basis of the S-S index, the United States has greater a priori power in the World Bank than in the IMF, in spite of having identical vote proportions in each institution. In addition, based on the S-S index, U.S. power in the World Bank (28.5 percent) is larger than that indicated by its vote proportion (23.0 percent); whereas in the IMF the opposite holds (21.6 percent vs. 23.0 percent.

In any event, it is clear that the United States exerts substantial influence, if not *de facto* control, over these organizations. As a result, these organizations may, to some extent, be viewed as instruments of U.S. foreign policy. Thus, decisions regarding the disbursement of loans may be influenced by whether the United States perceives the recipients to be cooperative or hostile in their foreign policies.

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Appendix D

THE VARIABLES OF FOREIGN POLICY COOPERATION

D.1 DATA SOURCES OF VARIABLES OF FOREIGN POLICY COOPERATION

1. U.S. Treaties in Force, $\emptyset_i$ (USTF)

The data were compiled from "Treaties in Force" published by the Department of State. These treaties are not only treaties as defined in the strict sense by the U.S. Constitution, but include agreements that are a) pursuant to or in accordance with existing legislation or treaties, b) subject to Congressional approval or implementation, or c) in accordance with the President's Constitutional power. Ratifications are compiled rather than agreements.

2. U.S. Military Transfers, $\emptyset_i$ (USMT)

Data were obtained from the Department of Defense's Security Assistance Agency's Fiscal Year Series from file number FYS39, file date 08 Jan 79 (Rand Library No. 00298544). The variable was constructed using the cumulative level of the sum of foreign military sales (FMS) and Military Assistance Programs (MAP) *agreements*, as opposed to *deliveries*.

3. World Bank Loans, $\emptyset_i$ (WBL)

Data were obtained from a combination of World Bank Yearbooks and various annuals of U.S. Overseas Loans and Grants. The cumulative level of loan disbursements was compiled as opposed to loan authorizations.

D.2 DATA DESCRIPTION

As an example, the following includes plots over time of the cumulative levels of these variables of foreign policy cooperation. Figure 1 shows the cumulative level of Treaties in Force between the

United States and Japan over time. Figure 2 shows the cumulative dollar value of U.S. Military Transfers to Japan over time. Figure 3 shows the cumulative dollar value of World Bank Loans to India (as this measure is not applicable to Japan) over time. For similar data on the other U.S. trading pairs considered in this analysis, the reader is referred to the data sources given above.

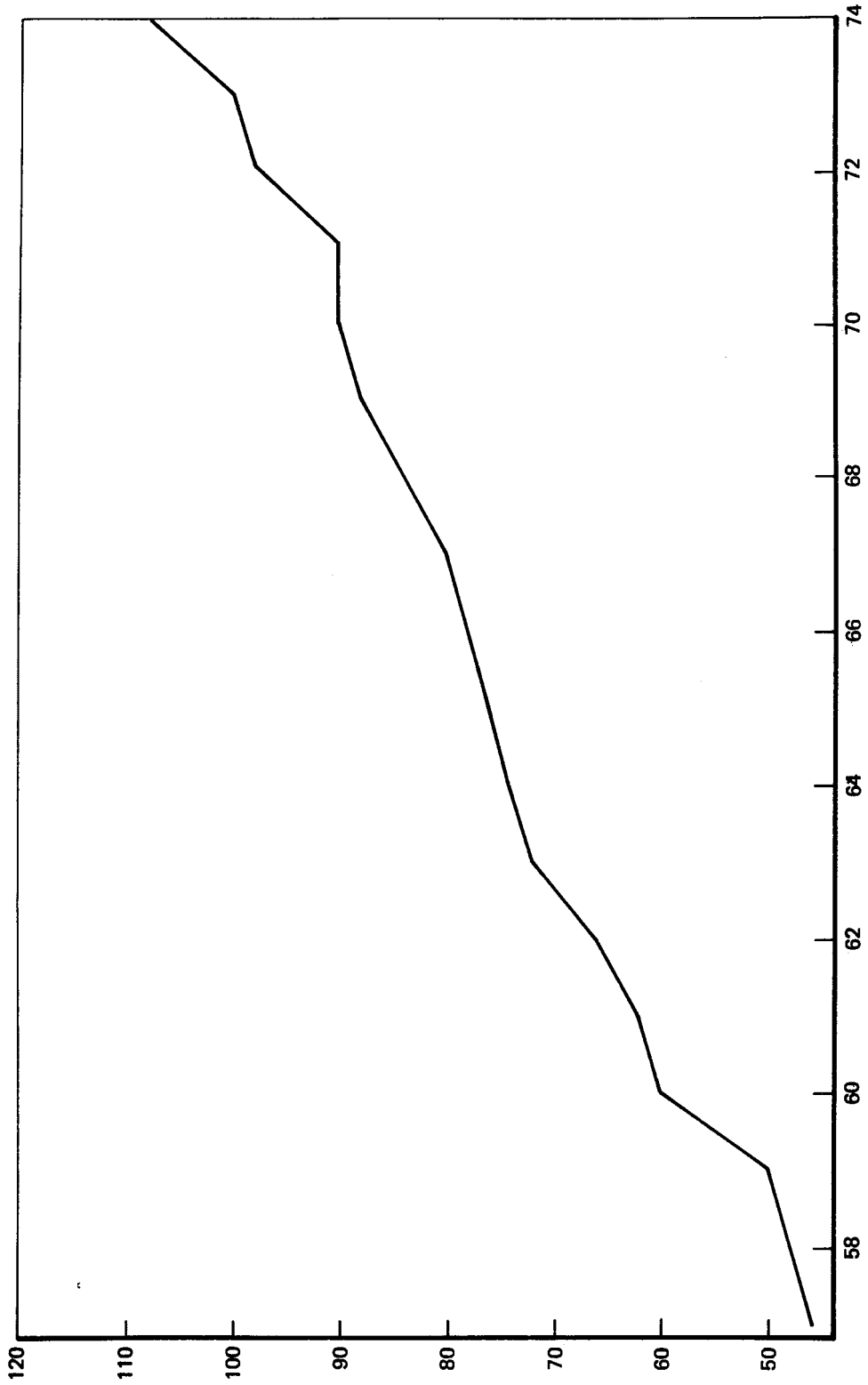

Fig. 1 — Cumulative number of treaties vs year for U.S.-Japan

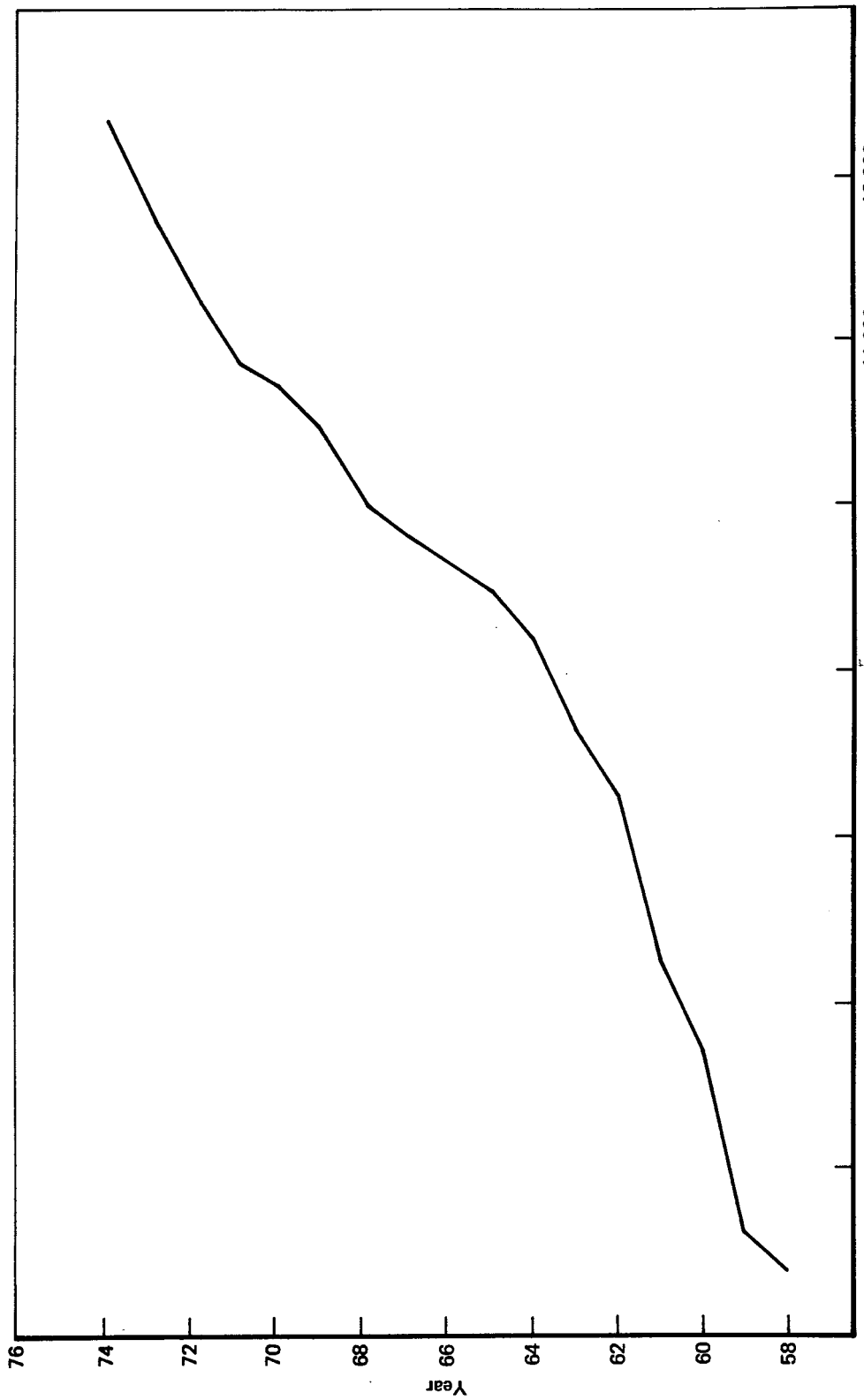

Fig. 2—Year vs cumulative dollar value of military transfers x 10^{-5} for U.S.-Japan

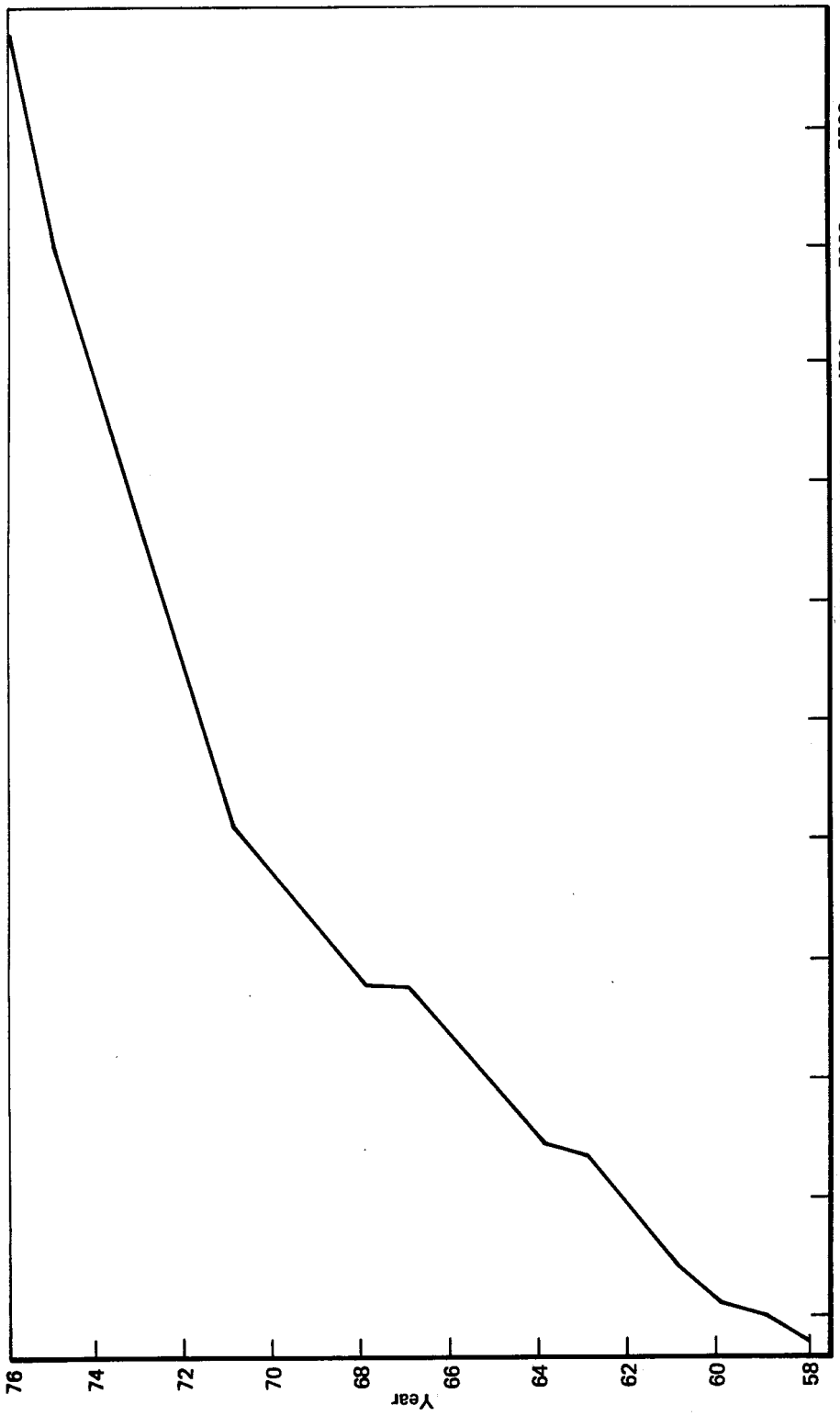

Fig. 3—Year vs cumulative dollar value of World Bank loans x 10^{-6} to India

Appendix E

APTNESS OF THE MODEL

As an example, the following considers the model aptness for the two regressions based on the cumulative level of U.S. treaties in force, ϕ_1(USTF), and the rate of change of that level, ϕ_2(USTF), for the U.S.-Japan trading pair (see Table IV.1). The residuals of these two regressions are given in Tables 1 and 2.

HETEROSCEDASTICITY

The Goldfield and Quandt statistic is as follows:

for an even number of observations (η)

$$H = \sum_{i=1}^{\eta/2} \varepsilon_i^2 \Big/ \sum_{i=\eta/2}^{\eta} \varepsilon_i^2,$$

and for odd η

$$H = \sum_{i=1}^{(\eta-1)/2} \varepsilon_i^2 \Big/ \sum_{i=(\eta+3)/2}^{\eta} \varepsilon_i^2.$$

For even η, H is an F-statistic with $\left(\frac{1}{2}\eta - K\right)$ degrees of freedom in both the numerator and denominator. For odd η, H is an F-statistic with $\left[\frac{1}{2}\left(\eta - 1\right) - K\right]$ degrees of freedom in both the numerator and denominator.

Table 1

THE ϕ_1(USTF), U.S.-JAPAN RESIDUALS

Number	Year	ε_i	$\Delta\varepsilon_i$	$(\Delta\varepsilon_i)^2$	ε_i^2
1	57	-5.58	-	-	33.6
2	58	-11	-5.2	27.0	121.0
3	59	-31	-20	400.0	961.0
4	60	-25	6.0	36.0	625.0
5	61	-6.5	18.5	342.0	42.3
6	62	-28	-22	484.0	784.0
7	63	-9.5	18.5	342.0	90.3
8	64	-8.8	0.7	0.5	77.4
9	65	-6.8	2.0	4.0	46.2
10	66	-3.9	2.9	8.4	15.2
11	67	-.26	3.6	13.0	0.1
12	68	.85	1.1	1.2	0.7
13	69	12	11	121.0	144.8
14	70	11	-1.0	1.0	121.0
15	71	10	-1.0	1.0	100.0
16	72	17	7.0	49.0	289.0
17	73	20	3.0	9.0	400.0
18	74	25	5.0	25.0	625.0
19	75	-1.5	-27	729.0	2.3
20	76	41	43	1849.0	1681.3
				4442.0	6133.0

Table 2

THE ϕ_2(USTF), U.S.-JAPAN RESIDUALS

Number	Year	ε_i	$\Delta\varepsilon_i$	$(\Delta\varepsilon_i)^2$	ε_i^2
1	58	-.03	-	-	.0009
2	59	.01	.04	.0016	.0001
3	60	.11	.10	.0100	.0121
4	61	-.01	-.11	.0121	.0001
5	62	.03	.04	.0016	.0009
6	63	.04	.01	.0001	.0016
7	64	-.02	-.06	.0036	.0004
8	65	-.04	-.02	.0004	.0016
9	66	-.02	.02	.0004	.0004
10	67	-.02	.00	.0000	.0004
11	68	.00	.02	.0004	.0000
12	69	.01	.01	.0001	.0001
13	70	-.04	-.05	.0025	.0016
14	71	-.04	.00	.0000	.0016
15	72	.01	.05	.0025	.0001
16	73	-.02	-.03	.0009	.0004
17	74	.02	.04	.0016	.0004
18	75	.02	.00	.0000	.0004
19	76	-.02	-.04	.0016	.0004
				.0394	.0235

For a given significance level, if H or 1/H is less than F, then we must reject the hypothesis that the variance of the residuals is heteroscedastic.

Referring to Table 1 yields

$$H(\phi_1) = \frac{2770}{3363} = .82.$$

At the .05 significance level $F_{7,7} = 3.79$. Thus, since $H(\phi_1) < F_{7,7}$ and $1/H(\phi_1) < F_{7,7}$, we must reject the hypothesis that the variance of the ϕ_1(USTF) regression residuals is heteroscedastic.

Referring to Table 2 gives

$$H(\phi_2) = \frac{.0180}{.0050} = 3.6.$$

At the .05 significance level $F_{6,6} = 4.28$. Thus, since $H(\phi_2) < F_{6,6}$ and $1/(H(\phi_2) < F_{6,6}$, we must reject the hypothesis that the variance of the ϕ_2(USTF) regression residuals is heteroscedastic.

AUTOCORRELATION

The Durbin-Watson statistic is as follows:

$$d = \frac{\sum_{i=1}^{\eta-1} (\varepsilon_{i+1} - \varepsilon_i)^2}{\sum_{i=1}^{\eta} e_i^2}.$$

A table of upper and lower bounds (d_L, d_U) was compiled by Durbin and Watson such that, for a given signifcance level, if $d < d_L$, then there is autocorrelation; if $d_L < d < d_U$, then no conclusion can be made; and if $d > d_U$, then there is no autocorrelation.

Referring to Table 1 gives

$$d(\phi_1) = \frac{4442}{6133} = .72.$$

At the .05 significance level and given $\eta = 20$ and $K = 3$, $d_L = 1.1$ and $d_U = 1.54$. Thus, since $d(\phi_1) < d_L$, there *is* autocorrelation.

Referring to Table 2 gives

$$d(\phi_2) = \frac{.0394}{.0235} = 1.68.$$

At the .05 significance level and given $\eta = 19$ and $K = 3$, $d_L = 1.08$ and $d_U = 1.53$. Thus, since $d(\phi_2) > d_U$, there is *no* serial correlation.

NORMALITY

That the ϕ_1(USTF) and ϕ_2(USTF) regressions for the U.S.-Japan trading pair yield normal residuals is demonstrated in Figs. 1 and 2, in which the residuals are plotted on normal paper. A straight line indicates normality.

MULTICOLLINEARITY

Values of $r(\eta_1, \eta_2)$ for the seven U.S. trading pairs examined in this analysis are listed in Table 3. These values indicate that multicollinearity was not a problem since the absolute value of $r(\eta_1, \eta_2)$ was never greater than .574.

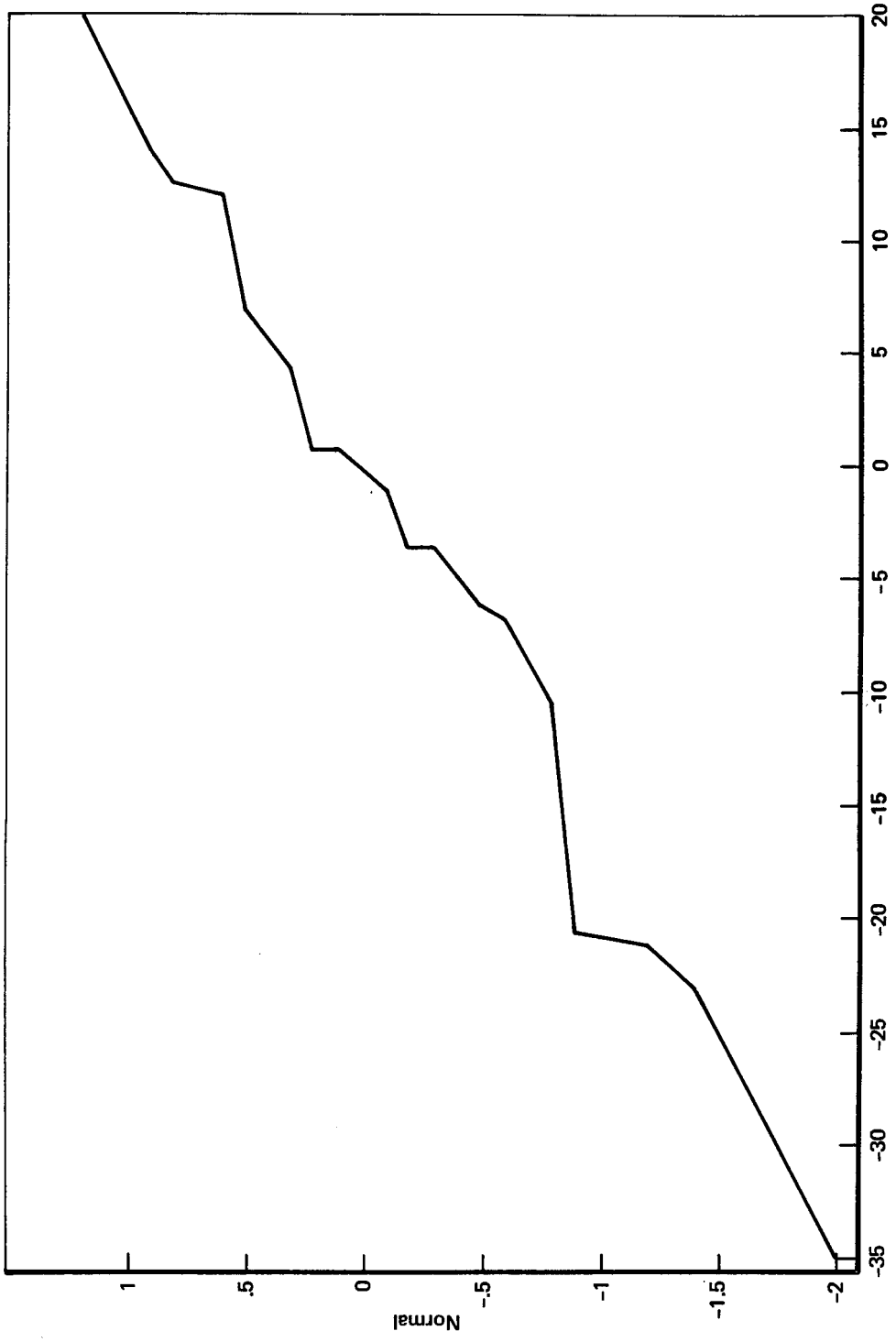

Fig. 1 — ϕ_1 (USTF), U.S.-Japan

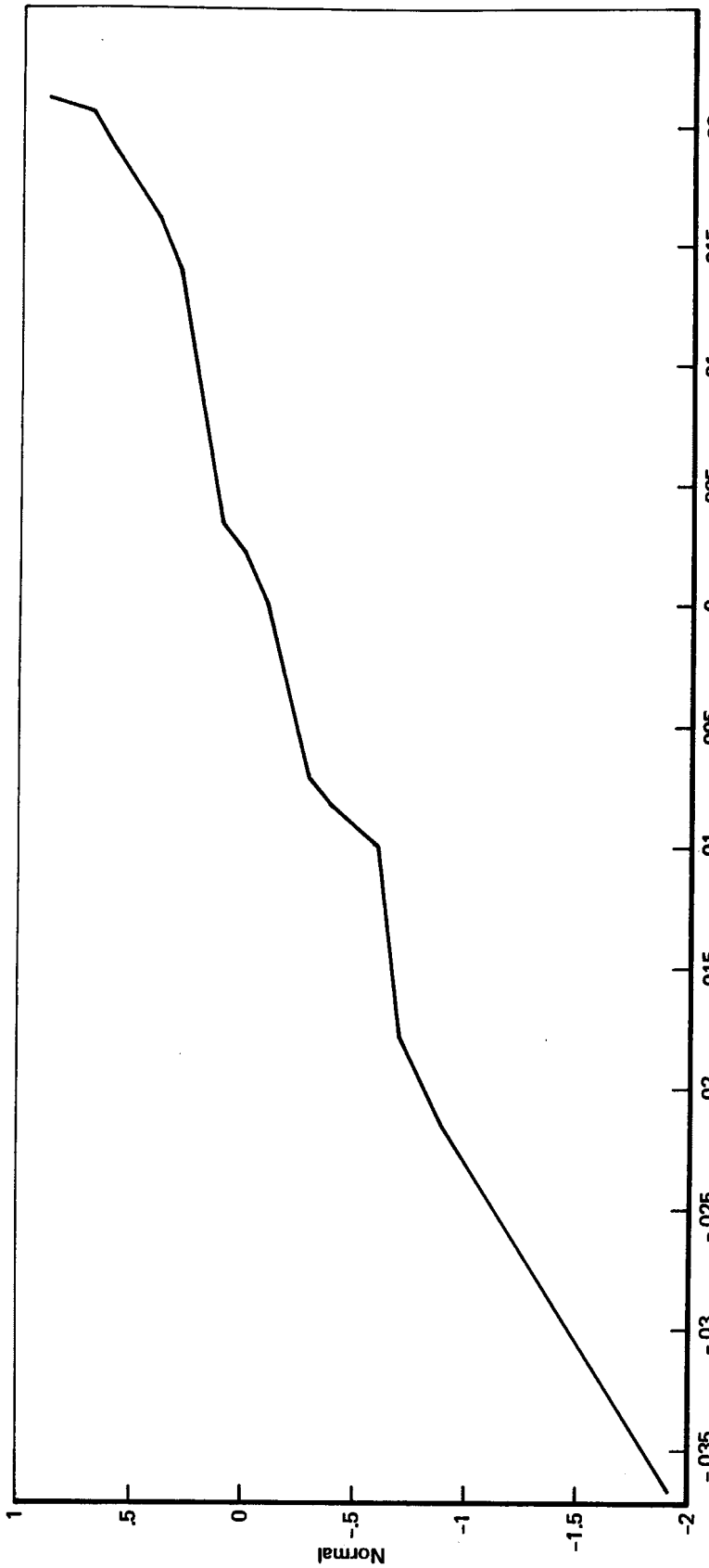

Fig. 2— ϕ_2 (USTF), U.S.-Japan

Table 3

CORRELATION MATRIX VALUES
FOR THE EXPLANATORY VARIABLES

Trading Pair	$r(\eta_1, \eta_2)$
U.S.-Netherlands	.574
U.S.-Japan	.254
U.S.-United Kingdom	.525
U.S.-Argentina	.386
U.S.-Brazil	-.321
U.S.-India	.486
U.S.-Philippines	-.059

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